

**MillionTreesNYC, Green Infrastructure, and Urban Ecology:
A Research Symposium**

March 5th and 6th, 2010
New York City

Research Abstracts

Local Air Quality and Urban Heat Island
Water Quality, Storm Water Management
Economic Impacts and Quantifying Returns on Investment
Urban Environmental Education, Ecological Literacy, and Curriculum Development
Human Health and Well-Being
Civic and Municipal Stewardship
Green Jobs and Social Justice
Reforestation Dynamics and Forest Health
Biodiversity and Ecological Communities
Green Infrastructure and Planting Designs

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TITLE:

Examining Motivations and Strategies for Engagement in Urban Forestry

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ABSTRACT:

Long-term stewardship is important for the survival of trees so that communities can receive the myriad health, environmental, and social benefits urban trees provide. This research is focused on the development and implementation of a community engagement model for urban forestry. The goal of this model is to create a toolkit of strategies that will help urban forestry practitioners nationwide more effectively engage and enable residents to be active stewards of the urban trees in their community. Research will aid in understanding the motivations individuals have with regard to initiating and sustaining involvement in urban forestry programs and stewardship. The model will be piloted in Jamaica, Queens and Canarsie, Brooklyn, working with community residents, organizations and agencies. This presentation will give an overview of the project, including the theoretical framework for the development of the model and plans for dissemination of the results. Presenters will highlight preliminary data collected from a focus group conducted with urban forestry professionals who shared their experiences and ideas about motivating people to be stewards of urban trees, and discussed strategies already in use by urban forestry organizations to engage residents and communities in long-term stewardship. Data is also being collected at the local level to give insight into the motivation of volunteer stewards. Findings of a preliminary survey of community residents who

participated in a Million Trees NYC Planting Day will also be shared, illustrating volunteer attitudes toward urban trees, and the challenges and opportunities associated with citizen involvement in urban forestry.

WORD COUNT:

248

TITLE:

Open Source Stewardship

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ABSTRACT:

What does it mean to integrate the many forces working on the urban environment through an open system that enables interoperability between government, NGOs and the public? This timely question is presented in the context of Obama's Open Government Directive issued December 8th, 2009, which mandates participation, collaboration, and transparency for government agencies and departments at all levels. This directive creates – and demands – new opportunities for government to support and be informed by the multiple actors working in New York's urban forest. Small project teams in cities across the United States, from Casey Trees in DC, to Friends of the Urban Forest in SF, are asking what kind of tool(s) could be built on which sets of data that can 1) meet the requirements of professional foresters, 2) scale to government operations, and 3) be engaging to a 12 year old or 70 year old non-expert as they walk past a tree on their city block. Could there be a common system that any city could take and customize for their needs?

Over the past year, the Stewardship and Environmental Mapping Project (StEM) and OpenGeo, the geospatial civic software experts, have been prototyping open source tools to enable greater participation, collaboration and transparency in the management of New York's ecological resources. Taking a hi-tech / lo-tech approach to building community along with building a map, StEM/OpenGeo has developed a protocol to collect a base inventory of "soft" infrastructure" upon which to visualize streams of maintenance activity for use in management and research. Through collaborating with community groups, city agencies, students and ecologists -- and through sharing notes with similar groups across the country -- many critical questions have been unearthed; the most interesting of which will be opened up for discussion here.

WORD COUNT:

292

TITLE:

Growing Trees in Concrete

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The need for a load-bearing soil under pavement gave rise to the development of CU-Structural Soil, a blended soil that can be compacted to 100% dry density (Proctor density) to bear the load of a pavement while allowing tree roots to grow through it. Previously, soils compacted to meet engineering specifications for load bearing restricted tree root growth. CU- Structural Soil requires a large volume of soil under pavement, approximately 2 cubic feet of soil for every square foot of envisioned crown diameter. Three feet of soil depth is recommended, although several projects have been successful using as shallow as 24". CU-Structural Soil has an available water holding capacity between 7% and 12% depending on the level of compaction. This is equivalent to a loamy sand or sandy loam. Because of its well-drained nature, trees that prefer well-drained soils do best in CU-Structural Soil. Depending on the stone type used to make it, the pH of the soil may be affected (e.g. limestone vs. granite). Good tree selection practices and establishment procedures should be used with CU- Structural Soil as would be done with any tree installation.

In 1997, one of the largest projects using CU-Soil up until that time was installed near McCarren Park in Brooklyn. Tree growth was evaluated after twelve years and root growth measured under the pavement using Ground Penetrating Radar. Results from this study and implications for future planting in sidewalks will be discussed.

WORD COUNT:

240

TITLE:

It Takes a Stewardship Village: Reducing Street Tree Mortality Rates in an NYC Neighborhood

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CO-AUTHORS:**ABSTRACT:**

This study examines effect of presence vs. lack of street tree stewardship on street tree mortality rates over five growing seasons on a population of over 500 street trees. Conducted within a Manhattan neighborhood in New York City of 200 acres, the study originated from a neighborhood organization's project to recruit tree stewards while increasing its street tree population. The project recorded data on street tree mortality and other factors, as the street tree count rose 35 percent and the share of street trees under a tree steward's care grew from 20% to 50%. Linear regression analysis of the tree mortality experience for this population shows that street trees with a tree steward during a growing season had lower street tree mortality rates for that year at a level of statistical significance compared to street trees without a tree steward. Logistic regression street tree mortality odds ratios were found 4.0 times greater for street trees without stewards (range 2.4 to 6.9) than for street trees with stewards. Significance was also observed for street trees within four years of planting, and for street trees beyond the four year point; the data show small negative logistic regression slope (coefficient - 0.1902) in street tree mortality for increasing years since planting. These results support the view that citizen stewardship for all street trees, established and recently planted, helps maximize urban forest canopy by substantially promoting street tree viability. The project experience also highlights the need to reallocate resources to street trees after planting.

WORD COUNT:

249

TITLE:

Working Methodologies for Protection of Mature Trees

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ABSTRACT:

Because the benefits of trees increase exponentially with growth, it is imperative that we protect existing mature trees. This will entail developing methodologies that incorporate the protection of trees into design and development. The City of New York Parks and Recreation's Olmsted Center is in the design phase of a 9,000sf addition and renovation of its existing building and landscape. The 50,000sf building shares five acres of land with 118 existing trees, of which 76 have a DBH of 15" or greater, and 36 of 24" or greater. Using the critical root zone calculation developed by the ISA that accounts for DBH, species tolerance to construction, and age class, the critical root zone of all trees on site were determined and illustrated from the outset of the project. The design team worked with these plans and a tree valuation matrix, considering the trees in each site, and many architectural, design decisions from siting of the building and utilities to re-grading for flood protection and stormwater management. The first priority has been to protect trees in place. Some transplants (5) and removals (4) are necessary, and in those instances, The New York City tree valuation methodology was used. In the end, the project will, in addition to achieving the design goals, maintain the impressive mature canopy and the environmental benefits it provides. This project is a model for using measures of tree sensitivity in the design process and for weighing the needs and value of mature trees in design and engineering decisions.

WORD COUNT:

251

TITLE:

Understanding Civic Environmental Stewardship Networks in New York City

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ABSTRACT:

How do we understand the social and spatial interactions among actors working on urban environmental stewardship? Locally grounded civic groups respond to public problems in cities by working along with and outside of government agencies and the private business sector as environmental stewards. As stewards, civic groups conserve, manage, monitor, advocate for, and educate their friends, neighbors, and representatives about a wide range of quality of life issues regarding urban resources. Understanding stewardship is integral to assessing the effectiveness of local sustainability efforts, such as MillionTreesNYC, which are created and implemented through networks of actors that include civic groups. This paper analyzes the social interactions among groups working as urban environmental stewards. First, we present data collected from a 2007 survey of nearly 3,000 civic groups in New York City that are working as urban stewards. As background, we present analysis of the organizational characteristics of these civic groups. Second, we present an analysis of the civic-to-civic social networks of these groups in order to understand the ways that they are connecting to and interacting with each other in webs of collaboration. Third and finally, we discuss the ways that this study helps us to understand the dynamics of civic stewards as part of urban environmental governance more broadly. By mapping the spatial distribution and social networks among civic stewardship groups, we begin to reveal the presence, capacity, and connections among these groups and to understand their role in urban natural resource management.

WORD COUNT:

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TITLE:

Biogeochemistry Within A Stormwater Capture System - the SIMS Metal Recycling Site in Bronx, NY

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ABSTRACT:

The stormwater capture system at the SIMS Hugo Neu metal recycling site, designed and constructed by the Gaia Institute, intercepts annually about 6.4 million gallons of runoff containing metals, hydrocarbons, and suspended solids from the 6.4 acre site, a portion of which used to flow directly into the Bronx River. Post construction, stormwater is filtered through soil horizons, prior to entering a man-made aquifer consisting of an array of StormChambers and gravel sitting above the groundwater, which discharges into the Bronx River. Apart from water capture efficiency, nutrient cycles and fate of contaminants are critical issues. Study is being conducted to examine partitioning of nutrients and pollutants within the biogeochemical systems operative in developing soil horizons. Nutrients such as N, P and K are intercepted, utilized and recycled by growing plants, while the mobility of toxic metals could be controlled by many different processes in the system. Water chemistry changes in the StormChambers, as well as those for groundwater, will be closely monitored following a storm event. Long term trends of water and soil quality changes are equally important to understand. This study will provide the first such data about the structure and development of stormwater management systems that are rapidly becoming common in urban areas. Understanding of the biogeochemical systems within the soil horizon may help to identify parameters to maximize water infiltration, contaminant capture, and nutrient utilization. These will lead to better design of engineered soil horizons for stormwater capture systems.

