BIOPHILIC CITIES

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Front Cover:
Edmonton, Alberta, Canada Skyline
Photo Credit: Tim Beatley

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Edmonton River Valley
Photo Credit: IQRemix from flickr.

BiophilicCities

The Biophilic Cities Journal is produced by the Biophilic Cities Network, which is a global network of cities committed to conserving and celebrating nature in all its forms and the many important ways in which cities and their inhabitants benefit from the biodiversity and wild urban spaces present in cities. The Network acknowledges the importance of daily contact with nature as an element of a meaningful urban life, as well as the ethical responsibility that cities have to conserve global nature as shared habitat for non-human life and people.

Many individuals and organizations are due thanks for helping produce this inaugural issue of the Journal. We owe special thanks to the Summit Foundation for their generous and continuing financial support for the Network and for this new Journal. We also thank the School of Architecture, University of Virginia, for hosting and supporting the Biophilic Cities Network in many ways.

For more information on the Biophilic Cities Network, and to learn about ways to become involved in this global movement, please see www.BiophilicCities.org

THE HOPEFUL PROMISE OF BIOPHILIC CITIES

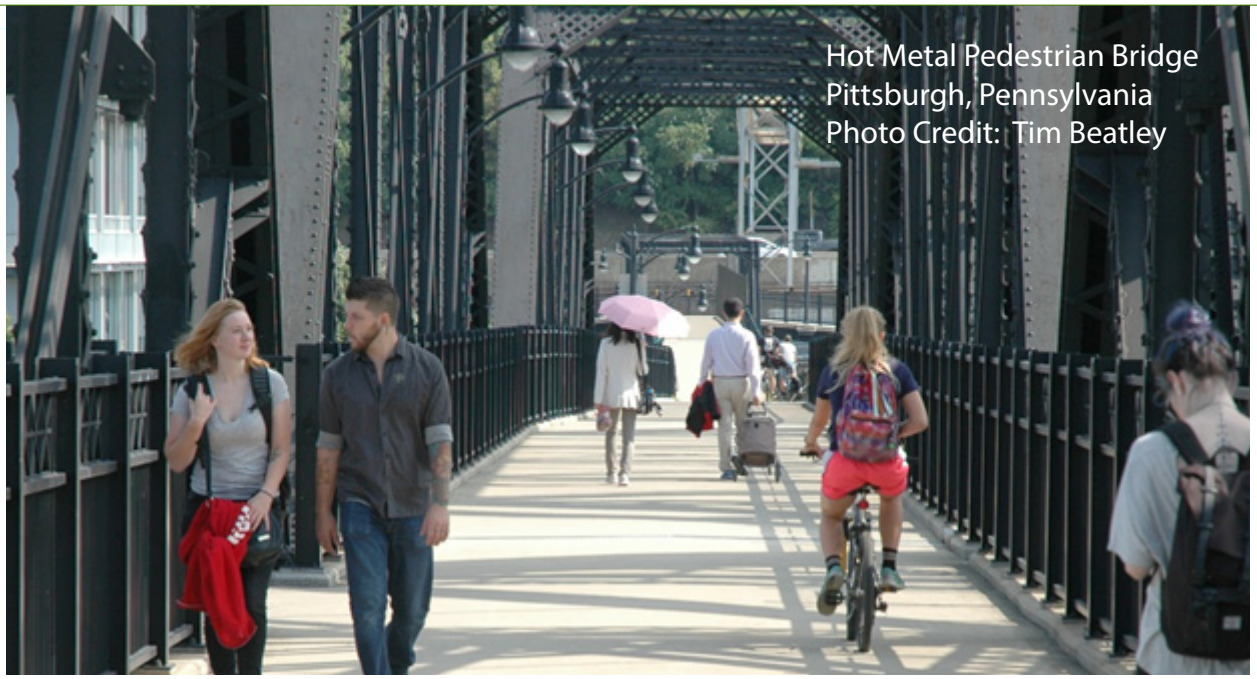
Tim Beatley

Tim Beatley is the Teresa Heinz Professor of Sustainable Communities, in the Department of Urban and Environmental Planning, at the University of Virginia.

(Opposite)
The Southern Ridges, Singapore
Photo Credit: Tim Beatley

We are very excited to share with you our inaugural issue of the Biophilic Cities Journal. With this first issue we are embarking on a new effort at more effectively sharing information, summarizing new research and practice, and telling the compelling stories of cities around the world helping to design and grow more nature-ful cities. We envision at once a journal that serves as a forum for discussing and sharing new insights and information, but also for inspiring us about the many creative projects and initiatives in cities, and the work of passionate people in these cities. We hope our journal will inform and inspire, and add an element of hope and optimism about the future of cities and of urban living. The nature in our lives and in our neighborhoods is one of the most powerful (partial) antidotes to the chaos, fear, and cruelty that seem to carry the day.

I am happy to report that the vision and practice of Biophilic Cities continues to gain traction. The second half of 2016 was a particularly exciting



Hot Metal Pedestrian Bridge
Pittsburgh, Pennsylvania
Photo Credit: Tim Beatley

period for the Biophilic Cities Network. In May, we added two high-profile cities, Washington, DC, and Edmonton, Canada. We participated in and helped to organize celebratory events in each city, marking the promise and potential of the Network and what it might mean for these two cities. Edmonton is pioneering a commitment to a nature-connected city, and one that values the easy movement of animals through the city. It has now completed its 27th wildlife passage. Some 250 attendees joined us at the Edmonton Public Library to hear about Biophilic Cities and celebrate that city's natural wildness and impressive green ambitions for the future. Hundreds of miles to the east, celebrants in Washington, DC, still a highly fractured, segregated city, considered how the role of its already abundant nature could play an even greater role in enhancing livability and security for all there. At a launch event co-organized by Biophilic DC, one speaker, Sabine O'Hara, Dean of the College of Agriculture, Urban Sustainability and Environmental Sciences (CAUSES) at the University of the District of Columbia told of an initiative to establish urban food hubs in each of the city's nine wards. She also took a group of attendees to see the impressive 20,000 square foot green roof on the rooftop of her School's main building, growing a remarkable amount of food. It was a visceral demonstration of sometimes hidden, underappreciated ways in which individuals and groups and universities are helping to pioneer new pathways to resilience, sustainability and biophilia.

In September, we participated in a wonderful press conference at the Phipps Conservatory in Pittsburgh announcing that city's joining the Network, and presented Mayor Peduto with a framed membership certificate. For me it was also an opportunity to experience first-hand some of the impressive qualities of a nature-rich city like Pittsburgh. The successful efforts at regeneration in this former industrial city, built from steel and coal are well-known (and on display everywhere in that city, including Station Square, where I stayed) but the

nature story is less well-known. This is already a remarkably green city, a tree-immersed city with a canopy coverage of 42%. A new 660 acre park, Hays Park, has been purchased that will be larger even than the city's existing (and quite large) Frick Park, and the new connections to water are especially exemplary. The morning of our press conference with the mayor I walked along a beautiful trail and pathway, hugging the south bank of the Monongahela river. Along the way I saw the new South Riverfront Park, a lively and resilient new connection to the river. A former dock for steel mill barges, this park opened in 2013. Part of a larger (and growing) network of riverfront trails and bike paths in Pittsburgh, on this sunny September morning there were lots of residents out enjoying nature. I ended my walk by crossing the Hot Metal Pedestrian bridge. Originally built in the 1880's as a railroad bridge, and later the 1880's as a railroad bridge, and later to transport heavy carts of molten steel across the river, it is truly, as one newspaper article heralded "a Bridge to Pittsburgh's Industrial Past." It was incredibly busy with bicyclists and joggers and baby carriages on the day I walked across it and back, a visual blending of this city's steel town history with its emerging love of and connection with the outside nature in which it sits.

Pittsburgh has had remarkable success in recycling its former industrial landscape and in infusing green, nature-ful qualities in its neighborhoods. There is wildness around one here, from the visually-present forested hilltops to the water's edge. I walked a portion of the South Side Riverfront Trail, along the southern edge of the Monongahela River. Along the way, wild nature emerges, for instance in the form of the hardy, emergent plants and moss that spring out from the large retaining walls.

The press conference announcing Pittsburgh's joining the Biophilic Cities Network was held in a beautiful open-air patio (itself an example of overcoming indoor-outdoor barriers) of the Center for Sustainable Landscapes at the Phipps Conservatory. It is a spectacular green building, the first certified Living Building in the City. From its daylit interior spaces to its reclaimed

Pittsburgh Mayor Bill Peduto Receives Partner City Certificate, Photo Credit: Tim Beatley

wood siding (from Pennsylvania barns!), it is a building that exemplifies the importance of connections with nature that we want to design into all of our living and work spaces. Later in the day, I had the chance to visit the recently-completed Frick Environmental Center, at Frick Park. With some work still underway (the elaborate waterfall and feature on the exterior of the structure was not yet functioning) it was another beautiful addition to the biophilic architecture of this city.

Pittsburgh has clearly had much success in re-imagining itself and moving from "steel city to biophilic city." The development community is not surprisingly quite aware of these new nature amenities, especially the riverfront trails and parks. A 2015 study by Sasaki found that the investment in riverfront parks and trails (something on the order of $130 million) has helped to stimulate much development (more than $4 billion) along or near the water. Property value increases were found to be much higher for property near the riverfront (and especially so in the area around South Shore Park).

Much credit for Pittsburgh's joining the Biophilic Cities Network must go to Richard Piacentini, the energetic director of the Phipps Conservatory. Their work began several years ago when they started convening a monthly biophilia group. They invited speakers and engaged in discussion about how their city could be more connected to the natural world. I gave a lecture in 2015, hoping the city would join the Network, and the next meeting of the Biophilia group was aimed at an open discussion about what participants want to see their city aspire to, and becoming a biophilic city was a main conclusion. Piacentini and his colleagues at Phipps were able to advocate and actively push the mayor and his staff to apply for partner city status. At least in Pittsburgh this is a model of grassroots, bottom-up citizen activism, some form of which could work, I believe, in almost any city. It remains to be be seen how this group of activated citizens, and the staff of the Phipps Conservatory, will be a part of what the city does in the future to advance biophilic urbanism, but I know they will be watching and likely pushing the city ahead.

We have been active in other cities in recent months, as well. We had a wonderful time in Baltimore beginning filming for our new documentary film about Blue Cities and Blue Urbanism. We spent much of the morning filming young adults participating in a City Parks and Recreation Department program to teach about kayaks and canoes. We watched and filmed as city staff taught the kids how to balance and paddle, first on the firmness of land, and then on the water.

Baltimore Alley Painting
Photo Credit: Tim Beatley

These were kids who had grown up in troubled neighborhoods, not far from the water, but never actually visiting or recreating on the water.

They seemed to be having a great deal of fun, and hopefully the initiative serves to ignite a lifelong love of these watery refuges. Later that day we filmed one of the City's impressive alley makeovers. This one took place in the Patterson Park neighborhood, a diverse, though struggling neighborhood. The dramatic result in this alley was the painting of a linear blueway, a ground level mural produced by some 80 residents of the neighborhood who came together in a moment of collaborative hope.

