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A GREEN ROOFS FOR HEALTHY CITIES PUBLICATION

VOLUME 20 / ISSUE 3 / FALL 2018

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INSIDE

On the cover: As Our Cities Become So Unbearably Hot – Even Frogs Will Seek Escape – But Where Will The People Go? Illustration by Lillian Mason. mason.lillian@gmail.com

LIVING ARCHITECTURE MONITOR

VOLUME 20 / ISSUE 3 / FALL 2018

LIVING ARCHITECTURE MONITOR IS PUBLISHED FOUR TIMES PER YEAR IN PRINT AND DIGITAL BY GREEN ROOFS FOR HEALTHY CITIES (GREENROOFS.ORG)

MISSION

Green Roofs for Healthy Cities' mission is to develop and protect the market by increasing the awareness of the economic, social and environmental benefits of greenroofs, green walls, and other forms of living architecture through education, advocacy, professional development and celebrations of excellence.

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HOT FROGS, CITY-REGIONS AND ENVIRONMENTAL JUSTICE

You've all probably heard the story that if you drop a frog in a pot of boiling water, it will frantically try to clamber out. Yet if you place it gently in a pot of tepid water and turn the heat on low, it will float there quite placidly and the frog will sink into a tranquil stupor, exactly like one of us in a hot bath, and before long it will unresistingly allow itself to be boiled to death.

Are the rising temperatures from the Urban Heat Island (UHI) and heat waves in our city-regions the human version of the frog in the pot story? Are we lulled by the rising temperatures? Will we unwittingly allow our cities to become increasingly uninhabitable in the summer?

Eighty per cent of us now live in city-regions that generate their own weather and climate. In the summer, the gradual increase in the UHI combined with more frequent extreme heat waves is making city regions less livable and even dangerous. From 1971 to 2000, NYC has experienced an average of 18 days above 90º F each year, but by 2039 it is expected to rise to 33 days, and by 2069 it will be 57 days and by 2099 87 days. On hot and sunny days, the surface temperatures of roofs and pavements can be 50 to 90ºF hotter than the surrounding air. These surfaces make the air in cities as much as 22ºF warmer than the surrounding countryside. (See page 31)

The rising temperatures are further exacerbated as buildings exhaust warmer air to the outside from air conditioning. Hotter city-regions are deadly places. As climate change-driven extreme heat waves continue to intensify, citizens in southern cities and in poorer areas will suffer the most from negative health impacts and even heat-related death. Each year in the U.S., approximately 600 people die from extreme heat according to the Centers for Disease Control and Prevention. Other studies have suggested this number is much higher, ranging from 200 to 600 heat related deaths in New York City.

A 2013 study, based on 2000 Census data by researchers at Berkley found that people of color are up to 52 per cent more likely to live in areas of cities that suffer from intense urban heat islands. Some areas of cities, like the Bronx in New York which lacks urban forest cover, are hotspots that suffer from more intense heat. These areas are also often places where heavy industry is located and hence the residents have to endure increased levels of air pollution, exacerbated by the heat.

More urban leaders, like Rafael Espinal, need to implement measures to reduce the urban heat island, and in so doing create much needed green jobs, save tens of millions in unnecessary electricity costs, manage stormwater, grow fresh food and help redress environmental injustice. (See On Spec page 34)

As we celebrate award winning green roof and wall projects in this issue of the LAM, we also need to be mindful of the importance of catching rainwater and using it to support vegetation on and around our buildings. By so doing, our industry can help 'turn down the pot' and thereby avoid the fate of the hot frog, like the one featured on the cover page of this LAM, before its too late.

Please join us in New York City at *CitiesAlive* this fall and learn how to help make our cities cooler, more resilient and just places to live.

Sincerely yours,

Steven W. Peck,
GRP, Honorary ASLA
Founder and President

TOP 10 UHI CITIES (CLIMATE CENTRAL, 2004-13)

Las Vegas (7.3ºF)
Albuquerque (5.9ºF)
Denver (4.9ºF)
Portland (4.8ºF)
Louisville (4.8ºF)
Washington DC (4.7ºF)
Kansas City (4.6ºF)
Columbus (4.4ºF)
Minneapolis (4.3ºF)
Seattle (4.1ºF)

NEGATIVE IMPACTS OF URBAN HEAT ISLAND (EPA)

Increased Energy Consumption in Buildings
Increased Air Pollution
Negative Health Impacts
Impaired Water Quality
Increased Water Consumption
Reduced Tourism/ Economic Activity
Decline in Livability
Increase in Heat-related Mortality
Environmental Injustice

ANNUAL NYC HEAT WAVES (MAYOR'S OFFICE OF RECOVERY AND RESILIENCY)