WORD COUNT:

243

TITLE:

The UNESCO URBIS Initiative- Towards Designation

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ABSTRACT:

2010 marks the launch of the global UNESCO URBIS Initiative which promotes sustainable development by adopting an ecosystem approach towards urban planning. As a global network of scientists, planners, governments, educators, and policy makers, URBIS works to create more resilient and equitable cities through cross-sectoral discussions and use of the ecosystem approach. Urban areas participating in the UNESCO URBIS network present their own case studies and experiences focused around a specific challenge regarding governance of linked social and ecological systems. The first Pioneer UNESCO URBIS Initiative cities include Montreal, Stockholm, Shanghai, New York, New Orleans and Chicago, representing a broad spectrum of challenges related to human equity and relationships with the environment. As part of this process, URBIS will also create a handbook and toolbox of best practices. In the future, another value added of the UNESCO URBIS Initiative may be a UNESCO designation for cities employing ecosystem and adaptive planning approaches at appropriate scales. Criteria for this designation builds on previous work on the urban biosphere concept as discussed in *Urban Biosphere and Society* (editors: Alfsen, Lane, and Corry, 2004). This presentation will focus the possible designation of urban areas as URBIS Sites including the advantages and possible disadvantages as well as proposed criteria and approaches.

WORD COUNT:

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TITLE:

Green Roof Hydrology: Results from a Small-Scale Lysimeter Setup (Bronx, NY)

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ABSTRACT:

A small scale lysimeter setup situated on the green roof of the Ethical Culture Fieldston School in the Bronx, NY has been the focus of ongoing monitoring initiated in June 2009. Data collected from the lysimeter setup and associated experimental equipment including a rain gage, soil moisture sensors and tipping bucket gage (for qualitative runoff monitoring) has provided the basis for calculation of runoff and percent stormwater retention during storm events, as well as evapotranspiration (ET) during antecedent periods. Of the 23 storm events that occurred during June and July 2009, the green roof setup retained between 33 and 100% of total precipitation, with a mean of 85% retention. Relationships between percent stormwater retention and factors impacting retention such as total storm depth, antecedent period, storm duration etc. have been explored. However, no clearly discernible relationship was observed. Also, methods for the estimation of potential evapotranspiration (PET) were compared to measurements of actual evapotranspiration (AET) to examine the applicability of these approaches to green roofs. As anticipated, estimates of PET were not in agreement with measurements of AET, and further evaluation of these methodologies will be pursued. Although many research questions remain, the results from the small scale lysimeter setup are encouraging, particularly regarding the stormwater management potential of green roofs.

WORD COUNT:

211

TITLE:

Ecological Literacy and Curriculum Development

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ABSTRACT:

Context: Increasing numbers of design students have heard about the unprecedented ecological challenges imposed upon their generation. But when the subject is addressed, they admit they feel depressed about their daunting future rather than energized. They don't understand how they contribute to the crisis, let alone how the ecological collapse is affecting their health and well-being as well as their concentration and creativity. The connections of their habits and professional training to larger issues, such as toxic garbage, migrations of island and coastal peoples as sea levels rise, poverty and human suffering, are perceived as distractions from their design education.

Pedagogical Problem: Students often identify nature solely with parks, trees, and flowers that are someplace else. After a night spent working and mid-morning hunger pangs, their attention wanders when we discuss ecosystem concerns. How can we expect students to design ecologically if they have no idea how their bodies are embedded in and affected by natural ecosystems? Or when they have never considered how they themselves are 'ecosystems,' whose own well-being their personal habits undermine?

My Research focus is developing a *Slow Design Pedagogy*. I am researching biology, neuroscience, psychology, physiology, and physics as well as contemplative traditions. My exploration, the teaching methods I have initiated, as well as student projects lead me to propose that a *Slow Design Pedagogy*, based on research in science, could complement existing design methodologies in our efforts to educate our students in Eco-Literacy.

WORD COUNT:

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TITLE:

Urban Tree Canopy (UTC) Research and Applications: Progress and Future Directions

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ABSTRACT:

The initial development of an urban tree canopy (UTC) policy and UTC assessment tools grew from research focused on urban riparian areas. This research described the phenomenon of urban “hydrologic drought” and the role of urban riparian areas to regulate groundwater and stormwater flows into streams. Based upon this ecological understanding, the Chesapeake Bay Program developed policies to encourage the development of municipal urban tree canopy goals. To develop and achieve these goals, the US Forest Service’s Northern Research Station has worked with local government agencies and NGOs inside and outside the Chesapeake Bay Watershed to develop assessment and decision making tools and to identify research needs to further these tools. This presentation describes progress made and future directions needed for UTC research and applications.

WORD COUNT:

125

TITLE:

Applications of Hyperspectral Remote Sensing for Urban Tree Canopy Monitoring

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ABSTRACT:

Hyperspectral sensors have been successfully utilized in contiguous forest canopies for a range of biophysical modeling and monitoring efforts including: species mapping, foliar chemical composition, stand density, productivity and biomass, forest health and ecosystem process modeling. Until now, application in urban settings has been limited by the high spatial resolution required to isolate individual tree canopies and the extreme processing requirements associated with such large, complex data sets. Here we present the results of a species mapping and canopy condition effort conducted using 2m resolution AISA Eagle data collected over Traverse City, MI in July of 2008. The focus of this effort is to map four key tree species groups (oak, ash, beech, and hemlock) and to develop techniques to locate crowns that are in early stages of stress. These data layers will be used to focus survey efforts designed to locate incipient outbreaks of oak wilt, hemlock woolly adelgid, emerald ash borer and beech bark disease. While the accuracy and coverage of this effort surpasses what could be accomplished using more traditional survey methods, widespread application may be limited by the current cost, expertise and time required to develop the end product.

WORD COUNT:

193

TITLE:

Envisioning Gateway

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CO-AUTHORS:**ABSTRACT:**

Established in 1972, Gateway National Recreation Area encompasses 26,607 acres across the NY-NJ harbor and coast, supports 22 million residents in the tri-state region, and serves over 8 million visitors annually. The park is a key sanctuary on the North American migratory flyway, supports diverse estuarine wildlife habitats, and is home to public beaches, historic military forts, and New York City's first airport.

Gateway is also a significant infrastructural crutch for the metropolitan region, with combined sewer outfalls, treated wastewater effluent, abandoned buildings, degraded habitat, drowned marshes, former landfills, and vast asphalt runways. These elements have compromised Gateway's ability to meet the aspirations of its founders, to negotiate its relationship with surrounding communities, and to balance the National Park Service (NPS) mandated goals of environmental conservation, historic preservation, and public education.

Since 2006, Van Alen Institute, National Parks Conservation Association, and Columbia University have been working in collaboration to establish a new vision for Gateway and to build a foundation for the public, political, and financial support needed for its eventual restoration. Through extensive background research, an international ideas competition, related public programs and outreach, and a forthcoming publication, *Envisioning Gateway* has sought to:

- foster public dialogue about the role of parks relative to an increasingly urbanized national landscape
- bridge environmental science, urbanism, and politics via innovative design strategies and public processes
- redefine environmental stewardship and cultural patronage to match the scale of contemporary urban development patterns and needs
- renew the NPS notion of environmental education based on an understanding that "nature" in urban environments is complex, actively constructed, and dynamic

WORD COUNT:

265

TITLE:

Case Studies of Salt Marsh Change in New York City and Vicinity and Implications of Accelerated Sea-Level Rise

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ABSTRACT:

Even in a densely populated urban environment such as New York City, salt marshes provide numerous functions and values including wildlife habitat, storm surge protection, wave attenuation, pollution absorption and aesthetic appeal. More than 300 species of birds feed, rest or breed in New York's coastal areas and the habitats they depend on may become squeezed between rising sea levels and urban infrastructure. In Jamaica Bay, Queens and Brooklyn, more than 700 acres of *Spartina alterniflora* island marshes became submerged in the last decades. In addition to the many other stressors on coastal marshes, sea level rise may have already had an impact and projections of future sea level rise indicate that many will be at risk of drowning without intervention such as sediment spraying.

For a case study in New York City parklands a trends analysis is being conducted using historic aerial photographs of two selected Parks, Udalls Cove Park Preserve in Queens and Pelham Bay Park in the Bronx. Expanding upon previously collected data we are comparing 1951, 1974, 1999 and 2005 aerial photography. Initial analysis indicates significant land loss including eroding embankments, widening of channels and breaking up of previously contiguous marshland. The land loss will be quantified and placed in context of marsh loss elsewhere in the region.

Together with NASA/Goddard Institute of Space Studies we will generate a range of scenarios by extrapolating from current trends using several Global Climate Models (GCMs) for the 2020s, 2050s and 2080s to help determine marsh vulnerability.

WORD COUNT:

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TITLE:

Tree- and Impervious-cover Influences on Air Temperature in Baltimore, MD

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ABSTRACT:

An objective of our work with the Baltimore Ecosystem Study, a Long Term Ecological Research site, is to model and map the influence of tree cover on air temperature in the urban landscape. Air temperature is important for its effects on space-conditioning energy use, carbon and water cycling, soil and stream temperatures, ozone formation, human thermal comfort, and human health.