Biophilia, in all its forms and expressions, has special import to neighborhoods like this one. Social justice demands that the beauty and profound benefits bestowed by nature be made available to all. The most disadvantaged neighborhoods and cities deserve these connections to the natural world. We know of course that too often the result of introducing new nature (whether it is the High Line in New York or the Belt-Line in Atlanta) has the unintended consequences of gentrification and displacement, and we must continue to find the tools and the will to mitigate these kinds of impacts. But we know the power that planting fruit trees or creating a pocket park from abandoned lots or starting a community garden can have in creating community and building resilience. One example can be found in the profile in these pages of the work of Kemba Shakur and her organization Urban Releaf, working in the minority neighborhoods of Oakland, California. When she arrived there in the 1980s, she was struck by the absence of trees: there were more trees on the grounds of Soledad prison, where she worked, than in her Oakland neighborhood! Planting trees, as Shakur demonstrates, can change lives, can open up new opportunities, can foster optimism. And trees, in no small ways, can help us build hope.

So, I circle back to the sources of hope. There are many, but I find the view of the white oaks outside my office window, the birdsong I hear on the way to class, the persistent stream near my home, and the many remarkable ways cities around the world are protecting, nurturing, celebrating their own nature(s) as some of the most important sources of hope we have today.

Baltimore "Kids in Kayaks" Program
Photo Credit: Tim Beatley

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BRIDGEPARK

RICHMOND, VIRGINIA

BridgePark is a linear public park proposed by non-profit Richmond BridgePark Foundation that would connect the north and south sides of downtown Richmond, Virginia and bring City-level access to some of the most appealing views of the James River. Utilizing excess roadway on the Manchester Bridge and surrounding areas, the new park space can connect to City parks on both sides of the river, thereby creating an experience that marries the urban appeal of downtown with the beauty of the James. BridgePark would also connect down to river-level access points on both sides of the Manchester Bridge.

Renderings of the BridgePark
Photo Credit: Spatial Affairs Bureau

FINANCING BIOPHILIC CITIES

James D. Brown

In our rapidly urbanizing world there is a growing appreciation and understanding of the value of nature in cities both for nature's personal biophilic health benefits and for the large-scale ecosystem services that nature provides, such as: clean air and water; climate regulation; and a buffer for increasingly inconsistent flood and weather systems. Biophilic cities embrace these diverse values by nurturing native, natural systems to grow green infrastructure that provides cost effective environmental benefits but also creates the opportunity for urban residents to interact with nature on their doorsteps. Biophilic cities see opportunities in their investments in green infrastructure to restore, repair and enhance urban ecological systems. These investments reap economic, environmental and biophilic benefits for these cities.

These benefits are gradually being internalized and quantified by our economic markets, which are increasingly accounting for the need for healthy and active natural systems within cities in new and innovative ways. Operating at their best, these market forces not only embrace the utilitarianism of urban nature but also provide an avenue for promoting biophilic interests. They can

spur the development and conservation of diverse urban ecologies, which create the opportunity for residents to observe and experience nature in urban settings.

The result is a new magnitude of financing for nature in cities and a promise of funding for biophilic solutions to environmental problems that are growing beyond the capacity of traditional governmental and philanthropic sources. Cities across the U.S. and globally are embracing non-traditional sources of financing to enhance urban natural ecosystems and are, consequently, increasing biophilia within their borders. Financing efforts include a new level of partnership and collaboration with private investors, but also a heightened government funding focus on green infrastructure.

Growing Green Investment

A report from The Nature Conservancy's investment unit, NatureVest, identified $23.4 billion in global "conservation impact investments" over the five year period of 2009 to 2013. The report defines these investments, which I term "green investments" here, as investments intended to return principal or generate profit while also enhancing natural resources and ecosystems. The figures provided by NatureVest have only increased since 2013, as an estimated $10.6 billion was invested in 2014 with an additional 16 percent of increased investment projected by JP Morgan for 2015. Separately, the fixed income green bond market tripled in size from $11 billion in 2013 to $37 billion in 2014.

These investments can return sustained benefits. For one thing natural, green infrastructure does not depreciate over time in contrast to man-made structures. Consider one example cited by Goldman-Sachs and The Nature Conservancy, which is the investment in oyster reefs versus a man-made seawall to protect New Orleans against rising sea levels. Both options have similar initial capital costs, but the sea wall depreciates over time while the oyster reefs remain undiminished and produce ancillary benefits like commercial fisheries, clean water and fish habitat.

Green investments also create small individual scale benefits that collectively

(OPPOSITE)
Green Infrastructure in Philadelphia.
Photo Credit: phillywatersheds.org

(LEFT)
Kennedy Center Green Infrastructure Streetscape Project from Nitsch Engineering
Photo Credit: D.C. Water

amass to significant economic savings in terms of increased worker productivity and reduced healthcare costs. A Terrapin Bright Green report on the economics of biophilia estimates savings of $2,000 per employee per year with increased productivity related to office natural daylighting and $93 million per year in healthcare costs related to shorter hospital stays by providing patients with views of nature.

Other added benefits of green investments include the reduced cost and risk for public entities that are not forced to solely shoulder the cost of green infrastructure improvements. Private investments leverage other new sources of capital and create a greater connection between the private community and cities' natural amenities. New sources of private funding can also help to accelerate the development of green infrastructure and help to reduce increased costs that are lost as project time lines lengthen.

Accordingly, interest is growing in a variety of financial sectors. For example, in 2014 Goldman Sachs convened an Environmental Innovation Finance Summit to overview the availability of investment opportunities in solutions that benefit the environment as well as investors. Supported by a growing network of international policy the Executive Director for the United Nations Environment stated that 2016 was the "Year of Green Finance"; a refrain that has been echoed by variety of financial experts with the urging that global cities embrace green financing to ensure that their growth is sustainable.

In this article, I take a closer look at Washington, D.C., and Philadelphia, which are two examples of biophilic cities using green finance to increase the presence of nature in their cities both for the ecosystem services that nature can provide and also for the biophilic benefits that result from healthy native urban ecological landscapes.

Washington, D.C.

Washington, D.C., has undertaken a few different measures to enhance nature by using green financing opportunities. A primary driving force is the city's need to control stormwater as the fastest growing contributor of pollution to the Chesapeake to the tune of 3 billion gallons of stormwater and overflowing untreated sewage waste contributed to the Chesapeake watershed annually. DC is seeking to address this environmental challenge by funding green infrastructure with a specific emphasis on the use of native landscaping.

In 2013, the city initiated a stormwater credit trading program to fund private green infrastructure development within the city. At the outset, the DC Department of Energy & Environment modified its stormwater management regulations to require that new development account for the capture of stormwater from their sites for all but the largest rain storms.

Specifically, the 2013 Stormwater Rule applies to new major disturbances of land and new substantial improvements to structures. These new developments must capture the majority of rainfall

Race Street Pier
Photo Credit: James D. Brown

onsite. The stormwater must be managed with one or more approved green infrastructure best management practices, which include: green roofs; rain gardens; constructed wetlands; and tree planting and protection.

In practice, developments are only required to capture 50% of the stormwater onsite and have some flexibility with the option of purchasing credits for the remaining 50% from other developments that have exceeded their obligations. Developers can also alternatively pay an in-lieu-of fee to the city. The fees are used to fund other green infrastructure projects with the city. A purchaser can choose to bank credits that it purchases and that exceed its annual obligations for later use or sale.

Thus, a developer that invests heavily in green infrastructure in its site design can create additional returns on investment by selling the stormwater credits it generates to other new developments that are not meeting their stormwater capture obligations. The net aim for the city is to capture and treat stormwater at unprecedented levels and for less than the cost of traditional grey infrastructure methods.

Two recognized early challenges for the program are creating sufficient liquidity within the credit market and lack of a centralized entity to facilitate trades. A stormwater credit retention fund has been established by NatureVest and EKO Asset Managers who are working jointly to solve these market challenges.

DC's guidance for implementing stormwater projects promote the use of native landscaping that holds the promise of creating vibrant ecosystems for flora and fauna. For example, street level stormwater projects, like bioretention and constructed wetlands, emphasize native plant species. The city has developed demonstration sites that promote native vegetation for these project types. The similar use of native plants for green roofs is more challenging given the need to emphasize particularly hardy species that can tolerate more intense rooftop conditions. However, the recommended plant lists for green roofs also include plant species that are native to the region

Cira Green
Photo Credit: James D. Brown

Stonecrop Blossom
Photo Credit: Courtesy Alan Cressler, Lady Bird Johnson Wildflower Center

and the U.S., such as various species of wild stonecrop from the succulent Sedum family.

Complementing the stormwater credit trading program's promotion of native landscaping are DC's Green Area Ratio (GAR) landscape and design standards for new development. The GAR is a comparative weighting of landscape features with the aim of increasing the quantity and quality of the urban landscape's environmental performance in the areas of stormwater retention, air quality and heat reduction. The GAR scoring system provides a bonus for the use of native landscaping that is set out in the U.S. Fish & Wildlife Service's Native Plants for Wildlife Habitat and Conservation Landscaping in the Chesapeake Bay Watershed.

These various efforts by DC emphasize the value of flourishing native ecosystems in creating answers to the environmental problems that trouble all growing urban areas. The investments encouraged by DC's recent efforts demand that the city's infrastructure perform double-duty: to meet the environmental needs of a major city in terms of clean air and water; and to enhance the urban landscape to provide individuals with the opportunity to connect with nature in the course of their daily lives.

Philadelphia

Philadelphia is a second city getting creative with financing to increase the presence of nature. Since 2011, as part of its Green City, Clean Waters program, over 1,110 new green landscaping features have been added to the city's streets to capture stormwater. Philadelphia has achieved this result by reconsidering how it invests public funds.

At its completion, the estimated clean water improvements and financial savings are quite impressive. Through the addition of "living landscapes" on current impermeable surfaces, including roofs, streets and sidewalks, it is estimated that stormwater pollution can be reduced by 85%. This would improve the quality of the city's waters beyond that for any city resident within living memory. The estimated savings to accomplish this task: $5.6 billion!

So how is Philadelphia accomplishing this feat? By combining its investments in stormwater control and the development

of public parks. The Philadelphia Water Department (PWD) is teaming up with the Parks and Recreation Department to respond to the demand for more green space within the city, while cost effectively controlling stormwater pollution. The first piece of this puzzle was to use PWD funding from residents' water bills to add 500 acres of new park space within the city by 2015 with integrated green stormwater infrastructure as part and parcel of the parks.

Other aspects of the green investment include a large-scale street tree program, conversion of vacant and abandoned lots, and restoring streams. Philadelphia plans to continue its current commitment and spend $2.4 billion over 25 years to capture over one-third of the city's stormwater from impervious surfaces. This plan was developed after 10 years of pilot programs and careful consideration as to its feasibility.