1971-2000 - 2
2001-2039 - 4
2040-2069 - 7
2070 - 2099 - 9

GRHC RELEASES GREEN ROOF MARKET SURVEY RESULTS

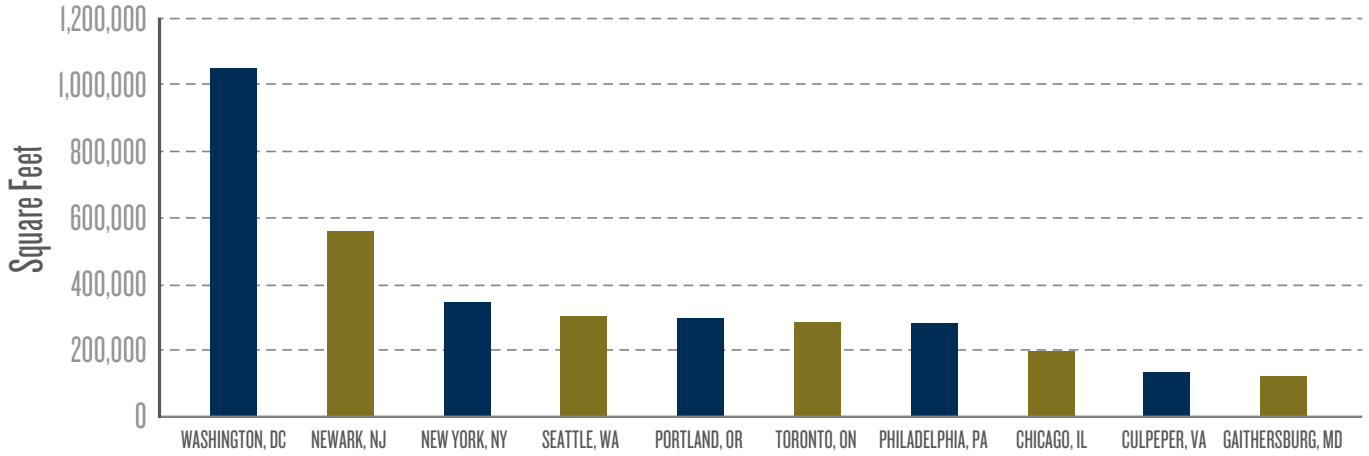
In July Green Roofs for Healthy Cities (GRHC) released the results of its Annual Green Roof Market Survey, and reported that that Washington DC has once again taken the top spot for green roof installations in 2017, followed by Newark, New York City, Seattle, and Portland as reported by GRHC Corporate Members.

In response to this finding, Tommy Wells, Director of the District of Columbia Department of Energy and Environment said "Metropolitan Washington is honored to be recognized by Green Roofs for Healthy Cities as a national leader for installing green roofs. Our progressive policies and innovative programs, like green roof rebates, Stormwater Retention Credit (SRC) trading, and SRC Price Lock, encourage residents and local businesses to install green roofs, which not only make DC a beautiful place to live, but also help protect our rivers and streams."

The 2017 Green Roof Industry Survey collected data from 14 of GRHC's corporate members who collectively recorded more than 1,000 completed projects in 39 US states and five Canadian provinces. These resulted in 5,389,749 square feet of green roofing. The overall industry is likely to be much larger than reported, simply because not all GRHC members participate in the annual survey.

GREEN ROOF INSTALLATION BY METROPOLITAN REGION (2017)

Green Roofs For Healthy Cites, 2018



NEW POLICY DEVELOPMENTS

Lead by Councilor Adriane Carr, the City of Vancouver City Council unanimously directed staff to bring forth a draft policy that would require new commercial, institutional, industrial and multi-family residential developments to have green roofs and retrofits. GRHC will be having a Green Roof Market Symposium in Vancouver in October. In July, Council Member Rafael Espinal, New York City introduced mandatory green roof legislation for new buildings in New York City. Mr. Espinal will be a keynote speaker at *CitiesAlive* in New York.

ON THE ROOF WITH...
A GLIMPSE OF THE FUTURE OF ROOFING

INTERVIEW BY STEVEN PECK, GRP, HONORARY ASLA

Over the last two decades, the roofing industry has undergone some major changes, one of which is a growing recognition of the value of roof space other than keeping occupants warm and dry. Two veteran roofing professionals share their thoughts on the changes that have been, and where they see the industry heading in this 'black arts' segment of On The Roof With… John Robinson, Sika Sarnafil and Ed Jarger, American Hydrotech.

LAM: *In your opinion, what do you think has been the most significant change to the roofing industry over the last two decades?*
John Robinson (JR): The most significant change has been emergence of the single ply roof system as the most predominant system. Built up Roofing (BUR) and hot asphalt systems are losing market share due to environmental issues, cost factors and labor concerns. The combination of installation speed and efficiency and the movement away from high labor-based systems has accelerated the change. This will continue as manufacturers develop systems that are more labor efficient and more environmentally sensitive. Another more negative change has been the practice of accepting lower cost materials and systems versus performance, so called "value engineering". This has led to more premature failures in all types of roofing systems.
Edward Jarger (EJ): There has been a marked shift in how roofs are viewed by building owners and developers over the last 20 years. Besides its primary function, to keeping water out of a building, the rooftop is increasingly expected to provide more value and functionality. A roof may become a building amenity, such as a podium deck or rooftop terrace for tenants to enjoy. Or, perhaps assist in handling the stormwater challenges many urban areas must contend with by incorporating a vegetated roof or even a blue roof assembly in the overall roof design. Resistance or concern regarding a roofs ability to perform multiple functions has given way to acceptance over the last few decades, as good roof design and the use of quality roofing products and assemblies have proven successful.
LAM: *Has the design community started to pay more attention to the new technologies for roofs, like green roofs, reflective roofs, natural lighting systems and solar panels etc.? Have roofs become more prominent in their thinking?*
EJ: The design community is certainly paying more attention to new roof technologies. They are being asked to do more with the rooftop than ever before by building owners and developers, mainly because of the economics. Whether it's to maximize energy savings, meet municipal stormwater requirements or to provide useable amenity

space (which can increase occupancy rates and values), they continue to explore what is possible. Architects understand that they must keep current with these technologies to compete and deliver a sound, functional building for their client.