We make measurements of air temperature and humidity at the 1.5-m height at five sites in a variety of land uses near Baltimore. Data are also available from National Weather Service stations in downtown Baltimore (call sign DMH) and at the Baltimore/Washington International Airport. For one summer, we used regression analysis to develop prediction equations for hourly temperature difference (ΔT) between DMH and each of the other sites. Predictors of land cover influences on ΔT were the differences in upwind tree, impervious, and water cover from the 30-m resolution National Land Cover Data 2001. Additional predictors of ΔT were atmospheric stability, vapor pressure deficit, antecedent precipitation, elevation, topographic differences near the sites, and water temperature. Results showed the DMH site to be warmer than the other sites, with ΔT as large as 11 °C at night with clear skies and low wind speed.

We used the regression results to create GIS maps that illustrate the variation in the urban heat island throughout a day. Another use will be to predict the best areas to plant trees to reduce thermal stress in urban populations and maximize air temperature benefits from trees.

WORD COUNT:

250

TITLE:

Spatial variability in nutrient concentration and limitation in an urban watershed
(Bronx River, New York, USA)

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ABSTRACT:

Eutrophication, or the addition of excess nutrients to the environment, is a pervasive threat to the health of river ecosystems in urban watersheds worldwide. However, the influence of urbanization on longitudinal (i.e., upstream-downstream) variation in nutrient concentrations within a single urban watershed, and the capacity of riverine biota to absorb excess nutrients has not previously been measured. In summer 2009, we measured the spatial distribution of nitrate (NO₃⁻) and phosphate (PO₄³⁻) concentrations throughout the Bronx River watershed (N~200 sites). Also, we quantified stream biofilm response to experimental nutrient addition using nutrient diffusing substrata on organic and inorganic surfaces. Results suggested NO₃⁻ loading from diffuse sources, but patterns for PO₄³⁻ suggested point-source inputs. We found longitudinal variation in NO₃⁻ concentrations was low and related to impervious surface cover across sub-watersheds. In contrast, PO₄³⁻ concentrations were unrelated to watershed land-use, were lowest in upstream reaches, and high in only 1 tributary and the farthest downstream sites. Nutrient limitation of stream biofilms was consistent with longitudinal concentration patterns. Growth of biofilms decomposing organic surfaces was limited by PO₄³⁻ alone or NO₃⁻ + PO₄³⁻ together at the sites with lowest PO₄³⁻ concentrations. However, biofilm growth on inorganic surfaces, dominated by algae, was nutrient-limited at only 1 site. Results suggest additional nutrient uptake is possible via biofilm growth on organic surfaces, but that algal communities are nutrient-saturated. These data represent a critical starting point for restoration strategies directed at maximizing the potential to mitigate eutrophication in the Bronx River and other urban river watersheds.

WORD COUNT:

259

TITLE:

TreeBristol - www.treebristol.com

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CO-AUTHORS:**ABSTRACT:**

TreeBristol is a scheme run by Bristol City Council (UK) to promote planting in the city, it was launched in 2005. Based within the city's arboricultural team, a dedicated tree planting Officer (the first of its kind within the UK) works to replace trees that have been removed and plant trees on available sites within the city through traditional city revenue streams. The campaign also seeks to work with local groups and businesses to raise additional money for tree planting.

A key to the success of the campaign to date is the recognition of the need to work with and involve the local community in tree planting events around the city. Each year TreeBristol runs 10 - 15 tree planting events which has allowed thousands of people help plant trees in their local parks. The campaign also recognises that not all people actually want to plant a tree themselves and has set up a range of innovative way in which local people and businesses can sponsor tree planting in the city which helped raise an additional £20,000 (\$32,000) of funding for tree planting.

Since setting aspirational targets to plant 10,000 heavy standard trees over the first 10 years of the campaign, elected members have recently pledged to increase the cities canopy cover from 13% 1 to 30%. Elected members have also recognised the importance of trees within the city and the desire of local people who wish to see more trees in their city which has resulted in an extra £50,000 (\$80,000) budget to deliver additional tree planting.

1 Trees in Towns II 'A new survey of urban trees in England and their condition and management', Chris Britt & Mark Johnston ADAS UK Ltd., Myerscough College, February 2008, Department for Communities and Local Government: London

WORD COUNT:

258

TITLE:

Five Year Comparison of Washington, DCs Urban Forest Using the UFORE Model

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ABSTRACT:

Casey Trees is a Washington, DC-based not-for-profit organization established in 2001 committed to restoring, enhancing and protecting the tree canopy of the Nation's Capital. In 2004, we began a long term forest research study focusing on Washington, DC called UFORE, the US Forest Service created Urban Forest Effects Model. This study takes a statistically stratified plot sample and generates results based on an inventory of the land cover of these plots. The study quantifies the environmental and economic benefits of the district's urban forest using, tools we have come to use frequently, the itree suite developed by the Forest Service. In 2004, the study reported 1.9 million trees in DC with an abundance of American beech and red maple.

Washington, DC followed the protocol and was the first to do a follow up 5 year study in 2009. Data collection for the 2009 UFORE Inventory was completed in September. Casey Trees has been working with the Forest Service to analyze the data and compare with the 2004 results. Having time-change analysis is an essential tool in allowing us to speak clearly about what is happening to DC's urban forest over time. This study is in partnership with the National Park Service who owns 20% of the property in Washington, DC.

WORD COUNT:

210

TITLE:

Counting Crickets with Cell Phones: How we Harnessed New Yorkers' Favorite Tool During the NYC Cricket Crawl

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CO-AUTHORS:**ABSTRACT:**

If there are to be 1 million trees in NYC then there will be 50 million crickets and katydids singing from them, feeding on their leaves, and living amongst their roots. Every New Yorker is familiar with the sounds of crickets yet nothing has been written about them in nearly 100 years. We changed that with the NYC Cricket Crawl. The Crawl was designed to collect scientifically defensible data on seven species of common crickets and katydids (using auditory skills), involve the public in data collection, excite and inform them about crickets and katydids within urban environments, and weave art, literature, and outreach into the process. With the help of more than 300 volunteers and their cell phones, nearly 400 sites were surveyed during the count period. All seven target species were detected, the most common being the Fall Field Cricket, Jumping Bush Cricket, and Greater Anglewing. One unexpected species encountered in the Bronx was the Treetop Bush Katydid. Of particular interest was the Common True Katydid, which was considered extirpated from NYC, but has been rediscovered by Cricket Crawl participants and local naturalists in selected areas of the City that retained large trees and natural parks. A better understanding of our region's common (and vocal) Orthopteran insects will help inform land management and enhance nature appreciation by urban dwellers. The Cricket Crawl survey methodology also serves as a model for others considering similar citizen science projects. An overview and critique of the project including data are available at: www.discoverlife.org/cricket

WORD COUNT:

250

TITLE:

Long-term Outcomes of Urban Ecological Restoration: Post-Restoration Conditions of New York City Forests

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CO-AUTHORS:**ABSTRACT:**

Natural areas in urban environments are of special importance as reservoirs of biodiversity and socially valued ecological functions. However, urban environments present a unique set of stressors to natural communities, resulting in degraded ecological conditions. While many restoration projects have been undertaken to improve the health of these habitat fragments, very few studies exist of their effects.

This study investigates the long-term effects of efforts to restore ecological integrity to forests in New York City parks. In 1992 the New York City Department of Parks and Recreation's Natural Resources Group initiated restoration of woodlands heavily invaded by woody vines such as porcelainberry (*Ampelopsis brevipedunculata*) and oriental bittersweet (*Celastrus orbiculatus*). Restoration practices implemented were typical of those being used to restore woodlands across the United States: removal of invasive, non-native species by herbicide and mechanical means, followed by planting of desired tree species. Pre-treatment and initial site conditions following restoration were recorded and survivorship and growth of planted tree species were monitored during the two years following initial restoration.

In 2008, research plots at thirty of these sites were revisited. Data collection protocols were designed with the intent to expand the long-term forest health monitoring program to include ecological data that would give insight into successional trajectories (as indicated by community composition), effects of restoration practices, the role of invasive species in restoration outcomes, and the relationship of these to site history and adjacent conditions, in order to improve the effectiveness of restoration work. Preliminary results will be discussed.

WORD COUNT:

248

TITLE:

Can Environmental Education Contribute to Community- and Ecosystem-level Outcomes?

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CO-AUTHORS:**ABSTRACT:**

Community-based organizations in urban neighborhoods play an increasingly important role in small-scale environmental restoration through engaging local residents in tree planting, community gardening, habitat improvement, and similar civic ecology practices. Such initiatives have the potential to foster both environmental as well as social outcomes, a number of which overlap with attributes thought to be present in social-ecological systems that demonstrate resilience, including ecosystem services, social learning, feedbacks, self-organization, and social capital. Preliminary research suggests that civic ecology education programs, which engage youth in environmental restoration alongside peers and experienced adults, may contribute not only to learning about the environment, but also to environmental and social outcomes consistent with attributes of resilient systems.

In the proposed talk, I will first present a theoretical basis for youth civic ecology education situated within urban community forestry practices, drawing from the literature on social learning, social-ecological system resilience, and urban environmental restoration. Next I will present a framework for assessing outcomes of these programs at the individual (e.g., sense of place), community (e.g., social capital, social learning), and ecosystem (ecosystem services) levels. Finally, I will present methods used to develop and test for reliability and validity a measure for one of these outcomes, i.e., social capital, in the context of a youth civic ecology education program. This presentation will present a framework for determining outcomes of environmental education programs not only for individual learners, but also for the environmental and social systems that are the focus tree planting and related civic ecology practices.