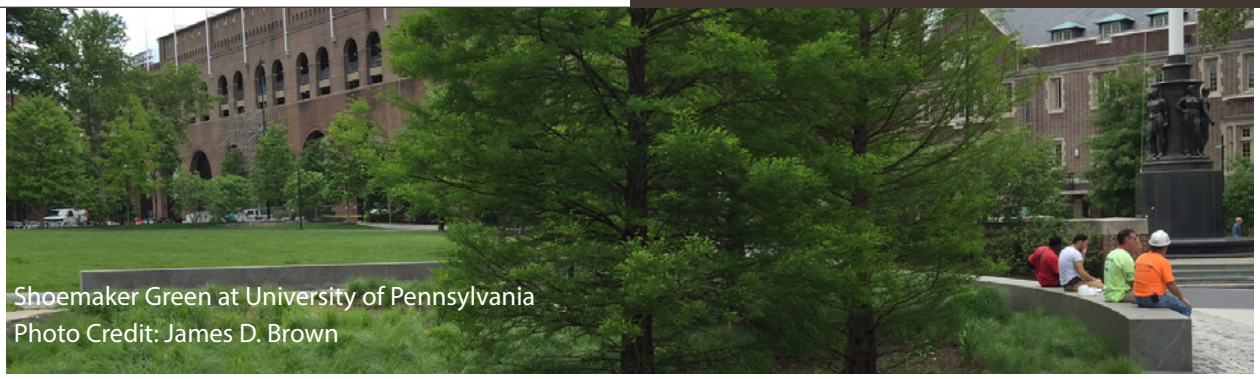
Philadelphia's commitment has leveraged additional financial commitments. Beginning in 2012, the Environmental Protection Agency (EPA) committed to ensuring that Philadelphia accomplishes its 25-year Green City, Clean Water plan, as a demonstration of the EPA's support for innovative greening approaches. In 2014, EPA provided $5 million in funding to five Philadelphia area universities to explore the financial and social benefits of the green infrastructure plan.

Prior to the adoption of the plan, in 2006, the city adopted a requirement that new developments larger than 15,000 square feet manage the first inch of stormwater runoff from their sites. The city estimated that over 25 years the benefits of this requirement would exceed $1 billion. Similarly, in 2010, the city began phasing in an update to its stormwater utility fee that bases the fee on the square footage of impervious surfaces. The city has developed a stormwater credit and grant program to assist non-residential properties in retrofits that increase green infrastructure on their property and reduce their stormwater utility bills. The Green City, Clean Waters plan complements these private investments in green infrastructure to put in place a citywide plan for greening.

One last piece of the puzzle is the redevelopment of vacant lots with an eye towards green infrastructure. As of 2011, there were over 40,000 vacant lots within Philadelphia, which is the result of a 24% reduction in the population of the city since World War II. The city has a community vacant lot program that provides clean up services for the 74% of vacant lots that are privately owned. The city is also aggressively looking to move the lots it owns to private ownership to encourage redevelopment. For those lots with limited redevelopment potential, the city is developing a plan to dedicate these lots for green infrastructure. A December 2012 Report indicates significant potential for improving the greening of vacant lots within the city. One tremendous added benefit of greening vacant lots is providing access to green

PORTLAND, OREGON

For other remarkable savings consider Portland, Oregon's River to Tabor program, which used green infrastructure to control stormwater on the city's east side. The projected cost of a traditional stormwater control project using pipes was estimated at $144 million, while the green infrastructure alternative cost 44% less at $81 million: a savings of $63 million.



Shoemaker Green at University of Pennsylvania
Photo Credit: James D. Brown

space for the more than 200,000, mostly low income, residents without half-mile access to public green space.

All this effort has translated into 441 different green infrastructure projects with unique biophilic qualities on over 837 acres across the city within the first five years of the program. Projects include rain gardens in municipal parks and stormwater tree trenches in public right-of-ways, along with private projects within commercial parking lots and residential common areas. As with DC, the challenge is for these projects to maximize the use of native and diverse landscaping to not only provide infrastructure services but also to grow healthy urban ecosystems that create an opportunity for residents to find respite and to connect with nature during the course of their daily lives.

Thinking outside the box will result in significant benefits for Philadelphia as it is enjoying a new era of access to nature and clean water, at substantial savings compared to a traditional stormwater infrastructure plan, and with the knowledge that green infrastructure can be maintained in perpetuity. As emphasized by the city, the plan has a triple bottom line that provides economic, social and environmental benefits. To the extent that the resulting projects can create vibrant and functioning urban ecosystems, these projects can contribute and also enhance the presence of biophilia across the city.

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TRANSBAY TRANSIT CENTER
SAN FRANCISCO, CALIFORNIA

San Francisco's Transbay Transit Center, a collective regional and local government initiative, will feature "City Park," a public 5.4-acre rooftop park. The 1,400 foot long elevated park will feature a wide range of activities and amenities, including an outdoor amphitheater, gardens, trails, open grass areas, and children's play space, as well as a restaurant and cafe. City Park will double as a "green roof" for the Transit Center. It will shade much of the ground-level sidewalk when the sun is strongest and provide biological habitat for flora and fauna and public open space for transit passengers, neighborhood residents, and employees.

Transbay Transit Center Rendering
Photo Credit: San Francisco Planning

Whitetail Deer
Photo Credit: Robert Costello

CITIZEN SCIENCE AND BIOPHILIC CITIES, THE GREAT EXPERIMENT

Robert Costello, William J. McShea, Tavis D. Forrester, Arielle Waldstein Parsons, Stephanie Schuttler, Megan C. Baker-Whatton, Roland Kays

Not so long ago ecologists looked upon urban areas as empty matrices, sterile wastelands isolated from natural wildlife habitat. Wildlife communities were considered to not have adequate habitat, refuges, or connecting corridors allowing animal movement around the urban cityscape. Only a small variety of animals inhabited our cities and their bio-depauperate parks, and quite a few of those animals were invasive species--Norway rats, house sparrows, starlings, domestic pigeons, house mice, Asian tiger mosquitoes, marmorated stink bugs. Parks were planted with trees originating from different continents--ginkgos, Norway maples, London plane trees, crepe myrtle. These unnatural habitats were useless to most wildlife. Have you ever seen a crepe myrtle in bloom abuzz with North American bumble bees?

But life adapts and evolves, native species are returning to land claimed by humans, cities are becoming full of nature. With a bit of help from urban planners and species evolution, natureful cities create opportunities for native communities of organisms to recolonize the urban landscape and reestablish breeding populations. The return of nature to cities is visible, but the overall effect on wildlife and people remains unknown. Can cities provide much-needed habitat to declining species and help

reverse their spiral toward extirpation, or worse, extinction? Can city dwellers accept living with recolonizing fauna such as carnivores? How about large carnivores?! And what about the zoonotic diseases animals carry that can spillover to humans--rabies, hantavirus, lyme disease, Nipah, Ebola? To answer these questions requires long term monitoring of wildlife communities across a variety of urban landscapes to measure the effects of greening urban spaces.

This is where citizen science has the potential to be one of the most potent practices for measuring how biodiversity returns to urban areas and the effects on humans. We make this claim from our experiences as wildlife ecologists and educators working on a variety of citizen science projects across many different landscapes, from urban to wild. We imagined and built eMammal, the largest citizen science project for monitoring mammals. The geographic scale of eMammal required recruiting hundreds of volunteers and students and we used the data collected to study the ecological implications of human activities and our pets on wildlife. We have also investigated the personal gains citizen scientists experienced from their participation. From our research and experience we see citizen scientists as valuable partners in our efforts to understand uniquely urban wildlife communities. These communities are new suites of species inhabiting disturbed and reconstructed landscapes and the trophic roles each plays in less disturbed areas may not apply to urban environments. We need to acquire new knowledge about the interconnectedness of species in urban environments and we need citizen scientists in those areas to participate in advancing our understanding of how nature works where so many human beings live.

Innately connected to the natural world, human health and well-being depend on healthy environments and the organisms inhabiting them. Monitoring the environment and correlating changes in plant and animal distribution and abundance to human activities and abiotic factors, such as land uses and climate change effects, is the only way we can know which strategies for making urban areas habitable for wildlife are working. Will biophilic cities create wildlife refuges and endemic communities of organisms, and will this have a positive effect on human health and well-being?

The commercial production chain of plants for urban, suburban and exurban landscapes has ecologically homogenized green spaces to the extent that planted lawns and parks in Phoenix, Arizona, Boston, Massachusetts and Daejeon (Korea) all share the same trees, shrubs and flowering plants, creating more of the same will not provide the most suitable habitats for endemic species. What would be the effects on faunal biodiversity should this practice change and a more mindful reconstruction of native habitats across urban landscapes became the standard? Answering this question requires analyses at different scales, from micro to macro, and collecting the data needed to inform us of the effects of our practices towards promoting and sustaining biodiversity is far greater than the capacity of a relatively limited number of ecologists. Documenting the flora and fauna in an urban landscape is the first giant step towards measuring changes over time and understanding urban wildlife habitat requirements.

The scale of documenting the biodiversity of even one urban landscape might seem daunting; however, there are ways to achieve this. First, programs are already in place for monitoring trees such as Tree Steward and Casey Trees in the Washington DC region. Monitoring birds, has been a popular activity for more than a century and there have been steady gains in understanding migratory species movements and bird reproductive success. In the U.S., the Christmas Bird Count, Great Backyard Bird Count, Neighborhood NestWatch, FeederWatch and eBird are a few of the projects contributing to monitoring avian communities. However, monitoring mammals requires a different strategy as most species are nocturnal and cryptic and difficult to observe with any regularity. eMammal and other projects working in urban spaces are using camera traps to capture the diversity, distribution and relative abundance of mammals. Camera traps utilize sensors to remotely detect animals as small as chipmunks and automatically photograph them. Tied to tree trunks, camera traps can remain vigilant for weeks and months at a time recording all the warm blooded animals and ground birds in motion within the field of view.

eMammal has successfully recruited hundreds of citizen scientists to deploy these devices at thousands of locations and assessed the effects of hunting, hiking, domestic dogs and cats and development on wildlife communities. As costs have dropped, these trail cameras have become so popular with the public it is estimated millions are sold each year in the U.S. So the tools, programs and method for monitoring birds and mammals are now within reach, yet this important and beloved fauna merely represents a fraction of biodiversity.

How can the remaining be documented? One method is to intensively scour a park with citizen scientists and a few experts over a short period of time to collect and document plants, fungi and invertebrates and vertebrates. Experts sort and identify the collected specimens. In celebration of the 100th anniversary of the National Park Service in 2016, hundreds of these bioblitzes took place all across the country. This is a remarkable achievement considering the first National Park Service bioblitz took place in Rock Creek Park in 2007. Rock Creek Park is a jewel for biodiversity in downtown Washington, D.C. and many of the scientists that participated were from the Smithsonian Institution. Yet not every city has a Smithsonian Institution and enough taxonomic specialists to cover the biodiversity of a single park. Although bioblitzes document species, it should be noted very little science has emerged from these activities as they tend not to be driven by research questions. Other methods are necessary. One approach that gets around having experts identify species is to barcode specimens.

DNA barcoding is a high tech, yet inexpensive way to identify species. For most animals such as arthropods, sequencing a single gene from the mitochondria of an organism is enough information to identify a species. Similarly, plants can be identified at the species level from the sequences of a few genes. To identify a species from a DNA barcode, anyone can query Genbank, an online DNA sequence database, to find a matching sequence that is already identified at the species level. Thus matching barcodes does not require a taxonomic expert to identify species. Also, the equipment required to extract and prepare DNA is minimal, and DNA sequencing centers have capacity to manage high throughput barcoding.

Gray Fox
Photo Credit: Robert Costello

At the grassroots level, DIY biolabs already exist that are capable, such as Genspace, which is set on barcoding the plants of Alaska. Even some high schools have barcoding programs. Consequently, citizen scientists could barcode Washington D.C. or any other city and maintain a database on biodiversity for perpetuity, resample at intervals and measure changes in biodiversity, species abundance and distributions.