JR: There has been an increased emphasis on more environmentally sensitive systems in the design community. The use of high Solar Reflective Index (SRI) roof systems has become predominant in the southern climates. There is a greater emphasis on products with recycled content and products that are recyclable. The emergence of the USGBC's LEED and other green building rating systems have led to more use of lower Volatile Organic Compound systems and less use of hot asphalt-based systems. Green roofs and solar roof systems are more prevalent in areas where local code requirements and /or incentives are in place. Roofs have become more prominent in the design process when there is a green or solar roof in the project or the roof will be used as an amenity space.

LAM: *Which of these 'green' technologies listed above is likely to grow significantly in market share over the next decade and why?*

JR: I believe that all of the technologies will continue to grow in market share and the rate will be based on local conditions and demands. Green roofs will continue to increase in urban areas with storm water and heat island issues. High SRI roofs have become almost standard in hotter climates and solar roofs will increase in areas that have incentives and/or high utility rates.

EJ: With respect to the vegetated roof market I believe the market growth potential has a huge upside, mainly because vegetated roofs offer not just one or two benefits like the other technologies, but because they can provide upwards of a dozen; be they technical, environmental and/or economic. Therefore, regardless of the specific vegetated roof design intent there are many benefits that will likely resonate with building owners resulting in even greater acceptance in the years ahead.

LAM: *Have manufacturer warranties changed in response to the use of new roofing technologies and if so how?*

EJ: Manufacturer or supplier warranties are intended to provide assurance to a building owner that the products or assemblies they purchase (new technologies or existing) will perform as intended. A warranty is only as good as the company that stands behind it, so it's advisable to work with an established and trusted company.

JR: Manufacturers have changed warranties significantly to meet the market demands. Full system warranties that include green and pedestrian overburdens are now common. Some include overburden removal with limitations. Many now require electronic leak detection systems as a condition for these warranties. (See LAM, Vol 20. No. 2) Some manufacturers are now offering up to 30 year warranties on conventional roofing systems. Manufacturers are also partnering with solar companies to provide comprehensive warranties on these systems.

LAM: *Are labor shortages going to be a big issue in the roofing industry and if so, what top of mind can be done about it?*

JR: Labor shortages will continue to be a major issue that will become more critical in the future. The trend toward roofing systems that require less labor and skill in the installation will continue to grow to combat this issue. Innovations in green overburden installation technologies will continue to meet the demands for more efficient and less labor-intensive installations. Manufacturers will also need to provide more in-house training and field supervision to ensure proper installation methods are utilized.

THE EXPERTS

Edward Jarger joined American Hydrotech in 1981. Ed has held various technical and sales positions over the years. Since 2008, Ed has been Hydrotech's General Sales & Marketing Manager, responsible for communicating and implementing the firm's sales strategies. Prior to joining Hydrotech he worked for the architectural firm of Skidmore, Owings and Merrill in Chicago.

John S. Robinson, CSI/CDT,GRP, RRO has been with Sika Sarnafil for over 20 years and in the roofing industry for more than 35. He currently holds the position of Education/Healthcare/Waterproofing Sales Specialist for the Southern Region and serves on the board of directors of Green Roofs for Healthy Cities.

"WITH RESPECT TO THE VEGETATED ROOF MARKET I BELIEVE THE MARKET GROWTH POTENTIAL HAS A HUGE UPSIDE, MAINLY BECAUSE VEGETATED ROOFS OFFER NOT JUST ONE OR TWO BENEFITS LIKE THE OTHER TECHNOLOGIES, BUT BECAUSE THEY CAN PROVIDE UPWARDS OF A DOZEN"

- ED JARGER

EJ: Labor shortages in the construction field have been a concern for some time now. Short term this may continue to be a problem. However, long term I believe the solution requires actively attracting young people to the trades, to become carpenters, plumbers, electricians and roofers too. Learning a skill and working in the trades is a respectable job that has typically paid well. We need to find ways to attract those that may be looking for a career path that doesn't include college.

LAM: *In your opinion, what are the most important new developments in roofing likely to be over the next decade?*

EJ: The most important new developments in roofing over the next decade are on my desk right now…he says with a smile. I believe within the vegetated roof market there is ample opportunity for innovation. There is always a market for something better, simpler, easier or faster. For example, in a typical extensive vegetative roof assembly, individual plant plugs have largely given way to pre-grown carpet or tile (like sod). This option provides a relatively "instant green" vegetated roof assembly that is easier and faster to install. Anything that can bring the overall cost down and maintain or improve the quality of the roof assembly is a win. This is the kind of innovation I expect we'll see more of in the future.

JR: The most important new development will be driven by the continued labor shortage issue and the need for more environmentally sensitive systems. Manufacturers will have to continue to develop systems and installation techniques that require less in field labor. Systems that offer a longer life cycle with lower maintenance requirements will also be in demand. Electronic leak detection and monitoring systems will become more commonplace in all types of roofing systems. The use of rooftops for solar, green, and storm water management will continue to increase as will the demand for amenity spaces. This will also increase the demand for high quality long life cycle roof systems that require less labor during installation and less maintenance throughout the service life.