WORD COUNT:

249

TITLE:

Civic Ecology in the Bronx: Coupling Environmental Restoration and Education

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CO-AUTHORS:**ABSTRACT:**

The goal of this research is to explore outcomes of civic ecology education programs conducted by five community-based organizations in the South Bronx. Each of the programs engage youth in environmental restoration in the Bronx River watershed, including tree planting, creating green roofs, and community gardening (www.UrbanEE.org). In summer 2008, I embarked on a participatory research project by interviewing adult leaders from collaborating community-based organizations about how they viewed program goals and questions they had about program outcomes that I might address. According to the adult leaders, their programs attempt to contribute to positive youth development, science learning, community-based environmental monitoring, and community activism. All five programs shared the goals of environmental restoration and strengthening participants' connection with nature and community, (i.e., place attachment, one component of sense of place) through engaging in restoration.

During fall 2009, my colleagues and I adapted and tested for reliability and validity existing survey instruments for measuring place attachment in adults, for use with youth audiences. During winter 2010, I am working with youth and scientists to develop means by which civic ecology education participants can measure the ecosystem services produced by their restoration efforts. I will present results from implementing the place attachment survey with youth participating in a civic ecology program and in a control group not engaged in such a program in the Bronx. In addition, I will discuss the ongoing development and testing of the ecosystem services assessment protocol for use by civic ecology groups in cities.

WORD COUNT:

247

TITLE:

Tools for evaluating and designing new urban canopies to mitigate Urban Heat Island: The New York City MARKAL System Model and the Urban Ocean and Atmospheric Observatory

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ABSTRACT:

It is well established that urban canopies can play a role in mitigating the effects of Urban Heat Island (UHI). Collaborative case studies produced by NYSERDA, NYSDEC CUNY, EPA and NASA Goddard Institute of Space Studies for the Lower East Side of Manhattan have confirmed that the urban canopy in combination with green or reflective roofs and Energy Star efficiency technologies can reduce cooling demand in buildings and reduce stress on individual substations within the electrical grid.

EPA, working in collaboration with Brookhaven National Laboratory and the City University, has developed an extended community scale version of the existing New York City MARKAL system model to identify the sets of technologies which can reduce the load on electrical substations at the lowest possible cost.

The Urban Observatory, a tool under development at the Grove School of Engineering at CCNY, comprises a set of urbanized weather and climate models for the New York-New Jersey Metro Area initialized by an array of high resolution remote and rooftop sensors, estuarine buoy and remote operated vehicles. The Observatory is used to explore real time interactions of the urban atmosphere with localized (urban heat island) and regional events that influence the built environment at various heights including wind, temperature, precipitation and air pollutants.

The MARKAL model has historically used time series on monthly or annual basis to form scenarios in which end-use energy demands are met subject to a series of environmental constraints involving either individual or bundles of pollutants. Using the real time outputs of the Observatory as input constraint scenarios will permit a more calibrated evaluation of the urban environment and management of strategies and technologies to improve it. The will present the performance of the existing canopy in selected areas of New York City and Compare them through the MARKAL model for a cost benefit analysis. This type of analysis will show how the canopy performs in real time and whether a different UHI purpose designed canopy could be considered for development by mid century.

WORD COUNT:

333

TITLE:

The 3 Ps March On: Prioritizing Potential and Preferable Locations for Increasing Urban Tree Canopy Cover in New York City

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CO-AUTHORS:**ABSTRACT:**

This paper presents a set of Geographic Information System (GIS) methods for strategically locating tree planting sites within urban environments. The MillionTreesNYC campaign serves as a case study and specific socio-ecological variables chosen by stakeholder leadership are analyzed. By outlining an approach to measuring need and suitability of tree planting sites, these methods and associated custom tools explain how decision-makers may optimize the urban forest with respect to biophysical and socioeconomic conditions in a clear and accountable manner. In light of each organizational planting partner's unique goals and constraints, custom tailored spatial analysis tools and maps were created to show where they may contribute to increasing urban tree canopy (UTC) as a way to achieve their own particular goals. Aided with this support, groups can adopt and implement a plan to reach New York City's goal of 30% UTC by 2030. This paper both advances an analytical approach collaboratively created by a University of Vermont service-learning class designed to apply research to adaptive management questions entitled "GIS Analysis of New York City's Ecology," and then applies these techniques to the MillionTreesNYC campaign. This approach can help cities systematically reach their urban tree canopy goals while achieving other social, economic, and ecological goals. Additionally, the framework established here may serve as a springboard to future urban ecological analyses.

Future opportunities include: redeploing these tools in other cities, tracking spatial characteristics of urban ecosystems temporally, ecosystem service valuation and benefit-cost analysis, and tool development for collaborative decision-making for urban natural resource management.

WORD COUNT:

250

TITLE:

Survival rates of young street trees in New York City

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ABSTRACT:

The goal of the Young Street Tree Mortality project was to understand how social, biophysical and neighborhood design factors affect the establishment of street trees. Prior analyses of street trees planted by Parks between 1999 and 2003 (n=45,094) found 91.3% of those trees were alive after two years; 4.2% of the trees were standing dead, and the remaining 4.5% were missing completely. A randomly selected sample of 13,000 of these trees was surveyed during the summers of 2006 and 2007. The survey was designed to collect several biological, physical and social variables that cannot be captured without a survey; the protocols are described in the Site Assessment Tools report. Overall, 74.3% of the sample trees were alive when surveyed. Six percent of the trees were standing dead, and the remaining 19.7% were missing from their planting site. 82.7% of young street trees in one and two family residential areas were alive when surveyed. Industrial areas, open space and vacant land had the lowest rates of street tree survival (60.3% -62.9%). Dead tree percentages were similar across land use classes (median 7.9%), but were much lower for trees planted in 1-2 family residential areas (3.6%), which also had the lowest percentage of missing trees (13.7%). Trees with more than one sign of stewardship present had higher survival rates than young street trees with no signs of stewardship. Pruning was the most commonly observed sign of stewardship (4,036 trees), followed by plantings in street tree pits (1,039 trees) and mulch (962 trees).

WORD COUNT:

250

TITLE:

The Relationship between Park Accessibility and Socio-demographic factors in New York City

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ABSTRACT:

This study seeks to assess the relationship between park accessibility and socio-demographics in New York City (NYC). Previous research has demonstrated a correspondence between lack of physical activity and adverse health outcomes, such as diabetes and obesity. Therefore, accessibility to parks may be a factor in mitigating such health outcomes. The association between population characteristics and parks in NYC is quite complex, and any potential environmental justice issues can be difficult to measure. As such, the problem was approached both quantitatively and qualitatively. Working within a GIS framework, the quantitative portion used kernel density estimation to create density surfaces of both park acreage and park active venues (e.g. ball fields, basketball courts, tennis courts, etc). These surfaces were then aggregated to census enumeration units and the associations with socio-demographics (percent non-Hispanic black, Hispanic, below poverty, and without high school education) were calculated via traditional global regression as well as geographically weighted regression (GWR). These analyses confirm a complex relationship, as well as the presence of spatial non-stationarity (fluctuation of the relationships over space). In order to attempt to explain some of these local relationships, two neighborhoods which behaved differently with respect to park density and demographics were identified from the GWR results and a qualitative exploration was performed. Through historical research, field work, and longitudinal demographic analysis, some of the possible reasons for the complexity of the parks/demographics relationship were revealed, as well as some potential shortcomings in the kernel density estimation in park accessibility research.

WORD COUNT:

246

TITLE:

Transformative Subjects

PRESENTING AUTHOR:

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CO-AUTHORS:**ABSTRACT:**

Social ecologists, economists and epidemiologists note that systems are 'leaky' particularly at the stage of reorganization, therefore for long term research, the challenge is not to gather information over time but rather, to measure in time, particularly with relation to collective memory and lagged effects.* Similarly art and design research with an ecosystem approach has seen a shift in attention from a subject's location in space toward an understanding of the subject being a transformation of the open whole in duration, for example the shift from one city mental model to another such as the metropolis to the metacity or the sanitary city to the sustainable city. The Westside of Manhattan from 20th to 34th St was explored in two classes at the New School last year through the lens of these trends.†

Consciously seeking alternatives to geographical mapping the city as an object in space, the class used STEW-MAP, perceptive readings of territorial shapes and cinematically inspired and cybernetically based drawing methods. The class found two interlinked and emergent patterns of intense cycles of reorganization; the centralizing force of a designed urban fragment and the distributive effects of everyday biophysical design acts by individuals and social organizations in creating the neighborhood urban forest. The semester long experience allowed the class to reflect on shared questions that resonate globally: could this reorganization pattern be predicted, maintained or controlled? Or alternatively what happens if the structure and dynamics of human-ecosystems are modeled as creative rather than something that can be predicted, maintained or controlled?