Of course, there will be DNA barcodes that are not yet in Genbank. According to a recent gap analysis performed by the Global Genome Initiative at the Smithsonian's Natural History Museum, a listing of all known species includes 147,246 described genera, yet there are just 17,293 barcode flags on Genbank. Many new barcodes will not have matches, either because a species known to science has not been documented with DNA sequence data, or the species that was collected is new to science. Both of these cases will undoubtedly occur with any ambitious barcoding project. It will be exciting for citizen scientists to discover new species right under our noses, and it will be important for them to help build the database in Genbank and detect newly invasive species.

The programs, technology and knowledge for documenting biodiversity at fine scale all exist. But what does participating in such an ambitious enterprise mean for the citizen scientists making observations with binoculars, sorting through camera trap photos, scouring the bushes in search of insects and sampling a tree leaf for DNA barcoding? Could the act of volunteering for science increase feelings of biophilia in urban people? Studies on the human dimensions of citizen science by eMammal and other projects provide a glimpse into the benefits derived

by participants. Several studies have shown that spending time in natural environments has a number of physiological and psychological benefits for people. So what happens when being in the woods is combined with collecting data? One eMammal study we published in 2016 assessed participant experiences and effects on knowledge, skills, attitudes and social networks. The findings show participants take satisfaction from participating in eMammal projects because they felt they were making a contribution; being in the woods was associated with a greater purpose. They also looked forward to seeing the photos of wildlife species that were hard to see in the wild and frequently mentioned discovering a whole new perspective on wildlife.

Without any targeted help from the project team participants showed modest, yet statistically significant gains in their knowledge about wildlife. They quickly became skilled at deploying camera traps as well. Within their social networks, participants were 85% more likely to share information on local wildlife and mammal conservation after volunteering, creating a ripple effect from one to many. Interestingly, there was a correlation between the number of carnivores captured in their camera traps and the degree to which the citizen scientists shared information within their social networks. It is unknown whether it was the opportunity to see and record charismatic carnivores, or simply capturing rarely seen mammals that triggered the behavior.

Collaborations between citizen scientists and a diversity of researchers could transform the way we think about urban environments and our decisions around land use, habitat reconstruction and recolonization by wildlife. On the human dimension side, it is estimated 1.3-2.3 million citizen scientists participate in biodiversity studies annually in the U.S. and the number is growing. The human resources are available, technology makes unprecedented documentation of biodiversity possible, and more data can be collected with fewer scientists involved. And there are personal rewards for those that participate. Events like the first nesting pair of ravens in Washington D.C. this year, the first in a century, and red-tailed hawks successfully breeding on the National Mall are small, positive signs. The first half of the 21st century is the right time, if not an urgent time, to set the baseline for urban biodiversity, which future generations can build upon to increase human health and well-being through a healthy, biodiverse environment.

Coyote captured with a camera trap.
Photo Credit: Citizen scientist and eMammal project

Authors:

Robert Costello, Smithsonian Institution, Washington, DC, United States.

William J. McShea, Smithsonian Institution, Washington, DC, United States.

Tavis D. Forrester, Oregon Department of Fish and Wildlife, Oregon, United States.

Arielle Waldstein Parsons, North Carolina Museum of Natural Sciences, Raleigh, North Carolina, United States.

Stephanie Schuttler, North Carolina Museum of Natural Sciences, Raleigh, North Carolina, United States

Megan C. Baker-Whatton, The Nature Conservancy, Arlington, Virginia, United States.

Roland Kays, North Carolina Museum of Natural Sciences and North Carolina State University, Raleigh, North Carolina, United States.

BIODIVERSE CITY: A BRIEF LOOK AT VANCOUVER'S BIODIVERSITY STRATEGY

KEVIN FRASER

Biodiversity is not necessarily a staple of the urbanite's lexicon, perhaps unsurprisingly so. Cities are, after all, dominated by built form. They are our laboratories of skyward-reaching ambition; veritable fortresses of concrete, steel and glass, insulated from the less-tamed wilds beyond their suburban boundaries. Isn't biodiversity a matter for these decidedly non-urban places? A measure of biological affluence concerned with our forests and oceans? Perhaps so. But, increasingly, this perception is being challenged.

(ALL IMAGES ARE COURTESY OF THE CANADIAN AFFARIS BUREAU)

"Our Biodiversity Strategy lays the foundation for the sustained ecological health of our city."

The Vancouver Convention Centre's "Living Roof From Above"
Photo Credit: Belinda Chan

For those tempted to question urban biological contributions, you may be surprised. Central Park in New York City – among the best-known examples of an urban wildlife 'hotspot' – plays host to some 312 recorded species of birds. But it is the realm of the invisible where the figures become truly staggering. A 2014 study concluded that the number of distinct microbes in the soils of Central Park rivaled even the most diverse biomes on Earth. New research from the University of Washington in Seattle corroborates the biological allure of cities, suggesting that urban shorelines support more marine life than remote areas. Cities around the world have taken note. Christchurch, New Zealand, Boroondara, Australia, Cape Town, South Africa and even London, England, are among those that have adopted comprehensive biodiversity strategies in recent years.

Vancouver, British Columbia, and its lush, temperate surroundings, makes many cities green with envy. A biologically rich context is no assurance of an urban counterpart, however. Which begs the question: is Vancouver's sleek, skyscraper-laden downtown capable of supporting a similarly impressive range of species? If so, what would it take to quantify this natural endowment? And what would it mean to do so? The City has endeavored to begin to answer these questions, introducing a comprehensive Biodiversity Strategy, officially adopted by the Vancouver Board of Parks and Recreation and City Council in February of 2016.

Building on the City's recent green policy additions, including its Bird Strategy (2015) and Rewilding Action Plan (2014), the Biodiversity Strategy states the following as its five principal objectives:

1. Restore habitats and species.
2. Support biodiversity within parks, streets, and other City-owned lands.
3. Protect and enhance biodiversity during development.
4. Celebrate biodiversity through education and stewardship.
5. Monitor biodiversity to track change and measure success.

A publicly available document, the strategy identifies priority areas, hot spots, and threats to biodiversity – e.g. habitat loss, invasive species, and, certainly not least of all, climate change. Objectives are expanded upon with key targets and recommended actions. For example, one such target is to increase the amount of natural areas, including forests and wetlands, by 62 acres (25 hectares) by 2020. Importantly, the Biodiversity Strategy also proposes various metrics that can be used to track progress. The end result is a strategic framework that, if leveraged properly, should serve to guide policy and development decisions at City Hall. Recognizing its significance, Vancouver Park Board Chair Sarah Kirby-Yung proclaims that the plan "lays the foundation for the sustained ecological health of our city."

Vancouver has made no secrets about its green intentions. Most prominent is its Greenest City 2020 Action Plan, which has inspired aligned initiatives that seek to strengthen its resolve. Nick Page, a biologist at the Vancouver Park Board and one of the key figures behind the Biodiversity Strategy, saw an opportunity to tackle a pressing issue that had thus far gone

One of Vancouver's resident beavers in Lost Lagoon, Stanley Park.
Photo Credit: Samuel MacTavish

unaddressed. "There was recognition at the staff level that the City's Greenest City Action Plan was ambitious on many sustainability goals," says Page, "but that it did not address biodiversity specifically." Moreover, proponents of the strategy lamented the loss of Vancouver's historical landscape. Once rife with towering rainforests and crisscrossed by salmon-bearing streams, it was largely desecrated prior to the enactment of preventative environmental conservation measures. Here was an opportunity to take a major step toward reclaiming its natural heritage.

While it would be naive to attribute successes to a single document, Vancouver's burgeoning biological livelihood suggests that its adoption is timely. Take the Vancouver Convention Centre, for example. Completed in 2009, the now-iconic multi-pitched 'living roofs' of the West Building were envisioned as a native meadow that would provide food and habitat for birds and insects alike. Today, staff from the University of British Columbia's Beaty Biodiversity Museum are conducting an insect survey that is beginning to shed light on the number of species that frequent its grassy confines. While the report is not yet published and the data are preliminary, 145 species have been surveyed to date, including one new to British Columbia and another that hasn't been recorded in the province since 1932.

Other success stories abound. In 2012, chum salmon were discovered spawning in Still Creek – an urban waterway in East Vancouver – after an 80-year absence. They have now returned for a fifth year running, a development nothing short of remarkable given the levels of contamination once reached in the widely channelized and culverted stream.

2013 saw an industrious beaver single-handedly redecorate the human-made wetlands of Hinge Park in Vancouver's Olympic Village. Spotted intermittently in years since, the months preceding the official adoption of the Biodiversity Strategy saw its high-profile return; only this time, there were two. This past summer, three beaver kits were observed. While Page cautions that the modest habitat allotment is likely insufficient to accommodate more than a pair of adults, he suspects that the beavers will have more success than humans in solving this conundrum.

In spite of these occasionally precarious human-wildlife juxtapositions, Page hopes the City will continue to embrace notions of biodiversity, solidifying its place on the agenda. In his mind, success will hinge on two things: "institutional change measured as staff resources and specific policies that address key biodiversity goals; and an increase in habitat to meet the biodiversity target." With a first-of-its-kind document, another crucial aspect will be its adaptability. Page cites current emphasis on pollinators as an example of an arguably unanticipated urban planning focus. "Who would have thought ten years ago that [they] would get the emphasis they do now? We need to be flexible, follow the science, connect to public interest, and learn from successes and failures."

Vancouver, like most cities, stands to learn a great deal through biological introspection. While the scientific measurement of successes is still ongoing, it has done itself (and its residents) a favor by recognizing and championing the cause of urban biodiversity.

Kevin Fraser is a graduate urban and environmental planning student at the University of Virginia, School of Architecture

Community planting event at a 'pollinator pop-up park' in Vancouver.
Photo Credit: Nick Page

Downtown Vancouver's marine and terrestrial context.
Photo Credit: Belinda Chan

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Monarch on purple coneflower
Photo Credit: Angelique Hjarding

THE BUTTERFLY HIGHWAY: CONNECTING PEOPLE TO NATURE

Angelique Hjarding

Pollination ecosystem services provided by managed honeybees and native bumblebees and butterflies are critical to maintaining biological diversity as well as agriculture services necessary for our food systems. Much attention had been focused on conserving pollinator habitat in rural areas to support agriculture but there is a great need to conserve habitat in urban ecosystems as well. Urban sprawl consumes valuable forest and meadow habitat and replaces it with weed free lawns and impervious surfaces such as roads and rooftops.

The Butterfly Highway is a grassroots pollinator habitat program that was created to address declining pollinator habitat in urban residential areas. The program began as a part of a research project at the University of North Carolina Charlotte as a way to address biodiversity conservation and environmental justice issues in urban communities in Charlotte, North Carolina. The Butterfly Highway began in 2014, with several communities in Charlotte that wanted to beautify their environment by planting native butterfly gardens. Through the Butterfly Highway, these communities have

transformed community gardens, backyard gardens, public spaces and park fragments into new pollinator and wildlife habitats. The Butterfly Highway has also provided opportunities to participate in a community based citizen science project that monitors butterflies and bumblebees.