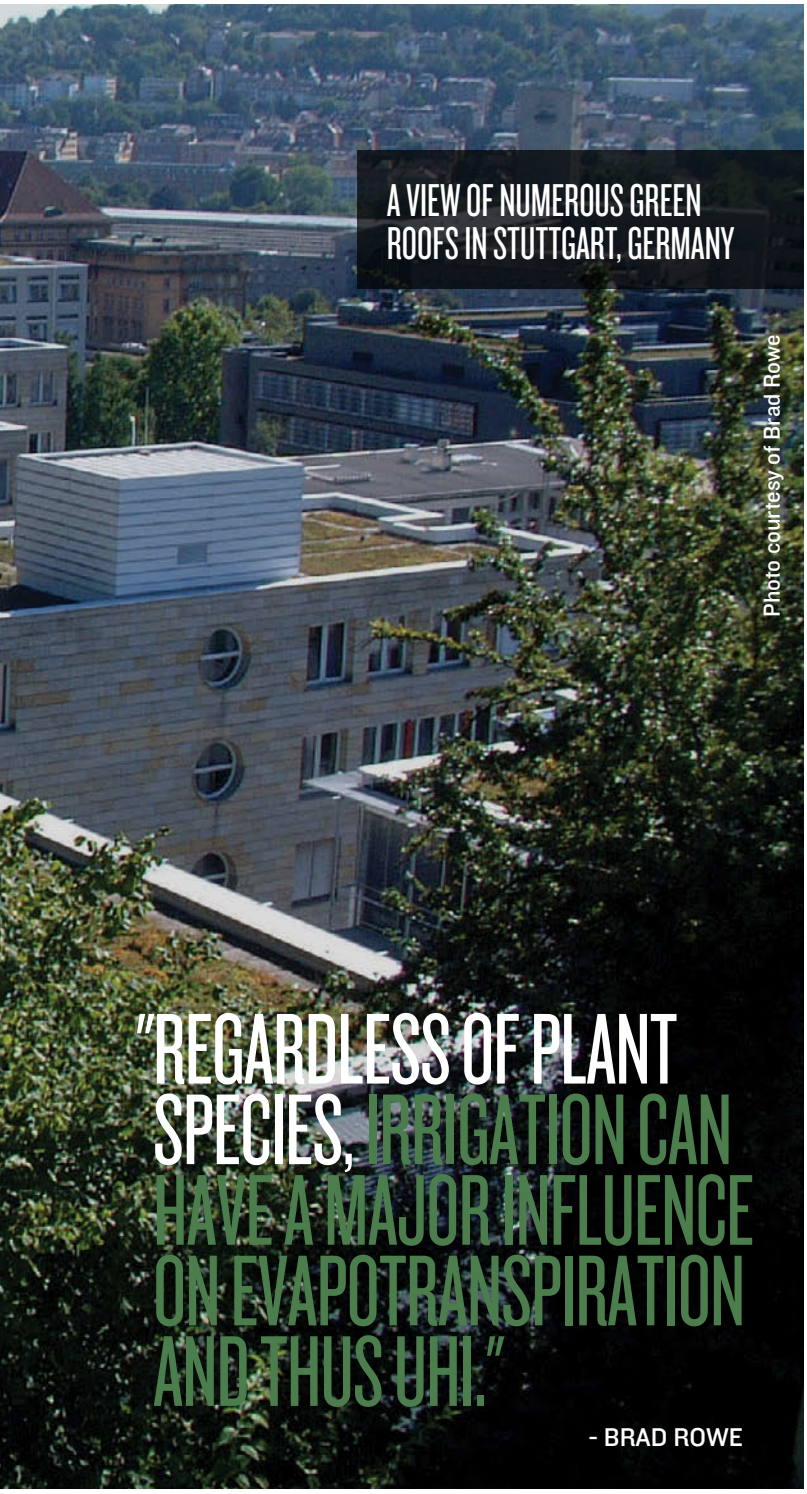
DOES PLANT SELECTION INFLUENCE THE URBAN HEAT ISLAND?

BRADLEY ROWE, MICHIGAN STATE UNIVERSITY, EAST LANSING

An urban heat island (UHI) is defined as an urban area that is significantly warmer than its surrounding rural landscape due to human activities. According to the U.S. Environmental Protection Agency, urban air temperatures can be as much as 22° F warmer than the surrounding countryside.

Warmer summer day and night temperatures are a problem for several reasons. They are a health hazard due to atmospheric ozone concentrations that increase with temperature as well as the increased demand for energy to power air conditioners and refrigeration systems. This in turn increases CO2 in the atmosphere that further exacerbates the warming trend.

The primary cause for the UHI is that humans have replaced vegetated surfaces with hardscapes such as roads, parking lots, and rooftops. Building materials such as asphalt and concrete have a much higher thermal mass capacity relative to plant tissue and therefore absorb and retain more heat. Dark surfaces absorb more solar radiation because of their lower albedo (level of reflectiveness) values. The albedo of green roofs ranges from 0.7 to 0.85, a value much higher than the albedo of bitumen, tar, and gravel roofs (typically from 0.1 to 0.2). Also, evapotranspiration (ET) (evaporation from a surface plus transpiration through plants) plays a major role. Fewer plants results in less transpiration, less absorption of CO2 via photosynthesis, and reduced shading of surfaces. Furthermore, because urbanization increases runoff, the quantity of water available for evaporative cooling is reduced. A great deal of incoming solar energy that would have been used to evaporate water is instead transformed into sensible heat. Coupled with the loss of vegetation and heat absorbing properties of impervious surfaces such as conventional rooftops,



A VIEW OF NUMEROUS GREEN ROOFS IN STUTTGART, GERMANY

Photo courtesy of Brad Rowe

"REGARDLESS OF PLANT SPECIES, IRRIGATION CAN HAVE A MAJOR INFLUENCE ON EVAPOTRANSPIRATION AND THUS UHI."