WORD COUNT:

253

TITLE:

Diversity and Conservation of Butterflies in the New York City Metropolitan Area

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ABSTRACT:

Butterflies are charismatic microfauna that provide opportunities for humans living in urbanized landscapes to directly experience biodiversity. However, very little has been published on which butterfly species currently persist in densely populated urban landscapes, such as the New York City metropolitan area. As a first step towards conservation of butterflies in this heavily populated landscape, we analyzed data on butterfly sightings in the five boroughs of New York City and adjacent counties from January 2001 to November 2009. In total, 12,847 individual sightings were compiled from 143 observers representing 116 butterfly species. Many butterflies were reported from large parks including Ward Pound Ridge in Westchester County (1506 observations), Hook Mountain in Rockland County (878 observations), and Van Cortlandt Park in Bronx County (801 observations). The five most abundant butterfly species were *Pieris rapae*, *Danaus plexippus*, *Colias eurytheme*, *Papilio glaucus*, and *Vanessa virginiensis*. Across years, the number of species and observers remained relatively consistent, although certain species were more prevalent in specific years. Some of the species represented by only a few sightings are vagrants while others may be scarce due to the New York City metropolitan area being at the edge of their range. Additional rare butterfly species may be limited by host plant availability and/or specific habitat requirements that might be increased in parks, gardens and other urban green spaces. We provide specific management recommendations for these species and discuss future research needs for conservation of butterflies in the New York City metropolitan area.

WORD COUNT:

245

TITLE:

Stormwater Basins: Subsidies or Sinks for Frogs and Toads?

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ABSTRACT:

Stormwater basins are a commonly employed Best Management Practice designed to deal with the negative effects of runoff from impervious surfaces. They are ubiquitous in urbanized landscapes; yet studies of the effect of these basins on faunal assemblages have been limited. Stormwater basins have the potential to influence the distribution of anurans by being urban subsidies, in the form of breeding habitat, for some species and ecological traps for others. Our study aims to determine which frog and toad species benefit from the existence of stormwater basins, which species are negatively impacted, and what local and landscape variables are the best predictors of these effects. Thirty-six permanently ponded stormwater basins in southern New Jersey were monitored for the presence of mating adults and anuran larvae, fish presence, managed and unmanaged vegetation within a 100 foot buffer, distance to canopied corridor, and percent of undeveloped upland. Resistance to fish predation distinguished successful species, those with larvae present, from unsuccessful species, those with calling activity but no larval presence. Connectivity to and availability of terrestrial habitat were significant predictors of how many species mated at the basins. The number of species increased as access to and amount of terrestrial habitat increased. Therefore, placement of permanently ponded basins near populations of threatened or endangered species, or small urban populations with limited area for migration is unadvisable, unless management and/or construction techniques can successfully prevent colonization by fish.

WORD COUNT:

234

TITLE:

Changes in Residential Zoning Capacity and Local Park Proximity; How do Recent New York City's Rezonings Stack Up?

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ABSTRACT:

New York City policymakers are planning for a city of over 9 million residents by 2030. In order to accommodate these new residents while simultaneously improving quality of life, the City has launched an ambitious land use and planning agenda, largely articulated by *PlaNYC 2030*. One of the key elements of this agenda is to expand access to the City's open space and ensure that virtually every New Yorker is within a ten minute walk of a park that is at least a quarter acre in size (translating to a half-mile walk for a typical adult, but as little as a quarter-mile for young children or seniors).

One of the main tools available to the City to realize its planning agenda is proposing neighborhood-level zoning changes, more than 100 of which have been enacted since 2002. These changes in permitted residential capacity will largely dictate where these new residents will live and play. In this study, we calculate the cumulative impact on residential development capacity of the approximately 80% of these rezoning actions that occurred between 2003 and 2007. With this data, we then calculate the residential development capacity changes resulting from the rezonings and the relationship between capacity changes and park accessibility (using GIS walkshed analysis). Additionally, we explore how the City's planned investments in open space (rehabilitation of existing underutilized parks and the construction of new parks) compares to its interventions to the rezonings it has enacted to date.

WORD COUNT:

241

TITLE:

Linking Challenges and Ecological Benefits in Urban Restoration

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The New York City Department of Environmental Protection (NYCDEP) started the large scale sustainable environmental restoration of the Pennsylvania (100-acres) and Fountain (275-acres) landfills, Class 2 Superfund sites, in 2004 and completed work in 2008. Located within a sensitive environmental area (Jamaica Bay), these sites provide important urban research and educational opportunities. To re-establish lost ecological function and biodiversity, an atypical innovative planting design approach to traditional landfill closure was undertaken. The design includes diverse coastal ecological communities of 41 tree and shrub species and 31 species of grasses and forbs. Important design features include the re-introduction of rare species, local genotypes within a 150- mile radius of the site, and a soil analysis of existing regional ecological communities to develop specific soil specifications. To ensure availability of plant material, most of the nearly 35,000 plants were contract grown for a period of three years. To maximize genetic diversity, the use of seed grown plants over “cuttings” was used to the greatest extent possible. Design included smaller plant material and varying sizes to replicate a natural “uneven” aged community. Large scale of project ensures restoration will become an important regional seed source to disseminate species to other locations within the region. To assist with long-term monitoring, plants have been field verified with a Global Positioning System (GPS) and incorporated into Geographic Information System (GIS) database. “Bar Code” plant tags that include information on species, nursery supplier, provenance, date of planting and plant size at time of installation have also been used.

WORD COUNT:

251

TITLE:

Assessing the Effect of MillionTreesNYC Forest Restoration Efforts on the Ecological Structure and Functioning of New York City's Urban Parkland

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ABSTRACT:

Terrestrial ecosystems in NYC are in the midst of a significant restoration effort which includes the addition of two thousand acres of forest to the city with the goal of increasing canopy cover, reducing invasive species, and mitigating climate change effects while increasing other ecological functions and services. This effort constitutes a large natural experiment in the most densely populated urban center in the nation. How will such institutional efforts to re-green public and private urban lands affect the provisioning of ecosystem services and the capacity of the system to support resilient, highly functioning biological communities? The NYC Urban Forest Restoration Study was established in 2008 in order to comprehensively understand the effect of MTNYC forest restoration efforts on urban ecosystem structure and function. It is a long-term study that focuses specifically on the abiotic and biotic drivers that may impact vegetation structure, biodiversity, invasive species dynamics, soil nutrients, and carbon sequestration and storage in urban forest vegetation and soils. This research links multiple plot-scale investigations across all five boroughs of New York City together to create a regional scale analysis of the changing urban forest ecosystem. Analyses make use of vegetation datasets from study plots re-assessed annually, extensive annual soil analyses, and documentation of forest management activity. The overall objective is to understand the dynamic interactions between urban ecosystem management and ecological services and functioning in ways that inform policy and management decisions at the local city scale with implications for understanding urban ecosystem resilience generally.

WORD COUNT:

247

TITLE:

Evaluation of the Stormwater Capture Potential of New York City Soils: Implications of Infiltration Rate Variability on Urban Runoff Predictions

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ABSTRACT:

The properties used to characterize soils and, more specifically, those that are used to describe the rate at which water infiltrates into them, are key parameters in most rainfall-runoff models. Because these parameters are known to be highly variable, they are a known source of uncertainty in our ability to predict runoff from pervious surfaces. The goals of this study were to a) characterize the heterogeneity in soil and infiltration characteristics in specific types of pervious surfaces found in New York City, and b) to study the potential effect of this heterogeneity on prediction of the total volume and peak rate of runoff from specific rainfall hyetographs. Characterization of soil and infiltration characteristics was performed at a variety of sites throughout NYC during Summer and Fall 2009. As expected, statistical analysis of the data, which includes nearly two dozen individual tests, showed high variability. The USEPA Stormwater Management Model, (SWMM) an industry standard, was then used to examine the impact of this heterogeneity on predictions of peak flow and total runoff volume for a design storm. The preliminary results of this work suggest that although soil and infiltration properties are highly variable, only a small portion of this range can significantly alter the runoff predictions obtained from SWMM using this particular design storm. Future research will address the significance of the variability in runoff predictions given a more diverse set of storm events for more generalizable results.

WORD COUNT:

237

TITLE:

Manual of the woody flora of the New York metropolitan region: taxonomic and ecological descriptions, suggested cultivation and management methods, and updated distribution maps

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ABSTRACT:

The New York metropolitan area has over 450 species of woody plants in its wild flora. Numerous native species that were once quite common are today exceedingly rare. Conversely many recently introduced, non-native species are becoming increasingly common. As a result of these changes, a new manual of these plants is needed. To fill this need, botanists at the Brooklyn Botanic Garden and the United States Forest Service are preparing a manual of woody plants for the New York metropolitan area. Components of the manual include 1) descriptions for all species; 2) guidelines for cultivation or control; 3) color range maps for all species that distinguish between historical and current records; 4) illustrations; 5) dichotomous and interactive keys. The interactive keys are exceptionally useful (relative to dichotomous keys) when one is trying to make an identification based on incomplete material (e.g., a specimen lacking flowers or fruits). The time-sensitive distribution maps provide useful examples highlighting the decline or spread of species. The information on cultivation and control will be useful to those involved in restoration projects. The manual will be available as a web-based application, a stand-alone program, and in print form. We expect that this project will be completed in 2011 with eventual publication thereafter. Further anticipated development includes specialty applications targeted at schools and other audiences that want to simplify application of the interactive keys. Should this project prove successful, a similar endeavor may be made with the herbaceous plants of the region.