The Butterfly Highway addresses a community identified issue of beautification while at the same time addressing pollinator habitat loss in urban areas. Participatory Action Research methods were used to ensure equitable community participation in project planning, implementation and research. Community partnerships were created to gather input and feedback on plant selection, garden design and even the project name was chosen based on community feedback. Though the project focused on creating habitat for all pollinators, the name "Butterfly Highway" was much more appealing to community members. It was a unanimous decision that no one wanted a "Bee Highway" through their neighborhood though they understood the importance of bees in their gardens.

In a relatively short period of time, the Butterfly Highway has made impacts from a local to a regional scale. These impacts have been both environmental and social in nature and long term impacts of the Butterfly Highway will continue to be studied. Several important outcomes include:

- Increased habitat for pollinators. Since the program was launched, participants in the Butterfly Highway have restored more than 850 acres of habitat for pollinators at over 1100 sites statewide. In addition to sites in North Carolina, there are habitats registered on the Butterfly Highway from Mississippi to New York.

- Creating community. Through in depth interviews with participants, the Butterfly Highway has been shown to create new asset based connections on a neighborhood and community level. Participants say they feel a closer connection to other participants in the Butterfly Highway and that they have an increased connection to their neighborhood after participation. Several participants also said that they have a more favorable view of their neighborhood after being a part of the project.

Kids at a community event learning about pollinators
Photo Credit: Angelique Hjarding

- Increased community capacity to address environmental justice issues. Community Alliance for Wildlife (CAW) is a new community based wildlife conservation organization born in the neighborhoods that participated in the Butterfly Highway in Charlotte. CAW will be a chapter of the North Carolina Wildlife Federation and founding members were co-authors of a grant from the National Fish and Wildlife Foundation to pilot an innovative community conservation training program called Wildlife Stewards. One of the primary activities of the group will be to address environmental justice issues in the community that affect both people and wildlife.

- Increased project capacity. In 2015, the Butterfly Highway was adopted as an official program of the North Carolina Wildlife Federation. The increased capacity provided by the North Carolina Wildlife Federation has helped the Butterfly Highway grow into a statewide community-based environmental restoration initiative. From backyard 'Pollinator Pitstops' to large-scale roadside habitat restoration, the program is working to create a network of native flowering plants to support butterflies, bees, birds, and other pollen and nectar dependent wildlife. While there is still a focus on restoring habitat in urban spaces, the program has opened up opportunities for restoring habitat on farms, roadsides and in utility right of way corridors.

- Partnerships with local government agencies and municipalities. Mecklenburg County Park and Recreation joined the Butterfly Highway early on by adding 20 Butterfly Highway sites at nature centers, recreation centers and senior centers. They were partners on a grant from the National Fish and Wildlife Foundation that will provide training for recreation center staff on pollinator habitats and will provide additional nature based recreation programming for 250 youth at community recreation centers. The grant also provides funding for additional Butterfly Highway gardens on county owned land.

The mayor of the City of Concord, North Carolina, signed the National Wildlife Federation's Mayor's Monarch Pledge and hired a full time environmental educator to provide support for creating new pollinator habitats and programs in the city. Part of this pledge includes establishing new Butterfly Highway sites.

CAW members plant a Butterfly Highway garden at Brisbane Academy Preparatory School. Photo Credit: Angelique Hjarding

CAW nest box project
Photo Credit: Angelique Hjarding

- Corporate partnerships. Private landowners manage much of the land in urban areas and on the rural urban fringe. Through the North Carolina Wildlife Federation, the Butterfly Highway has partnered with several regional utility companies to create new pollinator habitat in utility right of ways. The program is also working with solar companies to explore ways to create pollinator habitat as a part of new solar array installations.

The Butterfly Highway project has proven to be a successful intervention to reconnect communities with nature. Part of the success can be attributed to the participatory nature of the project that places an emphasis on environmental conservation informed by local knowledge. The project has also worked to build community assets that benefit both humans and wildlife in a positive non-conflict oriented way.

Looking towards the future, the Butterfly Highway project will be a primary mechanism to affect change on both a regional and local level. Increasing awareness about pollinator conservation and expanding the Butterfly Highway in North Carolina is a top priority for the North Carolina Wildlife Federation. The Community Alliance for Wildlife and research partners from the University of North Carolina Charlotte will continue to work towards utilizing the Butterfly Highway as an intervention to address social and environmental justice issues in urban communities of color. Together, these and other organizations that have adopted the Butterfly Highway will provide a safe haven for native plants, bees and butterflies and create healthier cities for humans and wildlife.

Angelique Hjarding
University of North Carolina Charlotte
North Carolina Wildlife Federation
angel@ncwf.org

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Neighborhood towards South
Photo Credit: Ron Savage

PARQUE MIRADOR DEL SUR

Mirador del Sur City Park

Ron Savage

Parque Mirador del Sur (Mirador del Sur city park) is to Santo Domingo, the Dominican Republic, what Central Park is to New York City. Santo Domingo, with a population of more than 3.2 million people and a footprint of approximately 1,200 square kilometers, sits on the south-central coast of the island of Hispaniola. Santo Domingo was the first successful permanent settlement in the New World, established by Bartholomew Colon in the year 1496. Today, Santo Domingo is not only the nation's capital, but also the economic center of the entire Caribbean region. The city is a magnet for people from all over the country, contributing to the Dominican Republic's very high rate of urbanization, and drawing migrants from other countries such as Venezuela, Italy and the United States. Parque Mirador del Sur, meaning "southern viewpoint park" in Spanish, is probably the foremost urban park in the Caribbean, and one that "Santo Dominicans" are rightfully proud of.

The Parque Mirador del Sur (PMdS) was established in 1970 and designed by Dominican architect Christian Martinez. Measuring approximately 6 kilometers (km) in length by .5 km in width, PMdS is a longitudinal park, straddled by major boulevards and

surrounded by towering modern high-rise apartment buildings, lower income housing, and industrial zones. It sits approximately one kilometer inland from the ocean and from various locations in the park one can see over the older residential neighborhoods and industries to the ocean. One very interesting feature of the park is that a major through street, Avenida Mirador del Sur, which traverses the length of the park is closed to cars from 5 pm to 7 am weekdays and 24 hours a day during the weekends, permitting only bicycling, skating, and walking instead. The routine closing of the boulevard resolves what would have been a fatal flaw in the design of the park and allows it to be used safely throughout the day. The city and local police departments have also coordinated closely to ensure the security of park visitors by establishing a small police station in the park, stationing police officers at critical locations throughout the park and conducting roving patrols. The addition of around-the-clock security has been key to encouraging park use. Park infrastructure is minimal and consists of an administrative office, a small police station, a handful of parking areas, a small lake and restaurant complex, a small miniature golf-snack bar complex and a concert shell. The park houses a small municipal composting facility and tree nursery, which provides various ornamental plants for planting around the city and within the park itself. It also has a small educational center and interpretative facility that was funded by the Japanese Government, that is often visited by school groups. Nonetheless, there is considerable potential to upgrade this facility to make it more relevant as a "hub" for environmental education.

Ironically, while the park now exists within the confines of a large modern metropolitan area, one of the initial reasons for preserving the land in this part of the city had to do with the vestiges of Taino indian rock drawings and dwellings that could be found within the caves and limestone sinkholes in the area. Thus the PMdS continues to contain several important archaeological sites where the original residents of the island, the Tainos, lived until the arrival of Europeans. Today, however, the park is frequented by a mix of people from all social and ethnic groups, particularly those that live in the diverse neighborhoods surrounding the park. Interestingly, the fact that the PMdS lies towards the southwestern part of the city, away from the Colonial Zone, and lacks museums, means that it is rarely visited by tourists. Nonetheless, the PMdS has something to offer just about everyone and contributes to the wellbeing of city residents in many ways.

Cyclists on path in Parque Mirador del Sur
Photo Credit: Ron Savage

When it comes to recreation the park offers something for virtually everyone. The park includes a variety of outdoor recreational features including children's play areas, basketball courts, baseball fields, walking and cycling routes, and bicycle, skate and peddle boat rentals. Most of the trails are wheelchair and handicapped friendly, thus increasing the park's appeal to people using wheeled transport modes. When it comes to amenities there are a number of small restaurants around the periphery, including a couple that are nestled underground in limestone sinkholes, and a handful of roaming coconut and ice cream vendors. There are a variety of permanent exercise areas (with weatherproof equipment) and a number of enterprising individuals give yoga, Zumba, and a variety of exercise classes for young and old alike. This means that the park attracts a variety of people and that visitation continues to grow.

The Mirador del Sur city park is vital from ecological and environmental perspectives as well. Much of the park sits upon a karst geological formation that is highly porous thus absorbing much of the water that runs off the city streets to the north of the park. In addition, the park is home to a variety of flora and fauna, much of it native, but also many introduced species, that are only able to exist in the few fragments of green space that remain in Santo Domingo. In the park one can easily observe endemic species of palms and shrubs, as well as unique birds such as the Vervain and Emerald Hummingbirds, Hispaniolan Parakeet and palm chats, as well as a number of reptile and insect species that are characteristic of the coastal plains of Hispaniola. Also, small populations of bats continue to reside in several of the limestone sinkholes; these fan out over the city nightly, consuming untold millions of mosquitos, and contributing to reducing the risk of serious vector borne diseases such as dengue, chikungunya and zika for city residents.

While offering many amenities and services, PMdS is not without a number of significant challenges. Unfortunately, PMdS is a victim of its own popularity and is suffering from many of the ailments from which popular public parks are likely to suffer. For example, the lack of parking space at the park means that visitors often tend to park on green spaces or in other inappropriate locations. The park also has been suffering from inappropriate trash disposal, due to the lack of trash bins and recycling options; however, the recent installation of a large number of bins has helped remedy the problem. Nonetheless, many park visitors tend to not exert themselves while looking for trash bins and tend to throw trash in any convenient location. The park is also suffering from trampling in many areas, particularly in locations where visitors have tended to regularly set up baseball and soccer fields. In addition, the park staff lack training and incentives to manage the park's vegetation properly, often planting trees in inappropriate locations and not taking proper care of the plants that are there. Finally, the day-to-day management of the park has suffered from inconsistent resourcing and supervision.

It was with considerable wisdom and foresight that Parque Mirador del Sur was first established in 1970. Since then the city of Santo Domingo has mushroomed into a sprawling metropolitan mass,

View towards Restaurant
Photo Credit: Ron Savage

characterized by an overall lack of green space, limited recreation areas, extremely poor walking conditions for pedestrians and significant concerns about citizen security. Indeed, the lack of urban planning, a bias towards automobiles, and an over-reliance on concrete and asphalt instead of green infrastructure, means that Parque Mirador del Sur has become increasingly vital for maintaining the quality of life and wellbeing of city residents, particularly those who live within its area of influence. Indeed, the park is a vibrant, green oasis; "a relative sea of tranquillity", that helps to mitigate the "urban heat island effect" that a large built up mass like Santo Domingo is bound to produce. It is also offers a respite from the madness of the sprawl and traffic of Santo Domingo, thus attracting thousands of people of all shapes and sizes that frequent the park for relaxation, recreation and enjoyment. I'm sure that all would agree that it has become an important part of the daily cycle of life for many city residents and helps to make their lives so much better. Hopefully all stakeholders will continue to manage the park as the invaluable and irreplaceable resource that it is.