- BRAD ROWE

this results in higher ambient air temperatures. Since the albedo of urban surfaces is generally 10 per cent lower than the albedo of rural surfaces, urban areas can have higher ambient air temperatures.

There is much published research regarding how green roofs mitigate UHI and how plant species can influence energy savings within an individual building. There is no doubt that a green roof is beneficial relative to a conventional roof. However, there is not much published pertaining to how individual plant species on a green roof influence UHI. In theory, plant species with greater biomass and higher transpiration rates should provide a greater cooling effect. This has been shown to be true in some cases. However, in other situations this has been shown not to be true.

In one of our studies at MSU (Eksi et al., 2017, Energy and Buildings 145:174-187), daily summer surface temperature fluctuations on the sedum portion of a roof were as much as 32.8º C, whereas they ranged up to 21.2º C on the herbaceous roof. Thermal protection provided by herbaceous plants was greater, presumably due to its deeper growing substrate and shade provided by the plant canopy. During the afternoon, the surface of the sedum roof was as much as 13º C warmer than the surface of the herbaceous roof. Over the entire season, the daily average surface temperature of the sedum roof was 4º C warmer than the herbaceous portion. This agrees with done in the U.K. (Blanusa et al., 2013, Building and Environment 59:99-106) where leaf surface temperatures were lowest for the broadleaf Stachys byzantina compared to a mix of sedum.

In contrast, MacIvor et al. (2016, Ecological Engineering 95:36-42) observed that the lowest surface temperatures (2º C lower) and air temperatures 15 cm above the surface (1.5º C lower) occurred for a sedum plant community compared to a grasses and wildflower meadow mix. Likewise, Franzaring et al. (2016, Ecological Engineering 94:503-515) reported that monocultures of Phedimus floriferus and Lotus corniculatus provided better cooling than the larger erect species Dianthus carthusianorum and the grass Koeleria glauca. A viable explanation may be that the low growing spreading species shaded a greater percentage of the roof than the upright species. Shade provided by higher leaf area index will influence the overall albedo of the roof and decrease solar radiation that reaches the substrate surface.

Regardless of plant species, irrigation can have a major influence on evapotranspiration and thus UHI. Evidence suggests that like most herbaceous perennials, irrigation may be required during drought periods to ensure long-term survival and thus maintain plant cover. Irrigation is also beneficial if the roof is dry, as there will be no transpirational and evaporative cooling to help reduce urban temperatures.

So does plant species on a green roof influence the urban heat island? There is no definitive research conducted on green roofs to answer the question on such a large scale (it is a difficult parameter to measure), but research conducted at ground level shows that plant selection does influence it. The above discussion includes surface temperatures on the tested roofs where vegetation influenced temperatures within the boundaries of the green roof. However, it is reasonable to assume that this cooling effect would also extend beyond the roof, particularly on the leeward side, and affect UHI.

Brad Rowe has been conducting green roof research at MSU since 2000. Research topics include plant selection, growing substrates, carbon sequestration, stormwater runoff, energy conservation, and roof vegetable production. He was the founding chair of the GRHC Research Committee and received the GRHC Research Award of Excellence in 2008. Brad also teaches a course on green roofs and walls at MSU.

UPDATE ON THE DENVER GREEN ROOF INITIATIVE – COMPROMISE ON EXISTING BUILDINGS

BY BRANDON RIETHEIMER

It's been nearly a year since the passage of the Denver green roof ballot initiative and in that time a lot has changed. Various groups in the community raised very real concerns surrounding unintended consequences and we had concerns that opponents would challenge the legality of the ordinance claiming it violated very strict Colorado water rights using the word retain vs detain.

Because of these issues, it was imperative that all members of the community sit down and have a much needed conversation. Denver ranks third worst in the nation for its urban heat island. Denver's large buildings generate 60 per cent of its greenhouse gas emissions, and rapid development has Denver quickly evolving into a land of superheated concrete.

Shortly after the election, the city hired a facilitator and brought together representatives from various organizations throughout the city. From city agencies to building owners associations, we sat down for ten, 3-hour meetings to discuss the green roof ordinance in depth and to find a path forward that met and matched the benefits that would have been realized for each pathway permitted in the ordinance. We had expert testimony from various organizations. We had climate reports and insurance expert testimony. Every question we had was answered. Even unfortunate ones.

It wasn't long into the task force meetings that we realized the way the ordinance was written to include existing buildings would have exempted over 90 per cent of those buildings because they were not structurally able to handle the added weight of green roof. We, the proponents of the initiative, did not want to lose these buildings. This was a huge opportunity to achieve something more than just affecting new development. So, we fought, and we debated, and we compromised. In the end, I felt, if both sides gave up something and we walked away with a benefit that was greater than when we walked in, then the future of Denver and its residents would be better off for it. The Task Force meets in October to review regulatory language which reflects its recommendations.

HERE IS A SUMMARY OF THE NEW PROPOSAL THAT THE TASK FORCE HAS AGREED UPON:

Existing buildings must install a cool roof plus select one of five compliance options at the time of replacing their roof:

1. A small green roof or high functioning green space anywhere on the site.
2. An on-site solar array.
3. LEED Silver or equivalent certification.
4. A financial contribution for off-site green space.
5. Enrollment in a flexible Energy Program to achieve emission reductions like those achieved by the on-site solar option. The program will include options to buy community solar or to improve building energy efficiency in any way that makes the most sense for that building.