WORD COUNT:

245

TITLE:

Landscape Genetics of White-footed Mice (*Peromyscus leucopus*) in New York City

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CO-AUTHORS:**ABSTRACT:**

Urban areas were once thought of as harsh, biologically sparse environments with little ecological value, but urban habitat fragments can support substantial wildlife populations. The degree to which wildlife can move between these fragments (often city parks) is strongly influenced by the intervening urban environment. This study examines native white-footed mice in New York City (NYC) as a model of the impacts of urbanization on population connectivity and genetic structure. We are using molecular genetic tools (18 microsatellite loci) in combination with geographic data sets to determine I) how many evolutionarily-unique whitefooted mice populations exist in NYC, II) how long they have been isolated (or exchanging migrants), and III) what types of urban land use facilitate or hinder the movement of small mammals and their genes between urban habitat fragments. Preliminary results for 312 mice from 15 sites indicate that white-footed mice populations in NYC have become substantially isolated over very small geographic scales in a short period of time. However, routes for migration and genetic transmission do persist as landscape "shadows" in one of the world's most urbanized landscape. This project has been designed to maximize the participation and training of undergraduates that previously had few opportunities to conduct ecological research, as well as accommodate participation from "citizen science" efforts.

WORD COUNT:

211

TITLE:

Application of Time Domain Reflectometers to Urban Settings

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ABSTRACT:

Time domain reflectometers (TDRs) are in-situ monitoring probes that produce a temperature-compensated signal proportional to soil moisture content of the surrounding material when calibrated to a particular media. Typically used in agricultural settings, TDRs may also be applied to urban soils.

EPA's Urban Watershed Management Branch located at the Edison Environmental Center (EEC) has been exploring the use of TDRs as a way to monitor stormwater infiltration practices. TDRs are installed in pilot- and full-scale bioretention units (e.g., rain gardens). The TDRs measure soil moisture and sense the wetting front as the stormwater infiltrates through the planting media and into the native soil.

Recently, a new permeable pavement parking lot was constructed at the EEC. This parking lot was designed for long-term monitoring and includes permanently-installed TDRs, both in the crushed concrete storage layer and the underlying soil. Early indications suggest that while TDRs placed in crushed concrete may not provide calibrated moisture content, measured wetting fronts correspond to those of the TDRs in soils. Extensive bench-scale, proof-of-concept testing was performed in crushed concrete before the permanent installation below the paved surfaces as a proof of concept test.

Application of this technology may be suitable to urban areas that are interested in modifying tree pit design, controlling stormwater using infiltration practices such as rain gardens and porous pavements, or using manufactured or engineered soils, and seek or require supporting data that water is infiltrating and available to plants.

WORD COUNT:

238

TITLE:

Jamaica Bay as Catalyst

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CO-AUTHORS:**ABSTRACT:**

This paper examines the concept of the urban watershed as a catalyst for new ways of designing, regulating and researching joint human-natural environments. Once a teeming ecosystem that supported Lenape Indian settlements, small-scale colonial era farming, and later the vibrant communities of New Lots and Canarsie, the Jamaica Bay watershed at 91,000 acres is now one of the largest and most densely developed urban watershed/sewer sheds in the country. It supports nearly two million people who collectively produce 250 million gallons per day of wastewater, all of which is discharged, after varying degrees of treatment, to the open waters of the Bay. (source: NYCDEP) The marsh ecology is threatened to disappear by 2012 due to a confluence of conditions including a “flush” of freshwater from treated wastewater and polluted surface runoff, the bulkheading of its edges, historic dredging, sea level rise, nitrogen levels and bacterial contamination from CSO events that together create a nexus of factors exceeding capacities of ecosystem resilience. This paper traces the history of the modernization of the Bay and projects its role in framing a new concept of “Park” and a new brand of ground-up, community based, dispersed green infrastructures to mitigate global climate impacts for the next century where citizens are not passive consumers of pastoral park scenery but active participants in shaping the quality of their environment. Hypothetical quantification of water calculations of green infrastructure based interventions are juxtaposed with future scenarios of change and regeneration that hybridize design, policy-based and scientifically grounded approaches.

WORD COUNT:

250

TITLE:

Community Gardens: An Exploration of Urban Agriculture in the Bronx, New York City

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ABSTRACT:

Urban agriculture/community gardening in the Bronx has multiple roles, including healthpromoting, economic, environmental, and cultural. These roles are particularly important in light of urban sustainability issues and environmental justice concerns, such as differential access to open space, recreation, and fresh produce in poorer communities and communities of color, as well as differential environmental and health impacts of unsustainable practices on these communities. The gardens generally help promote a sense of place - a focus for communities - which often have little access to safe parks or recreational space within their neighborhoods, and create a center for community cultural and educational activities. The Bronx currently has about 175 community gardens administered by Operation Green Thumb, as well as a number of community gardens operated by non-profit entities, such as the Parks Council, and community gardens on private property. On average, the Bronx community gardens use about 75% of their land for growing vegetables, and many gardens supply the farming families and others in the neighborhood with much of their vegetables for the year. This study investigates urban agricultural practices in the Bronx to assess how community gardens improve quality-of-life for the proximate populations. Through semi-structured interviews of the gardeners, visits to observe the gardens, and a spatial analysis of community socio-demographic

characteristics using Geographic Information System (GIS), we examine the social, political, cultural, environmental, food security, and health benefits of community gardening. This is part of a larger study comparing urban agricultural practices in the Bronx and Curitiba, Brazil.

WORD COUNT:

248

TITLE:

Reforestation Targets for New York City and the Effects of Plant Species Composition on the Development of Urban Forests

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ABSTRACT:

As part of the PlaNYC Million Trees Initiative, the City of New York has committed to reforesting 2000 acres (810 ha) of land. Much of this forest restoration will occur on land where altered soils, frequent human disturbance, and/or aggressive exotic species prevent the spontaneous development of native forest ecosystems. As part of a city-wide long-term ecological research project, we are studying how different types of forest plantings will influence the success of these restoration efforts. Given the variation in environmental conditions and management history of the sites targeted for restoration, we developed two lists of tree species – one for mesic sites and one for hydric sites – considered to be generally capable of rapid growth and/or high survivorship across a wide range of urban environments. Mixed communities of these tree species have been planted in 30 replicated 225 m² plots at 9 sites across all five boroughs, with plans to establish plots at 10 to 30 additional sites over the next several years. These research plots are planted with either two or six tree species to allow us to study the effect of tree species diversity on reforestation dynamics. Approximately half of the replicates will also be planted with native shrubs and sown with a mix of native herbaceous plant seeds in order to compare different planting strategies on the rate of canopy closure, the resistance to invasion from exotic species, and a range of ecosystem properties.

WORD COUNT:

237

TITLE:

Urban Backyards and the Link between Ecosystem Services and Historic Preservation

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ABSTRACT:

The objective of this paper is to investigate the potential role of increased vegetated land cover within *private* open spaces, particularly residential yard spaces, as a strategy for promoting ecosystem service function, especially urban heat island (UHI) mitigation and surface water runoff management. Increased vegetation has been cited as a component of effective UHI mitigation, and as part of a strategy to reduce the burden on our city's aging water treatment system and combined sewer overflow events.

More than one-quarter of the total land area of New York City (~62 Central Parks) is classified as residential yard space. Currently the City, via PlaNYC, is attempting to enhance the sustainability of neighborhoods, while large-scale development and building footprint expansion claim an ever larger share of the city's private open space, making this a critical time for evaluation.

Open spaces, vegetation distribution and density, and surface temperatures were quantified in a comprehensive GIS-driven inventory of residential yard spaces. The results show that vegetative cover is positively associated with lower local temperatures at a resolution of 60m². *In situ* measurements of surface and near-surface temperatures in combined yard spaces could provide a better understanding of this relationship at a higher resolution. The results of this analysis may be used to inform public policy with regard to land use, zoning, and development regulation and increase awareness of the environmental benefits that vegetated backyards confer to the City.

WORD COUNT:

233

TITLE:

Salamanders and dragonflies in an urban stream five years after impoundment

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ABSTRACT:

New York City's Natural Resources Group conducted a study of stream fauna before (2000 to 2002) and after (2000, 2004, 2008) construction of a stormwater impoundment between two stream segments on Staten Island, New York. We sampled 10 cross-stream transects for northern two-lined salamanders (*Eurycea bislineata*) and larvae of a dragonfly, *Boyeria vinosa*, and a damselfly, *Calopteryx maculata*, in two 50m stream segments, one above the impoundment (Bloodroot Valley) and one below (Egbertville Ravine). Analysis of Variance found no difference in densities of salamanders or larvae of the two odonate species between the two segments in the years before impoundment and two years after impoundment, but by 2008, five years after impoundment, significant differences between the sites occurred. Before 2008 densities of salamanders and *B. vinosa* were never higher in Egbertville than in Bloodroot, but in 2008 there were significantly more salamanders and dragonfly larvae at Egbertville than at Bloodroot. Densities of *C. maculata* were approximately equal at both sites all years except 2008, when there were significantly more *C. maculata* at Egbertville than at Bloodroot. It is noteworthy that the differences occurred five years after impoundment, because it generally takes five years for differences in the benthic invertebrate community to develop downstream of a new impoundment. Overall, the impoundment has improved habitat downstream, most likely by reducing the volume and velocity of stormwater runoff and filtering sediment, but has resulting in a "backwater" effect upstream, reducing habitat quality and favoring species typical of more sluggish streams such as *C. maculata*.