Ron Savage is the Climate Change Office Chief for the U.S. Agency for International Development in Santo Domingo, Dominican Republic

Environmental Education and Stewardship
Photo Credit: Urban Releaf

KEMBA SHAKUR: ON A 'RELEAFING' MISSION IN OAKLAND

Tim Beatley

Kemba Shakur founded the nonprofit Urban Releaf in 1998, with the goal of transforming many of the least affluent parts of the City of Oakland from largely gray and barren places to living environments of trees and greenspaces. Shakur who worked for a time as a prison guard at Soledad state prison, famously observed when she moved to Oakland that there were more trees on the grounds of the prison than on her street. In fact there was not a single tree on her Oakland street. "It was street after street of no greenery," she told me in a recent phone interview. She has devoted most of adult life to changing these conditions.

The work of Urban Releaf is not top-down but community-based, and trees are planted by individuals, organizations and companies. Much of the tree planting, and more recently sidewalk gardening and green rooftop installation, happens through events. Shakur tells about a recent event she was especially excited about, in honor of Muhammad Ali, and involving a well-known Bay area rapper, Mistah Fab. Partners for this event include the East Oakland and Lightning's Boxing Clubs, with support from Eureka Bank, Calfire, and PG&E, among others. These tree planting events sound much like community parties, with music and fun and often many activities to engage kids. And the video of

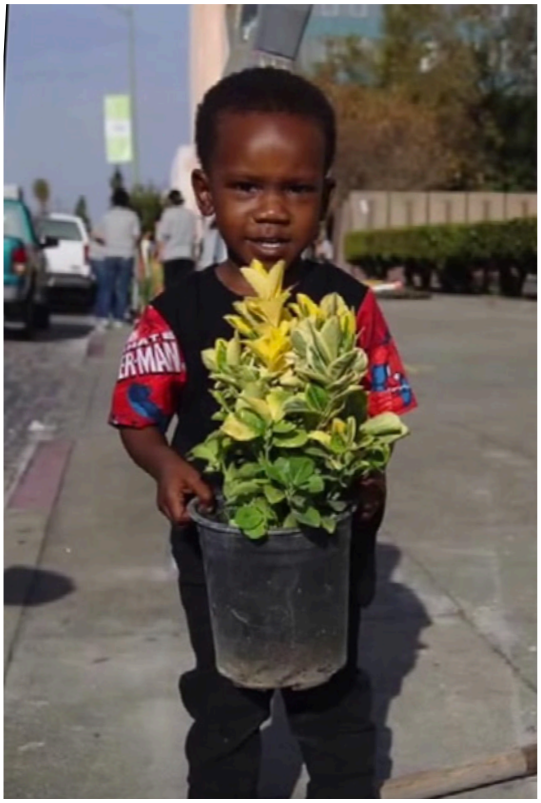
the event posted later on YouTube certainly shows the extent of the fun and also the personal and organizational efforts that go into these events.

In Shakur's daily work, she draws from her love of nature and gardening. Growing up in Hunters Point, a poor neighborhood in San Francisco, she remembers fondly the trips to nature she would take with her mother: "She took us to parks, both her and my dad, every chance they got. We went to Big Basin and Big Sur, Yosemite, just so many of the natural parks. Stinson Beach, up and down the coast. Big Basin was my favorite." She has clearly absorbed this early love of nature, and also love for growing food, and applies them every day in her work in Oakland.

There is a strong social justice dimension to Shakur's work. Oakland is itself a microcosm of the economic and social disparities in many cities, and these disparities manifest clearly in the extent of "greenness." The City's poor and minority flatlands of East Oakland stand in contrast to the leafy affluent Oakland Hills.

Over its nearly two-decade history, Urban Releaf has accomplished much, including the planting and maintenance of some 20,000 trees. The organization has trained many in the community in how to maintain and care for these trees, and helped shape the career paths of many disadvantaged youth in the process. She points to her own son, who has become an arborist, as evidence of the power of imagining a professional path inspired by this work.

She also notes the continuing struggles for the better. She tells me, in regretful tones, about the two men she had to lay off because of limited funding. One was later convicted of murder, the other shot and killed while breaking up a fight. The story was testament to the tough urban setting that kids and young people in neighborhoods of color face in cities like Oakland. This sense of the potential of trees and tree-planting to profoundly change the lives of these young people for the better seems a deep motivation for what she does with Urban Releaf. She mentions her friend Mohammed Nuru, who ran the successful non-profit SLUG (San Francisco League of Urban Gardeners), and how time spent with him convinced her of the potential of this model in impacting lives.



Tribute to Muhammad Ali Planting
Photo Credit: Urban Releaf

Urban Forest Education & Stewardship Training Program (UFEST)
Photo Credit: Urban Releaf

She says, "I noticed the young people in Hunters Point had jobs. They had pride... As we were going [along], a young man flagged him [Nuru] down and invited him to his wedding. So I'm, like, wow. This doesn't happen unless people are secure in a job." Creating jobs is a key goal and a key lesson for Shakur.

"It's the tough part of employment in communities of color and cities like Oakland. It's really one of the main reasons that I stay here. I love trees and canopy, and I think we all love it here, but the other side of it is having the capacity to really hire and train young people because it's really life and death in terms of what their future could hold if you get them through those critical years. It can keep them out of a lot of trouble and idle time."

Maintaining a healthy and sustainable level of funding remains a challenge for Shakur. One bright spot is the new funding flowing from California's innovative cap and trade program. Companies can purchase pollution credits which go into a state fund to support greenhouse gas-reduction projects. Urban tree-planting is already benefitting, and as a result of Senate Bill 535, at least 25% of these climate funds must be spent on projects that benefit disadvantaged neighborhoods.

Urban Releaf has a small staff of around ten, and much of its work happens through a variety of partnerships, with organizations from the Girl Scouts to the Mennonite church. Many involve working with troubled kids--for instance through organizations like Berkeley Youth Alternatives, and through the Weekend Training Academy, which serves as an alternative to detention for juvenile youth offenders. Recently Shakur and her team have been helping to plant trees as part of an initiative to "re-oak" the city. Oakland is one of the largest cities to be named after a tree, and this species holds a special place

in the history of the city, though through development it has gradually lost most of these oak trees.

Shakur spoke to me about the pride of what she and Oakland Releaf have accomplished. "I think at the end of the day I'm most proud of the fact that I created something that brought people together, that brought all kinds of people together." She also speaks of the personal solace she gets from trees. She refers to them as her "sanctuary," and speaks of the pleasure she gets from just watering the trees. There is a clear pride in bringing beauty and nature to struggling urban neighborhoods.

She describes the pride she feels when she sees trees planted by her crew for the first time. "Then, you see it and it's, like, oh I'm so proud of that. That's our tree! It's so beautiful. It's the perfect job. It's the best job in the world."

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Community Involvement
Photo Credit: Urban Releaf

OAKS BOTTOM

PORTLAND, OREGON

MIKE HOUCK

The 160-acre Oaks Bottom Wildlife Refuge, was the first formally designated urban wildlife refuge in Portland. In the middle distance, sitting in the middle of the Willamette River, is the four island Ross Island archipelago (Ross, Hardtack, East and Toe) 45 acres of which was recently donated to Portland Parks and Recreation by Ross Island Sand and Gravel. Holgate Channel, the narrow channel between Oaks Bottom and the islands is now a wake-free zone where families can canoe, kayak and bird watch without the noise and wakes associated with high speed motorized activities. In the distance is the downtown Portland skyline. Oaks Bottom, Ross Island, and the riparian habitat along the Willamette River comprise 400 acres of significant fish and wildlife habitat and access to nature in the heart of Oregon's largest city.

Mike Houck is the Director of the Urban Greenspaces Institute

Oaks Bottom Wildlife Refuge
Photo Credit: Mike Houck

Exploring Biophilic Cities as Flourishing Cities

An Interview with Corey Keyes and Tim Beatley

Edited by Carla Jones

The Biophilic Cities Project had the pleasure of interviewing Dr. Corey Keyes, Winship Distinguished Research Professor of Sociology at Emory University. Dr. Keyes coined the term "flourishing" to describe the presence of positive mental health characteristics rather than solely the absence of mental illness. Keyes has been conducting research on flourishing since the late 1990s and has found that flourishing individuals have the lowest risk of cardiovascular disease, lowest number of chronic physical diseases, and lower health care utilization, among other health benefits (Keyes, 2007). We interviewed Dr. Keyes to explore the relationship between flourishing, nature, and urban life.

Tim Beatley:
Here at the Biophilic Cities Project, we are trying to better understand the benefits of nature-ful cities. The concept of "flourishing" seems like an important one for us to better understand. What is flourishing? How did the idea evolve? What makes flourishing different as a way of framing mental health?

Corey Keyes:
I would define flourishing as a state in which you feel good about a life in which you are functioning well. It's not just feeling good about your life: it's about feeling good about a life where you feel you're functioning well with purpose, contribution, belonging, and acceptance. You need curiosity, concern, and connection to achieve these things.

In 1998 and 1999, I was finishing up some work on well-being, specifically looking at a concept called social well-being, which is near and dear to my heart. As I came to see these different components of subjective well-being, it occurred to me that we had a long list of signs and symptoms of positive mental health.

Additionally, there is this long-standing

interest in psychology and sociology in terms of social indicators. Scholars were interested in emotional well-being: happiness, enjoyment, and pleasure. There's always been an interest in that form of happiness and well-being. In fact, in my opinion, perhaps way too much.

During my Ph.D., I worked with Carol Ritz and introduced this notion of social well-being that mirrored psychological well-being. Only the shift was looking at getting away from emotions and emotional well-being and starting to focus on how people are functioning in the world. Psychological well-being to me represented the pronouns I and me while what was missing was the pronouns we and us.

Once we mapped these relationships out it occurred to me – I had created a diagnosis for positive mental health that sort of mirrored the psychiatric diagnosis. Only I was interested in moving beyond the psychiatric treatment model as the modus operandi for dealing with population mental health. I brought these ideas together by writing measurement rules and introduced the concept in 1999.

I chose the term flourishing because the word mental health is a rather confusing term to many people. It's also used sometimes interchangeably in two ways: mental illness or absence of mental illness. I wanted to be very clear to the world that I was talking not about the absence of mental illness, but the presence of good mental health. Since 1999, we've done a lot of research at the genetic level and at the societal level. We now know that we can prevent mental illness by promoting the concept of flourishing in the population and there are more and more studies being released supporting this.

Per the World Health Organization, depression is already the second-leading cause of burden to societies. By 2030, if we don't change what we're doing, it will be the leading problem. My efforts have been focused on bringing this concept of

Dr. Corey Keyes is the Winship Distinguished Research Professor of Sociology at Emory University who researches positive mental health, known as flourishing

Factors and 13 Dimensions Reflecting Mental Health as Flourishing

Dimension	Definition
	Positive emotions (i.e., emotional well-being)
Positive affect	Regularly cheerful, interested in life, in good spirits, happy, calm and peaceful, full of life.
Avowed quality of life	Mostly or highly satisfied with life overall or in domains of life.
	Positive psychological functioning (i.e., psychological well-being)
Self-acceptance	Holds positive attitudes toward self, acknowledges, likes most parts of self, personality.
Personal growth	Seeks challenge, has insight into own potential, feels a sense of continued development.
Purpose in life	Finds own life has a direction and meaning.
Environmental mastery	Exercises ability to select, manage, and mold personal environs to suit needs.
Autonomy	Is guided by own, socially accepted, internal standards and values.
Positive relations with others	Has, or can form, warm, trusting personal relationships
	Positive social functioning (i.e., social well-being)
Social acceptance	Holds positive attitudes toward, acknowledges, and is accepting of human differences.
Social actualization	Believes people, groups, and society have potential and can evolve or grow positively.
Social contribution	Sees own daily activities as useful to and valued by society and others.
Social coherence	Interested in society and social life and finds them meaningful and somewhat intelligible.
Social integration	A sense of belonging to, and comfort and support from, a community.