New buildings must include a cool roof plus one of eight compliance options:

1. A green roof or high functioning green space anywhere on the site.
2. A financial contribution for off-site green space.
3. A combination of green space and solar panels.
4. A combination of green space and energy efficiency measures.
5. A solar array covering 70 percent of the roof.
6. Energy efficiency measures so that the building is 12 percent more efficient than current energy code.
7. LEED Gold or equivalent certification.
8. Enterprise Green Communities Certification.

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PORTLAND'S ECOROOF REQUIREMENT FOR CENTRAL DISTRICT ADOPTED - LIVING ARCHITECTURE POLICY LIBRARY

BY EMMA TAMLIN

Behind the success of recent green roof policies, a common theme is the role of strong public advocacy groups. SPUR, the San Francisco Bay Area Planning and Urban Research Association, is a nonprofit that was motivated by the 2013 *CitiesAlive* conference in San Francisco to create the SPUR Green Roof Task Force. The group developed a report promoting the implementation of a green roof policy for San Francisco.

In January 2017, San Francisco passed the Better Roofs Ordinance. In Denver, the Denver Green Roof Initiative lead the first fully citizen-led ballot initiative requiring green roofs. I-300 passed in November 2017 largely in part due to the tireless work of volunteers and a supporting cost-benefit study prepared by Green Roofs for Healthy Cities (GRHC). Most recently, the work of the Green Roof info Think-tank (GRiT) in Portland, with support from GRHC, advocated for the passing of the new Ecoroof Requirement as part of Portland's Central City 2035 Plan (CC2035).

GriT was established in 2009 as a network of businesses, government agencies, non-profit organizations, researchers, and community members that work together to grow the knowledge and use of green roofs in the Pacific Northwest. The grassroots group was integral to building a community of support for green roofs, dismantling myths put forward by the opposition and communicating why a green roof requirement was necessary. GRiT secretary, Amy Chomowicz, says "GRiT was instrumental in the passing of the requirement. Providing technical assistance and support for decision-makers was essential to the process."

Portland has long been a proponent of green roofs. In 2004, Portland hosted the second annual green roof and wall conference *CitiesAlive*. The conference brought together policy makers, designers and researchers and highlighted the benefits of green infrastructure as a tool for urban sustainability. The conference brought attention to the harmful effects of the urban heat island effect, stormwater runoff and decreased urban green spaces - and green roof development in Portland began to expand soon thereafter.

In 2008, the city adopted the Ecoroof Incentive program that offered property owners and developers $5 per square foot of green roof. The program ran until 2013 and granted more than $1.8 million in incentives that helped fund over 130 projects. As a result, more than 43,000 square feet of green roofs were installed around Portland. On average, the green roofs manage at least 4.4 million gallons of stormwater annually, reducing, cooling and filtering its flow into Portland's stormwater runoff system.

The Ecoroof Incentive, as intended, stimulated the green roof industry in Portland and once it expired, green roof installations slowed down. The incentive was never meant to be permanent but only to pave the way, gauge interest and prepare the city for a mandate.

Six years in the making, Portland's Central City 2035 Plan was adopted on June 6, 2018 and came into effect July 9, 2018. The Central City District, which straddles the Willamette River, is one of the most densely populated areas of Portland and it is experiencing explosive growth. The CC2035 will address the challenges and opportunities of growth in the central city to ensure the areas unique economic, transportation, cultural and education characteristics will be a vibrant resource for Portlanders over the next twenty years.