WORD COUNT:

250

TITLE:

Spatial Correlations among Tree Cover, Air Pollution Sources, and Social Stressors across NYC Communities

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ABSTRACT:Introduction:

Parks and green spaces have been linked with improved urban health outcomes. It remains unknown however, whether such benefits derive from environmental benefits of trees or from other spatially-correlated factors. Disentangling the health effects of these factors requires examining the spatial relationships among urban green space, air pollution, and population susceptibility factors.

Methods:

As part of the NYC Community Air Survey (NYCCAS), a year-round study of intra-urban variation in multiple air pollutants across NYC neighborhoods, we have developed models describing wintertime intra-urban variability in multiple pollutants, as a function of local emission sources. We are also compiling indicators of trees and ground cover, potential modifiers of source-pollution relationships, and neighborhood-level data on social stressors (e.g., crime), to examine spatial correlations among source indicators, social stressors, and tree cover measures.

Results:

Preliminary analyses indicate inverse correlations for tree cover with traffic volume ($r = -0.48$) and permitted boilers ($r = -0.22$), within 1000 meters of air monitoring sites. We found a nonsignificant inverse correlation between neighborhood percent poverty and tree cover ($r = -0.24$, $p = .07$).

Conclusions:

Inverse associations between tree cover and combustion emissions sources may indicate a displacement effect, as there are fewer trees on busy roads or near large buildings with permitted

boilers. Likewise, the inverse association between tree cover and poverty indicates the difficulty of disentangling multiple exposures in urban settings. On-going analyses will inform future studies of respiratory outcomes, applying epidemiological techniques for apportioning variability in health effects among multiple correlated covariates.

WORD COUNT:

248

TITLE:

Public Reactions to New Street Tree Planting

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ABSTRACT:

As part of New York City's PlaNYC and the MillionTreesNYC Program, the Department of Parks & Recreation will be planting 220,000 new street trees by 2017. The government is greening the city through planting a tree at every suitable sidewalk location in the city, transforming blocks and communities. Since the program began in the fall of 2007, over 45,000 street trees have been planted. Trees provide a myriad of environmental, social and aesthetic benefits, but the public understanding of and enthusiasm for new street trees planting varies.

From 2007 to 2009, approximately 3000 citizens have communicated their concerns about street trees to NYC's Department of Parks & Recreation via calling 311, emails or letters. These records of Commissioner's correspondence were documented in a database and categorized as a complaint, service request, information request, recommendation, or thank you. This diverse collection of correspondence includes public comments about the City's new street tree planting policies and processes including placement objections, maintenance concerns, reports of resultant damage from tree planting operations, requests for new street trees and reports of tree conditions.

This project involves the qualitative content and spatial analysis of these correspondence records. Qualitative analysis of this administrative data will examine trends, public perceptions and concerns related to the MillionTreesNYC program. Spatial analysis will be used to explore possible correlations between public reactions, housing type and homeownership. Results of this research will inform public policy and procedural practices, identify specific locations for targeted outreach and education and lead to further research projects.

WORD COUNT:

250

TITLE:

What is Urban Environmental Stewardship?
Working Toward a Practitioner-Derived Definition in Seattle

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ABSTRACT:

While “stewardship” is often used to describe environmental improvement efforts, it is difficult to find an agreed upon definition of the term. Current research examines stewardship activities, networks, and outcomes. However, little has been done to determine what stewardship means to practitioners using the term to define their work. Establishing a shared concept of stewardship is essential to further research, and the intent of this study is to begin to develop a definition. Researchers conducted semi-structured interviews with representatives of nine Seattle environmental organizations, who collectively have over 100 years of experience in the field. Conceptual content cognitive mapping (3CM) was used to elicit responses to the question “what is environmental stewardship?” The 3CM method encourages participants to reveal and explore their cognitions and perceptions about an idea or activity. Responses are open-ended, rather than constrained by finite lists of questions or variables. Analysis of 3CM responses generates thematic, structural representations of shared concepts and their interactions across study participants. Results show that these practitioners have a multi-layered definition of stewardship, from environmental improvement to community building, from actions to outcomes. This meaningful concept is mirrored in their organizational activities, and as further research may show, in organizational networks and outcomes. This builds upon ongoing stewardship mapping research in New York City, and is part of a larger project comparing stewardship networks in Seattle and Baltimore. Through continued study in these and other cities, this work can be expanded and replicated to create a framework for urban environmental stewardship research.

WORD COUNT:

250

TITLE:

Vulnerability to Heat-Related Mortality in New York City's Neighborhoods

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ABSTRACT:

While prior studies on heat-related mortality have mapped the urban heat island effect, and others have mapped population risk factors, none have examined the relations of neighborhood characteristics and the urban heat island to the public health impacts of hot weather. We used an ecologic design to assess the relations of neighborhood-level characteristics to heat-associated excess mortality amongst seniors to improve understanding of geographic variation in heat related risk within New York City. As a measure of relative vulnerability to heat, we used the natural cause mortality rate ratio among those aged 65+ (MRR65+), comparing extremely hot days (maximum heat index 100+) to other warm season days. Data were pooled across 1997-2006. We evaluated associations of MRR65+ with neighborhood characteristics, including demographic, socio-economic and biophysical characteristics, including vegetative cover.

Several neighborhood characteristics were correlated with MRR65+ in our analysis; the prevalence of residential air conditioning access and use ($r=.34$) and residential property tax delinquencies, ($r=.35$) had the strongest association. Other correlations ($r>0.2$) included: percent of seniors with hypertension diagnosis ($r=.31$) or diabetes ($r=.28$); percent of population below poverty level ($r=.25$); measures of educational attainment, such as percent of adult population that are high school graduates or higher ($r=-.24$), rate of housing violations ($r=.24$), percent at risk for social isolation ($r=.23$). Poverty rates and relative income levels modified of the association between these neighborhood characteristics and the MRR65+.

Despite limitations, these findings affirm the importance of neighborhood characteristics and social determinants in targeting heat emergency response activities.

WORD COUNT:

246

TITLE:

MillionTreesNYC: Is reforestation working?

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CO-AUTHORS:**ABSTRACT:**

The Natural Resources Group has led a reforestation effort in the PlaNYC goal of creating 2,000 new forested acres citywide. The mortality study was developed as one tool to test the success of the program. This study captured the mortality and health of trees planted from fall 2007 until fall 2008 (all trees planted > 2ft. tall). Twenty seven parks were sampled throughout the five boroughs, between June and August of 2009. Trees were recorded by species and mortality, growth and health for each tree was gathered in 267 permanent 5X5 meter plots.

The mortality citywide came to 7%; out of 1869 trees sampled 138 were found dead. The mortality by borough varied from the highest in Staten Island at 12% to the lowest in the Bronx and Brooklyn at 3%. Seasonally the trees experienced a higher mortality in the spring plantings (10%) compared to the fall plantings (5-7%). The newly planted trees had different exposures to full sunlight. There was a slight increase in mortality for the trees that had full sun (9%) compared to trees that were shaded (4%). Out of 23 genera captured four experienced 100% survival citywide; birch spp. (*Betula*), hickory spp. (*Carya*), ash spp. (*Fraxinus*), and elm spp. (*Ulmus*). The health of the trees was assessed based on the survival of the original leader stem. The measure of die-back should indicate current stress. The highest die-back resulted in Staten Island (62%) with the lowest in the Bronx (11%).

WORD COUNT:

243

TITLE:

Restoring native plant and pollinator communities on New York City green roofs

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ABSTRACT:

Urban development has dramatically decreased habitat for native plants and other wildlife. One of the native insect groups affected by this change are the bees and wasps (Order: Hymenoptera), which provide valuable ecosystem services like pollination of crops and ornamental plants. These insects, like many other kinds of wildlife, are experiencing rapid population declines. A major obstacle to ecological restoration in New York City is the scarcity of space available for natural ecosystems. A potential solution to this is to re-create native ecosystems on green roofs. Green roofs consist of layers of live plants, growing media, and a drainage layer on top of a waterproof membrane. Most green roofs are planted with a mixture of non-native succulent plants (mostly the genus *Sedum*), which are favored for their high survivorship and low maintenance requirements.

On roofs with somewhat deeper media, a greater diversity of plants, including native plants typical of local grasslands, can persist. Here, we report on the differences in abundance and diversity of Hymenoptera attracted to native green roofs, *Sedum* green roofs, non-vegetated roofs, and ground-level green spaces. Preliminary data indicate extensive insect use of green roofs, with higher abundance on roofs planted with native species. The next phase of this research will involve comparing how the landscape context provided by different neighborhoods affects the development of the green roof biological communities.

WORD COUNT:

223

TITLE:

Stormwater Capture Opportunities, Carbon Sequestering, Biodiversity and Ecological Services Enhancement in the Bronx HP-009 Sewershed

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ABSTRACT:

Every inch of runoff generates 160,000 gallons of water at the SIMS material handling facility on the Bronx River, while the storm-sewershed of combined sewer HP-009 generates 10,881,000 gallons, per inch of rainfall. Assessed as a resource, this 160,000 gallons of water represents a potential for tree, shrub and herbaceous plant growth of about seven tons of carbon capture and the equivalent of 4,500 tons of AC. Through simple SWIM and spreadsheet modeling the landscape impact as well as the restorative and ecological significance was realized. In order to completely diminish the stormwater impact of the SIMS material handling facility, a carbon positive and comprehensive ecological system was designed and implemented and now supports a diverse habitat of over 50 species of plants. Far cheaper than conventional stormwater runoff reduction per gallon, the SIMS system cost could be calculated as negative if the ecological, habitat, and carbon sequestration values are factored in.