Note. The 13 dimensions are from Keyes (2005b, Table 1, p. 541).

flourishing into mainstream public health and health care systems. This is based on the premise that if we were to engage in promoting and protecting the things that promote flourishing, we could prevent the exacerbation of mental illness. But it goes beyond that, I've shown in my studies depression is barely the tip of the iceberg. There are lots of people who aren't mentally ill or depressed but are not flourishing. This population presents a bigger problem to society than depression alone. I'm now focused on interventions that can be used at various levels and sectors.

Tim Beatley:
You've discussed the limitations of the word "happiness," yet you use the term in the courses you teach and in the way you talk about flourishing. It sounds like you're not against the term itself, but you're defining it in a deeper way. Is that a correct interpretation?

Corey Keyes:
No, I'm not against the term. In fact, I want the word to be reclaimed in the way that the Greeks thought about it because their notion was that we should create a society of people who essentially are philosophers. I think that was the point of philosophy and that was the point of happiness. It was speaking much more deeply about life and not just about an individual and his or her feelings, but your community and equality. I think that's what happiness is about. It wasn't just a feeling, but an invitation to think seriously about life.

Tim Beatley:
What do you think about the potential of designing and planning communities with an emphasis on the natural world to help people flourish by the measures you've laid out?

Corey Keyes:
I worked with the Healthy Parks, Healthy People initiative by the National Park Service in its infancy and the Green Vets project. I'm extremely interested and, personally, find my greatest peace and flourishing when I'm in nature. I think that is one of the key elements of our life and somehow most urban parks and zoos aren't doing it in the modern city. I had to buy a house in the mountains to escape and be in nature. I live two blocks from the largest park in Atlanta, but that isn't the same as in my cabin. I'm convinced it's not just the things that are in nature, but it's something about how those things are arranged that get us interested in and connecting with other forms of life.

Social well-being is all about connection. Flourishing is, first and foremost, about when we feel at home and connected to the world around us. This is when we feel good and feeling connected to nature is one of the greatest ways of flourishing.

Tim Beatley:
What sorts of reactions do you get when you use the word flourishing?

Corey Keyes:
It's resonating a lot with people in part because the other work that I've done has shown that it's not enough just to feel happy. It's not enough just to have high levels of emotional well-being. It needs to be a derivative of connection, purpose, growth, and acceptance.

There is this kind of happiness exhaustion out there. There is this sense that it's not possible to feel good all the time, to feel constant happiness or pleasure. That's not even the point of life. It's remaining interested in life, having purpose, contribution and connection. It resonates with people once they understand that's what goes into flourishing.

The pushback I receive is that critics tend to think that flourishing signifies that we're expecting too much of people. When you look at my diagnosis criteria of needing a minimum of 7 out of the 14 symptoms, no one is going to prescribe which ones you must have. In fact, research shows that you don't need to have a specific combination.

My response is that flourishing doesn't require much more than what most people say they want out of life.

Tim Beatley:
Are there particular things going on in the world right now that you think are undermining flourishing? Are there particular threats or things that you have identified in your work that we ought to be particularly worried about in the modern world?

Corey Keyes:
One threat is that we've totally distorted and shifted the meaning of time. Time has become a currency that stresses us out. One thing I like about nature is how it resets your sense of time. Research shows that when you get people to think of time as money than they are less likely to volunteer or to help each other.
Another threat is social inequality. We're not going to get anywhere with flourishing if we don't deal with that. People who are impoverished can benefit from nature, but that alone will not do it. We need more fairness and equality.

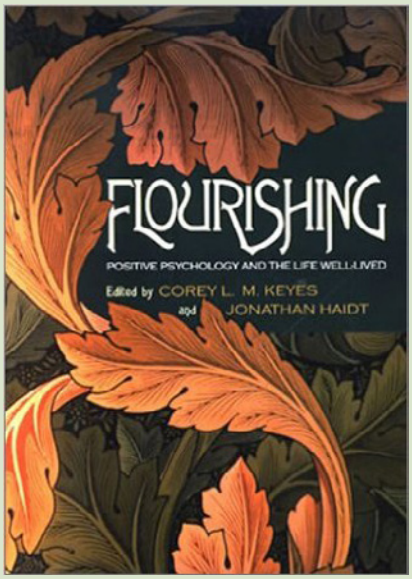
Complete Model of Mental Health conceptualized by Corey Keyes.

Tim Beatley:
I'm impressed that you've identified these different components that create flourishing. It's about relationships between people and it's about trust. Of course, nature isn't the only source for those things, but we argue that it's uniquely suited to bring people together. For example, parks have that ability and then there is evidence about being more generous in the presence of nature, perhaps even being better human beings because of it. Where would nature connect to all the constituent parts of flourishing in your model? Would it fit in a particular place?

Corey Keyes:
Well, that's an interesting question and I think my immediate reaction is that it fits in various ways in all those components. I think nature creates a certain humility that is lacking in the modern world. It triggers the idea that this is a pretty vast and amazing place and that I might be in control of some of the things around me, but the more I learn about the world around me the more I'm at peace.

About Dr. Corey Keyes:

Dr. Corey Keyes is a Winship Distinguished Research Professor of Sociology at Emory University in Atlanta, Georgia. His areas of expertise include social psychology and mental health. The research centers he is affiliated with illuminate the "two continua" model of health and illness, showing how the absence of mental illness does not translate into the presence of mental health, and revealing that the causes of true health are often distinct processes from those now understood as the risks for mental illness. This work is being applied to better understanding resilience, prevention of mental illness, and informs the growing healthcare approach called "Predictive Health," which monitors the presence of positive physical and mental health and to develop and apply responses to correct early losses of it to maintain health and limit disease and illness. He has and continues to work on healthcare transformation and public mental health with governmental agencies in Canada, Northern Ireland, Australia, and the U.S. Centers for Disease Control and Prevent, the Substance Abuse and Mental Health Services Administration (SAMHSA), and the American Association of Colleges and Universities.



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Biophilic Dimensions of Urban Biodiversity

Julia Triman

Biodiversity, while a lauded and important goal in a biophilic city, is not always neat or pretty. Researchers have been working over the past several years to try to understand human perception of and preference for various types and levels of biodiversity in cities, and connections between these perceptions and preferences to other indicators, such as human well-being and urban ecological health and connectivity.

Urban ecologists and environmental planners underscore the importance of biodiversity for city life, both non-human and human and are advancing new and creative ways to plan for and manage it (see, for example, the City Biodiversity Index). Empirical research, however, reveals mixed results in terms of human understanding of and preference for biodiverse urban landscapes. Dallimer and colleagues (2012) found through a series of surveys in Sheffield, United Kingdom that psychological well-being increased when people perceived that greater biodiversity was present, but that this did not correspond with actual levels of biodiversity. Conversely, Qiu and colleagues (2013) discovered using visitor-employed photography in Helsingborg, Sweden that participants in their study were able to discern greater levels of biodiversity, but stated preferences did not relate positively to areas of higher biodiversity.

Most recently, Gunnarsson and colleagues (2017) published a study exploring aesthetic perception of urban green space at six field sites in Gothenburg, Sweden. The researchers deployed a survey examining whether participants found the sites "Naturalistic," "Rich in species," "Lush," or "Varied." The researchers concluded, through a composite survey of aesthetic perception, sound perception, and importance assigned to trees and plants for perception of bird species that overall, perceived positive values of urban greenery (across the three scales) were highest where measured biodiversity was highest.

How much does it matter whether people prefer biodiverse urban landscapes? Nonhuman plants and animals might be just as entitled to urban space as humans, but humans are the ones who make the planning and policy decisions. Perhaps rather than seeking palatability or preference, planning goals might center around education and interpretation of biodiverse urban landscapes in ways that might intrigue or inspire critical thinking. In a recent review of studies related to perception of biodiversity in cities, Botzat and colleagues (2016) identify four gaps in present theoretical and methodological approaches that, if filled, might continue to deepen and richen the applicability and interest of research results. These include expanding research beyond temperate climates, including informal greenspace along with designated forests and parks, including work at the species community or gene scales, and explicitly incorporating perceptions and views of people from diverse backgrounds and age groups.

While research to date does not prove clear and unequivocal connections between biodiversity and positive human perception and outcomes for human well-being, there are clearly promising directions and some evidence suggesting that people can derive value from increased biodiversity in cities. As urban planning efforts continue to adapt to changing urban conditions, both towards population increase and density and towards re-structuring and re-defining relationships between "natures" and "cities," biodiversity will be a consideration at both the local and site scale and the scales of city and region. The studies mentioned here are only a fraction of the current research on human perception of and benefits from urban biodiversity; it is an increasingly important issue in planning for nature in cities.

Julia Triman
Julia Triman is a PhD student in the Constructed Environment at the University of Virginia School of Architecture.

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DC Park Rx: Connecting Patients to Parks and Creating the Next Generation of Environmental Activists

Robert Zarr, M.D., MPH

As a public health-minded primary care pediatrician, I now regularly prescribe parks to my patients and their families. I have come to the conclusion that we must have a varied approach to both preventing and treating chronic disease, as well as promoting wellness.

Looking at the US population from a birds-eye view, we see millions of Americans suffering from serious mental illness (depression, anxiety, ADHD, etc.), diabetes, obesity, high blood pressure, and unhappiness. We know that, on average, Americans spend only 7% of their time outdoors. While indoors, we are more likely to be sedentary, sitting in front of a handheld device, often eating. In contrast, spending time outdoors in natural settings, we are less likely to experience anxiety, rumination, or negative affect. Just being in green space is restorative and boosts attention. Shinrin-yoku or "forest bathing", as it is called in Japan, reduces cortisol level and blood pressure. Living in a neighborhood with one or more opportunities for physical activity is associated with lower risk of Type 2 diabetes. When adjusting for sociodemographic factors, living near green space reduces our overall mortality.

These are enough reasons to place a high level of significance and importance on helping patients spend more time in parks.

This is why, 6 years ago, I set out to establish DC Park Rx, a community health initiative whose mission is to prescribe parks to prevent and treat chronic disease and to promote wellness.

DCParkRx.org is now a regional initiative that provides healthcare professionals in their respective organizations with the tools they need to fully integrate the park prescription not only within the electronic health record, but more importantly within our daily routine of providing health care to our patients.

Just as doctors and other healthcare professionals prescribe medicines, write referrals to specialists, and order diagnostic tests, we can just as easily prescribe parks, when provided the right tool. We have been prescribing parks since July 1, 2013. Our catchment area now includes Washington DC, as well as parts of Maryland, with a current total patient population reach of nearly 200,000. We now have nearly 300 healthcare professionals with ready access to prescribe parks within their electronic health record.

DCParkRx.org is quickly expanding throughout the Northeast region, as well as nationally, currently expanding into Connecticut, Virginia, and West Virginia.