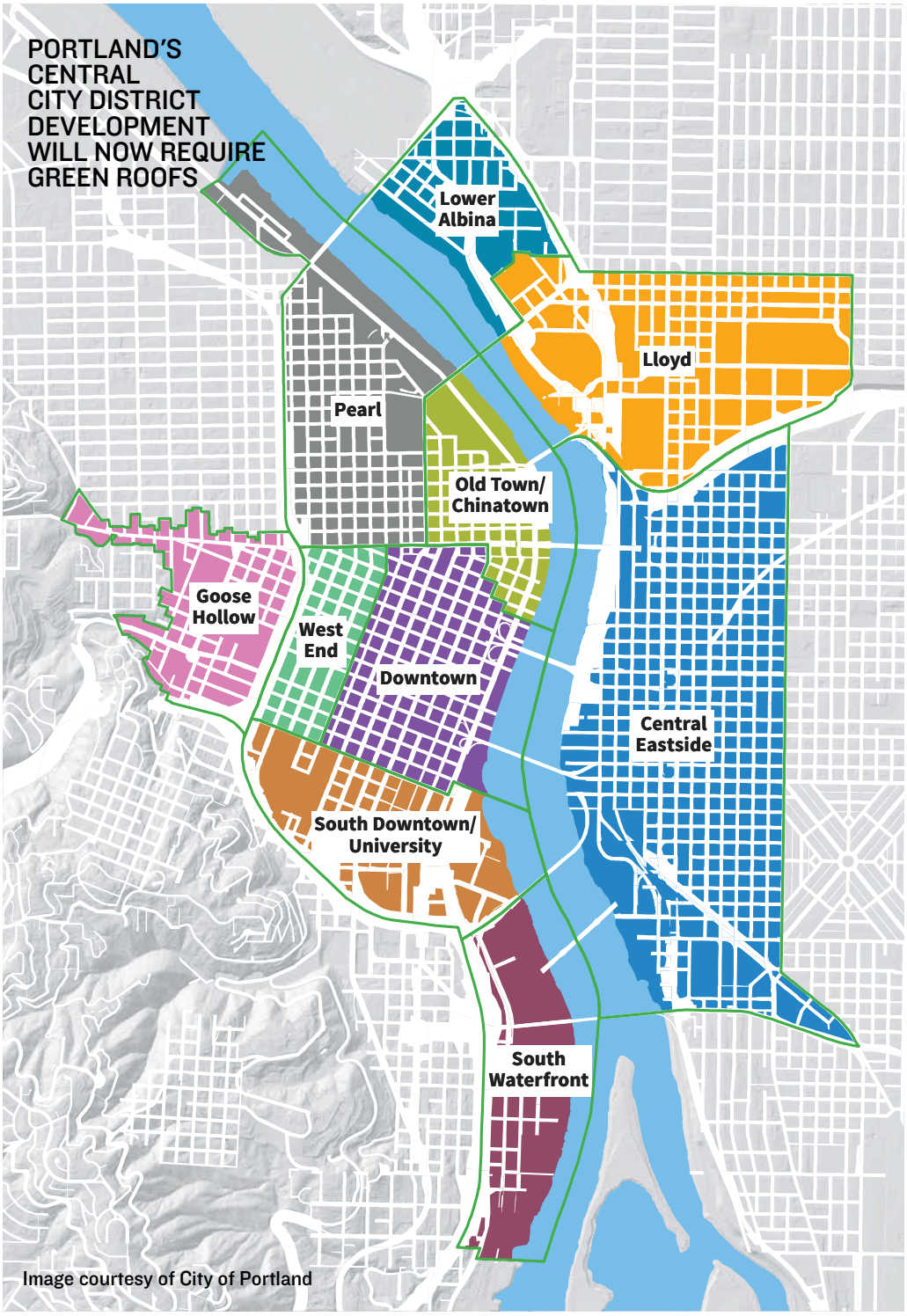


Image courtesy of City of Portland

Included in CC2035 is the new Ecoroof Requirement, that will help the city meet its environmental and human health goals. The city recognizes ecoroofs are an effective tool in environmental resilience and encouraging a healthy lifestyle. Under CC2035's Health and Environment section, ecoroofs, among other forms of green infrastructure, will help the city manage stormwater, improve pedestrian environment, reduce heat island effects, improve air and water quality and create habitat for birds and pollinators.

The Ecoroof Requirement went into effect on July 9, 2018. It requires new buildings in the Central City over net 20,000 square feet of floor space to install a green roof. No more than 40 percent of the total rooftop area can be covered in non-ecoroof structures such as HVAC and rainwater harvesting equipment. There must be at least 4" of growing media depth, and roofs with over 25 per cent slope are exempt.

The Portland Ecoroof Requirement, unlike similar mandates, does not include exemptions for solar panels. Elizabeth Hart Morris, President of GRiT said that this policy measure was intentional because "solar panels and green roofs are mutually beneficial when installed together." Green roofs cool the air around the solar panels allowing them to produce electricity more efficiently, and the panels shade the plants, reducing irrigation needs.

Nonprofit organizations, grass root movements and volunteer initiatives have the potential to influence policy by providing research and showcasing a strong public consensus. Policy makers, especially amidst elections, do not want to implement a policy that will divide the voter base. GRiT was especially critical in bringing together opposing views and finding common ground on how green roofs meet everyone's needs. Morris said "it was important to not create an 'us-against-them' mentality but to unite" when pushing for the inclusion of the Ecoroof Requirement in CC2035. Luckily, "there was little to no opposition from the developer community in Portland, similar to San Francisco" said Steven Peck, GRP, President of Green Roofs for Healthy Cities. Evidently, the role of public advocacy groups is key to encouraging a municipality to adopt green roof policies.

Portland's new Ecoroof Requirement will be presented in depth at *CitiesAlive* 2018 in New York City from September 24-28. Amy Chomowicz will share how Portland adopted the Ecoroof Requirement, and provide lessons learned for other municipalities considering adopting similar initiatives, including why it is helpful to build a green roof requirement into an existing planning process.

2018 AWARDS OF EXCELLENCE

JUDGE'S TABLE

We would like to thank the judges who generously donated their time and expertise.

Jeffrey Bruce, GRP, FASLA, ASIC, LEED
Jeffrey L. Bruce and Co. LLC & Chair

Chris Brunner
New York Green Roofs

Terry Guen, FASLA
Terry Guen Design Associates

Michael Krause
Kandiyo Consulting

Monica Kuhn, GRP, O.A.A
Monica E. Kuhn, Architect Inc.

Christopher Lyon, MBA
Tournesol Siteworks

David J. Yocca, FASLA, AICP, LEED AP
Conservation Design Forum

Ishi Buffam
University of Cincinnati

Dr. Reid Coffman
Associate Professor, Kent State University

Virginia Russell, FASLA, RLA, LEED AP, GRP
University of Cincinnati

Dr. Youbin Zheng
University of Guelph

Peter Lowitt, FAICP
Devens Enterprise Commission

Hamid Karimi, PhD
DC Department of Energy & Environment

Jeff Joslin
City of San Francisco

CATEGORY
Extensive Institutional

PROJECT
McArthur/McCollum Building Rooftop Meadow

LOCATION
Boston, MA

AWARD WINNER
Recover Green Roofs / Omni Ecosystems

TEAM MEMBERS

Bee Keeper
Noah Wilson-Rich, Best Bees Company

Client
Julia Musso, Harvard Business School

Designer & Green Roof Installer
Richie Harvey and Brendan Shea, Recover Green Roofs

Designer & System Manufacturer
Molly Meyer and Jessica Bourque, Omni Ecosystems

Waterproofing Installer
John Marcone, Gilbert & Becker Co

Waterproofing Manufacturer
Paul Muller, Sika Sarnafil

Photos courtesy of Recover Green Roofs

"We hope this self-regenerating roof ecosystem causes people to take pause and reconsider their relationship to the built environment, particularly when they see "rooftop-foraged daikon radishes" on the Harvard dining services menu."