WORD COUNT:

152

TITLE:

Some ecological observations of an old growth forest, Corson's Woods, Staten Island, New York.

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ABSTRACT:

Corson's Woods, a 150 year old growth forest, is located in Staten Island, New York. The trees at Corson's Woods, were sampled by the quadrat method in April and May, 2008, and compared with the trees present at a similar moist woodland at Inwood Park, Manhattan, New York, sampled by Stalter in 2005. *Liriodendron tulipifera* and *Acer saccharum* were the dominant trees at Corson's Woods in 2008 and at the moist woodland, Inwood Park, 2005, ranking first and second in importance respectively. *Liriodendron* was first in relative dominance at both sites. *Acer saccharum* ranked second in relative dominance at Corson's Woods and third in relative dominance at Inwood Park. *Liriodendron* ranked first in relative dominance and importance at Inwood Park in 1935, while *Quercus* spp. ranked second in relative dominance and importance followed *Acer* spp. We will also present comparative data on the 2008 forest at Corson's Wood with the historical (1936) forests at Alley Park, New York.

WORD COUNT:

223

TITLE:

Implementing Sustainability Management Systems in Urban Infrastructure Master Planning Projects: Three Case Studies

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ABSTRACT:

‘Sustainability management systems’ are increasingly used in urban planning projects as frameworks for guiding design and measuring performance of green infrastructure systems against a ‘sustainability vision’ – a set of goals for social, environmental and economic performance arrived at by stakeholders, often directed by a team of experienced consultants. Such frameworks often have multiple objectives including, but not limited to, 1. Tracking, measuring and driving progress, 2. Integrating potentially transformational green infrastructure design into the core of the planning process and 3. Creating a system of benchmarks by which to compare alternative designs.

If the ‘sustainability vision’ is not shared and supported by stakeholders and the consulting team, the system will be perceived as irrelevant and illegitimate. Similarly, if the design and execution of the management system framework is not compatible with the political and procedural structure of the project context, implementation of any findings will be significantly hindered.

Hence the success and relevance of sustainability management systems, and therefore the likelihood that the end product will achieve a measured level of sustainability, depends significantly on the process by which the ‘sustainability vision’ is established, and on when and how the framework for management is integrated into the design process.

This presentation explores three case studies of sustainability management systems individually developed and tailored by the authors for three different urban infrastructure projects in the US and India and considers how the process of development and implementation led to relative ‘success’ against the three objectives outlined above. The authors believe that an in-depth assessment of such experiences by the actors involved outweighs the inherent subjectivity of the approach.

WORD COUNT:

267

TITLE:

Sustainable Urban Forest Management Planning using Criteria and Indicators

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CO-AUTHORS:**ABSTRACT:**

This presentation discusses how Criteria and Indicators (C&I) for success in sustainable urban forest management, first outlined by Clark et al. (1997), can be successfully applied as tools to improve Strategic Urban Forest Management planning. The first part of the presentation reviews Clark et al.'s (1997) C&I for urban forest sustainability, which consider the vegetation resource, the community framework, and management approaches. It also presents updates and modifications to the original tables, developed by van Wassenauer and Kenney (in press) to improve their application in strategic planning. The second part of the presentation discusses the development of a Strategic Urban Forest Management Plan for the Town of Oakville based on/around Criteria and Indicators. The case study demonstrates how C&I were used to evaluate current management practices in Oakville and to determine what needed to be done to optimize the vegetation resource, the community framework and management to create a sustainable urban forest. This part also outlines the strategic planning framework used in the preparation of the Oakville Plan, and presents it as a model applicable to any size of community interested in sustainably managing its urban forest resources.

WORD COUNT:

188

TITLE:

Promoting Active Urban Aging: Creating a Combined Walkability Index for Older Adults using a Geographic Information System

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ABSTRACT:

Background: Understanding the role of the built environment on physical activity behavior among older adults is an important public health goal, but evaluating these relationships remains complicated due to the difficulty of measuring specific attributes of the environment. As a result, there is conflicting evidence regarding the association between perceived and objectively measured walkability and physical activity among urban-dwelling older adults. This suggests that both actual environmental features *and* perceptions of these attributes influence walking behavior.

Objective: The purpose of this pilot project is to create a Combined Walkability Index (CWI) using a Geographic Information System (GIS) that incorporates data from an objective data audit and a subjective survey thus more accurately characterizing walkability.

Method: Computerized Neighborhood Environment Tracking (ComNET) was used to systematically assess environmental risks impacting activity patterns of older adults in two New York City neighborhoods. In addition, the Senior Center Evaluation of the Neighborhood Environment (SCENE) survey was administered to 103 older adults attending two senior centers located within the target neighborhoods.

Results: The results indicate that there is substantial variation in walkability both between and within the neighborhoods suggesting that some communities may increase the risk of inactivity among older adults.

Conclusion: GIS applications will help to promote further research that integrates various data collection methods and measures of the built environment relevant to physical activity behavior for specific populations. Further empirical evidence evaluating the complex relationships between the built environment and physical activity is the first step towards creating active communities.

WORD COUNT:

247

TITLE:

Linking Climate Action to Local Knowledge and Practice: A Comparative Case Study of Diverse Chicago Neighborhoods

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ABSTRACT:

Many researchers argue that strategies for climate change mitigation must build on cultural understandings of the relationship between humans and the natural environment. However, this is complicated by how different socioeconomic communities perceive agendas developed by outsiders and especially government. Furthermore, few studies have examined community engagement in climate action in the United States or in urban areas. We will present our ethnographic research commissioned by the City of Chicago Department of Environment (DOE) to understand sociocultural viewpoints on climate change in diverse neighborhoods. DOE's ultimate goal is to develop locally relevant programs for engaging residents in its recently released Chicago Climate Action Plan.

This research, conducted by anthropologists at The Field Museum with US Forest Service and social network researchers, community leaders, and DOE staff, employed qualitative and quantitative methods. We found that residents' relationships to the natural environment and their interests in City programs differ based on their demographics, histories, ecological landscapes, and locations in relationship to Chicago's downtown. Findings identify community concerns that can be linked to climate action, including commonly discussed issues such as cost savings but also non-utilitarian issues related to quality of life. For example, while one community is concerned with ecological restoration and building a local food system, another cares about affordable housing and heritage tourism. Findings also include creative practices of low resource use that can facilitate engagement and lead to local solutions. We will also discuss the process of linking research to action.

WORD COUNT:

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TITLE:

Urban Nature and Human Health & Well-Being Benefits:
Building A Comprehensive Research Outreach Resource

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CO-AUTHORS:**ABSTRACT:**

Scientific research across recent decades has provided evidence of the broad array of benefits provided by urban greening. While environmental benefits and services are becoming more recognized, human health and well being (HHWB) benefits are often reduced to a simple matter of aesthetics in public dialog. A comprehensive research literature review and summary is being prepared to serve as a national outreach resource about the full scope of benefits knowledge. The literature is extensive but is located in publications across many disciplines so is not easily accessible. The research compendium will pursue all sources and ultimately be a comprehensive reference that provides important justifications for why society should invest in urban forestry and natural resources stewardship. The web-based product will be oriented to professionals, officials, and concerned citizens. The literature review is the first step in compiling our empirical understandings of human response to urban trees and nature. A multi-stage effort should include, 1) Research Assessment and Summary (now underway), 2) Geospatial Modeling of HHWB Conditions, and 3) Economic Valuation of Benefits. This paper and presentation has several purposes: 1) to report on status of the research summary, and invite feedback, 2) to discuss the methods and potential applications of geospatial modeling of HHWB benefits, and 3) to propose an economic valuation framework for HHWB benefits. The presentation will conclude with discussion of the feasibility of creating an “i-Tree Community” module as an addition to the USDA Forest Service i-Tree suite of analytic tools.

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TITLE:

Using Phytotechnologies to Remediate Brownfields, Landfills, and Other Urban Areas

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ABSTRACT:

Urban areas requiring remedial work has prompted the use of phytotechnologies to improve water quality, soil health, and biodiversity, as well as to achieve sustainable social and economic goals. Phytotechnologies directly use plants to clean up contaminated groundwater, soil, and sediment. While woody and herbaceous crops are candidates for such remediation systems, trees within the genera *Populus* (poplars, cottonwoods, aspens) and *Salix* (willows) are ideal given their fast growth, extensive root systems, and elevated rates of photosynthesis and transpiration. The genetic diversity within these genera substantially increases the establishment and growth potential across heterogeneous sites. We have tested these trees for more than a decade across various sites and contaminants, which has resulted in developing phyto-recurrent selection, a method utilizing multiple testing cycles to evaluate, identify, and select favorable varieties with adequate genetic variation to guard against insect/disease outbreaks and changing edaphic conditions (especially those induced by contaminated soil and water) in the field. We will present information from our studies involving the selection and growth of trees performing well across variable site conditions (generalists) or sites with specific contaminant concerns (specialists) in order to enhance the success of phytotechnologies at brownfields, landfills, and other urban areas. This effort supports scientists and resource managers to acquire information that contributes to the deployment of systems that are ecologically and economically more sustainable versus traditional technologies, while the general public maintains environmental quality and protection of the natural resource base on which local and regional recreation, agriculture, and forestry depend.

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