DCParkRx.org is popular among healthcare professionals because it is relevant to our work, and easy to use. DCParkRx.org is popular among park agencies because we share common goals:

1. Increasing park utilization, and
2. Decreasing the burden of chronic disease in our communities.

By partnering closely with many local park agencies and the National Park Service, DCParkRx.org has developed a scalable method to import essential park attributes (longitude/latitude, accessibility, activities allowed, seating, water features, etc.) into a searchable park database, which is easy for healthcare professionals to use. By partnering with healthcare provider organizations, including community health centers, hospital systems, and group clinical practices, DCParkRx.org is demonstrating the value of Park Rx in achieving our common goals of providing high-quality healthcare while promoting a culture of prevention and wellness. DCParkRx.org is a win-win for park agencies and healthcare provider organizations alike.

But perhaps the biggest winner is the environment. Whether we realize it or not, our lives are dependent on the health of the environment. Without a healthy environment, we perish. We all need clean air and water, as well as natural undisturbed areas to restore our attention and to bring happiness and meaning to our lives. By connecting millions more people with parks and other outdoor areas, we are rekindling the connection between humans and Nature. By spending more time in Nature we develop a sense of belonging to the flora and fauna, and we begin to place value to our experience and place. Our renewed sense of connection to Nature inspires and motivates us to advocate for a most essential human right, access to green space.

Rock Creek Park Trail
Photo Credit: TrailVoice, Flickr

View of Downtown San Francisco from Twin Peaks
Photo Credit: Tim Beatley

SINGAPORE DELEGATION VISITS SAN FRANCISCO

Ella Wise

There are approximately 18,000 people per square mile in San Francisco and 20,000 people per square mile in Singapore. Both are internationally-recognized examples of compact cities that are "green" with climate-friendly design and resource-efficient policies, but are they "green" with nature? How does San Francisco share its 7- by 7-mile square grid with the natural world? How has Singapore shifted from a "Garden City" to a "City in a Garden"?

During the week of May 9, 2016, Khee Poh Lam, the Dean of the School of Design and Environment at the National University of Singapore, and members of the Carnegie Mellon University–Building and Construction Authority Executive Program—a partnership aimed at supporting sustainability leaders in Singapore—visited the U.S. from Singapore for a one-week tour to study biophilic design and big data analytics.

Singapore is already an international leader in urban sustainability and was one of the first members of the Biophilic Cities Network. The island city-state's Skyrise Greenery Incentive Scheme, in which the National Parks Board will fund 50 percent of installation costs of green roofs, rooftop gardens, and green walls, exemplifies the possibilities of biophilic policies.

The Executive Program's week began at Carnegie Mellon University and ended with a two-day field trip to the San Francisco Bay area. The week was mostly focused on biophilic design at the building scale, but for the last day's events, Khee Poh Lam invited Scott Edmondson of the San Francisco Planning Department—another early member of the Biophilic Cities Network—to add the "city" scale to the week's events. Edmondson along with Kirstin Weeks of Arup, led the Executive Program on a tour of some of the greenery impressively integrated into San Francisco's dense Financial District and then hosted a series of presentations on current biophilic strategies and research in the city.

The Financial District tour began at the Nature Conservancy's San Francisco headquarters, featuring a remarkable example of occupant-centric biophilic design that has resulted in approximately $270,000 worth of savings per year from increased employee productivity! The tour continued to the garage roof-top garden of 100 First Street, which is chock-full of impressive water features. Then, the group visited the lobby of Foundry Square III featuring two adjoining living walls and two floor-to-ceiling glass walls, allowing passersby to gaze through to the 12,500 plants inhabiting the space.

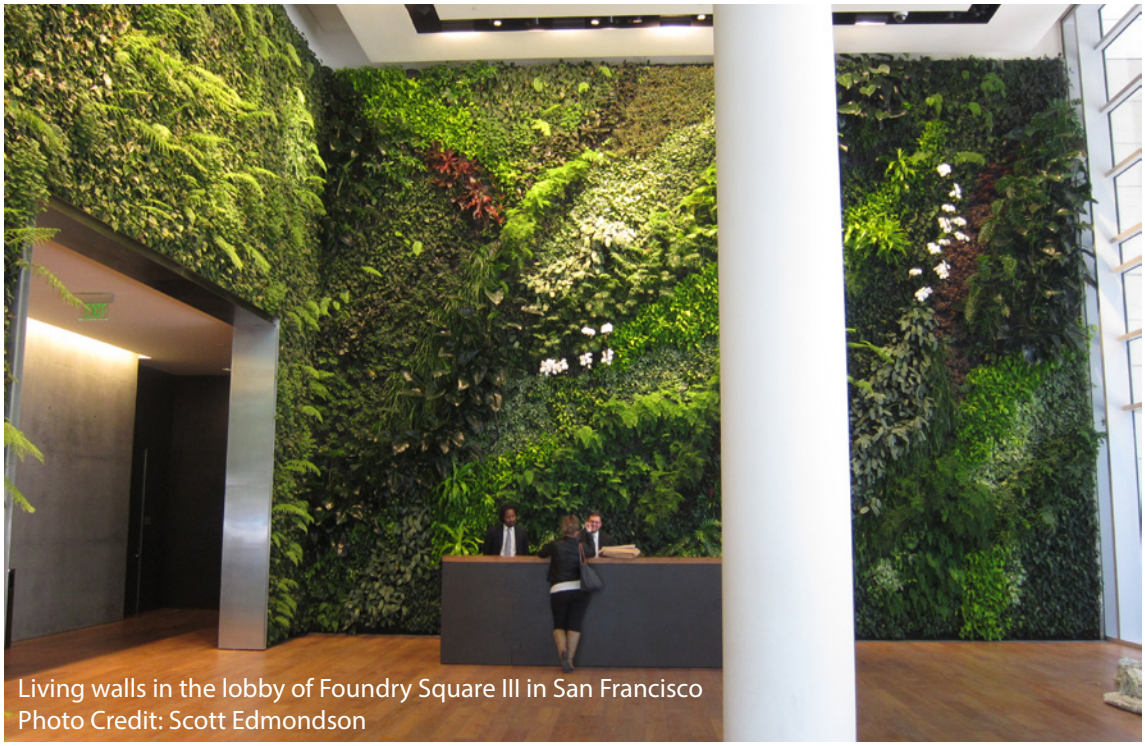
After the tour, Timothy Beatley of the University of Virginia called in remotely and; kicked off the series of presentations with an introduction on biophilia and the Biophilic Cities Network. David Winslow of the Planning Department then presented on the City's Living Alleys Program, which empowers community members to "humanize" alley street space in their neighborhoods with community-led design, financing, and building of multi-purpose public spaces. Peter Brastow, the City's Biodiversity Coordinator, discussed the thriving wildness all around us—there are 56 species of native bees in one of the parks within the city!

Rosey Jencks discussed the San Francisco Public Utilities Commission's low-impact design program, which utilizes biophilic rain harvesting and constructed wetlands to reduce stormwater load—an important cause as the City's stormwater system is combined with the City's sewer system and can overflow into the streets in flood events. Lastly, Alexej Goehring from Arup presented findings from their study of the potential benefits of vertical green walls in different cities around the globe to reduce urban heat island effect.

All in all, this one-day visit was just a snapshot of the rich array of strategies and new ideas that Singapore and San Francisco, both members of the Biophilic Cities Network, have to share with each other and cities around the world on integrating nature and cities.

Courtyard at Salesforce Building, Photo Credit: Scott Edmondson

Green rooftop of the garage at 100 First Street
Photo Credit: Scott Edmondson



Living walls in the lobby of Foundry Square III in San Francisco
Photo Credit: Scott Edmondson

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View of Wellington from City Peak
Photo Credit: Tim Beatley

WELLINGTON UPDATE

Amber Bill and Tim Park

Wellington is a City of hills, harbor and bush. The City has an impressive network of reserves within close proximity to both the Central Business District (CBD) and surrounding suburbs, has been carrying out intensive biodiversity restoration and protection work for more than a decade, and has a massive and ever increasing number of citizen volunteers who plant, control pests, build tracks and trails, and advocate for the City's nature. As such, the City is proud to be recognized as a Biophilic City.

If we consider biophilic urbanism as a journey, not an end point, then it is important as a City that we continue to explore new initiatives to grow our natural capital and citizen engagement. Our recent work in this space includes policy, advocacy and research.

With regard to policy, in 2015 we prepared a new Biodiversity Strategy: Our Natural Capital. This includes prioritized actions around protection, restoration, connecting and mainstreaming biodiversity, and research to inform our work over the next 10 years. We have also developed new measures drawn from the internationally recognized City Biodiversity Index.

Work has started on the Code of Practice which will enable implementation of our Water Sensitive Urban Design Guide, through our District Plan, which governs rules for the development of the City.

Community involvement in the City's biodiversity continues to expand for us, and our vision of a 'pest free' Wellington continues to become more realistic. We have recently employed a new biosecurity liaison officer whose role is to support and train community groups participating in pest animal control. We have also focused on bringing more biodiversity engagement initiatives right into the centre of the CBD - this kicked off last year with a popup forest during Parks Week (we also gave away free locally eco-sourced plants) and has been followed by other initiatives such as a 'box of birds' container in town and community garden planters.

Wellington Harbour Inlet
Photo Credit: Tim Beatley

We ran #Peakbragging (a play on the Scottish 'Peak Bagging') to encourage people into our Open Spaces, which was really popular, and our GIS team have been busy building storymaps to provide better online story telling about Wellington's parks.

Living Walls are now becoming a more regular feature of our Urban Design projects and we continue to have successes with nationally threatened bird species, initially released into Zealandia, our fenced ecosanctuary, spilling out and breeding in reserves throughout the City. We brought one of these into people's homes this nesting season with the "Kaka cam." And a new research group to better understand Kaka behaviour in the City has been established, facilitated by our Urban Ecology team. We have also again hosted one of the largest national citizen science projects - the Great Kereru Count in partnership with WWF-NZ.

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Diver with the Seastar
Photo Credit: Mark Coote

He Lifted the Binoculars to the Window

A Poem Commissioned In honor of Stephen Kellert

By Jamie K. Reaser

Dr. Stephen R. Kellert was the Tweedy Ordway Professor Emeritus of Social Ecology and Senior Research Scholar at the Yale University School of Forestry and Environmental Studies.

The warbler never strays from who he is, or where
he is intended to be. Here, and then gone.
There is a mystery to that for everyone but him.

~

What can we do but delight in this life, this collection
of moments that are always trying to get us to come
home to our true nature–unique and collective. All
around us there are clues to our humanity. We must
remember how to read them.

And, then, have the courage.

Of this, I am certain: the path forward is marked by things
that we cannot count. Maybe by things that
we cannot name and will never touch.

This is lovely.

Notice though that we are touched. Touched by a
longing so dangerous that we dare speak of it. Try.
We have become stuck in a conversation
between beauty and woundedness, a woundedness
we have inherited and earned.

How perfect.

This is about a love of place, and place for love. We are
given children to watch at play at the woodland edge,
and along the shore, and amongst the pigeons in a city park.
I know that it is there, and I believe that they can find it.

~

The boy never strayed from who he was, or where
he was intended to be. Here, and then gone. There
is a mystery to that for everyone but him.


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