- Molly Meyer, CEO & Founder of Omni Ecosystems

A SELF-REGENERATING ROOF ECOSYSTEM ALONG THE CHARLES RIVER

Across seven sections of a multi-tiered roof on Harvard Business School's McArthur/McCollum building stretches an 11,000 ft² extensive meadow. The design team searched for an innovative solution that would be light enough to satisfy weight restrictions for the building while showcasing a highly visible and structurally complex roof. The McArthur/McCollum rooftop meadow is the first of its kind in the region.

With an ultra-light media blend that allows for a diverse plant palette capable of growing a huge variety of native species, the meadow is designed to be self-regenerating throughout the years. The plant design takes inspiration from the adjacent Charles River ecosystem and the meadow seed mix unifies the seven roofs while distinct clusters of perennials create distinctive patterning. Honeybee hives are monitored for local pollinator data and a creative irrigation plan secured the seeded media during establishment.

During installation, extreme care was given to the salvage and reuse of building materials, as well as an existing extensive sedum green roof system and maintain the existing heritage structure.

The project challenges people to reconsider their relationship to the built environment, changing the paradigm of what a building is capable of, especially when they see "rooftop-foraged daikon radishes" on the menu in the Harvard Dining Hall.

Judges praised this project for its scale, plant palette, and integration into the local ecology, as well as overall water quality enhancement strategy for the Charles River. They also found it to be an excellent application of green roof technology on an existing educational structure.

Photo courtesy of Outside! Planning & Design Studio

CATEGORY
Exterior Green Wall

PROJECT
Nova Scotia Community College Centre for the Built Environment Green Wall

LOCATION
Halifax, Nova Scotia

AWARD WINNER
Outside! Planning & Design Studio

TEAM MEMBERS

Growers, Planters, & Design Consultant
Tim Amos, Students, & Faculty, Kingstec Campus NSCC

Irrigation
Greg Keddy, Rousseau Irrigation

Project Coordination & Design
Sue Sirrs, Outside! Planning & Design Studio

Structural Engineering
Roy McBride, BMR Structural Engineering

A LIVING BUILDING TEACHING TOOL FOR ALL SEASONS

Starting in 2008 as a two-year research initiative to see if permanent living walls could be sustained in cold climates, this 1000ft² structure has not only survived but thrived in a Canadian Zone 5 coastal climate, and is the first permanent, exterior cold-climate living wall in Canada. Sixty plant species were tested and five structural prototypes were developed before the design was settled on.

The living wall is a regular part of Ivany Campus tours and is used as a tool to teach students sustainable design techniques. Located at the college's front doors, the wall is highly visible and engages the broader community, communicating the message that there are alternate ways to build.

Project success was based on two key design drivers, free lateral root run, ensuring plant roots are never confined; and early development of a deep root system, encouraged by watering deep within planting baskets encouraging roots to reach deep into the soil medium. Rhizomatous plants were sought afterwards to provide a contiguous vegetation cover.

Irrigation and over-wintering were key concerns and addressed by installing two irrigation systems. The primary system turned out to be more complex than needed and was adjusted to a simple pump from the roof-water collection tank. Water gravity feeds through the top of the wall to the lower levels and ongoing maintenance is been provided by a group of dedicated college staff.

Judges praised this project for its spirit of innovation and willingness to learn and adapt to traditionally inhospitable environments for the technology.

OLD WORLD LUXURY COUPLED WITH MODERN DAY MUST-HAVES

Two Old Mill is a signature mixed-use condominium development with the objective of "Old world luxury coupled with modern day must-haves". Located in the Old Mill neighbourhood of Toronto, bordering the Humber River, the building is surrounded by abundant green spaces, and bringing the feel of these surroundings to the building in a sustainable manner was the main goal of the project.

Two of Old Mill's beautiful rooftops contain a balance of spaces for relaxation, entertaining, and cooking, all situated within a lush and varied green roof. The installation contains a mix of extensive and intensive areas, with some areas having as much as 1200 mm of soil, and others only a 30 mm mixed sedum mat with water retention fleece.

Sustainability and ecological function are important aspects of the building. In addition to sedum varieties, the roof includes 13 different species of grasses, evergreen shrubs, deciduous evergreens, perennials and vines, the varied plantings and soil levels creating a more diverse habitat for local fauna. These diverse plantings are layered to maximize the visibility of the different roof areas. Although irrigated, water comes harvested from rainwater and the majority of the planting utilizes drought tolerant species to limit water use. Additionally, over 50 per cent of the species selected for the project are native to the area. The project met Toronto Green Development Standard Tier II and achieved LEED Gold Certification in 2016.

Judges praised the project for its varied landscape, lush and vibrant palette and ability to provide multiple benefits to this urban site.

CATEGORY
Intensive Residential

PROJECT
Two Old Mill

LOCATION
Toronto, ON

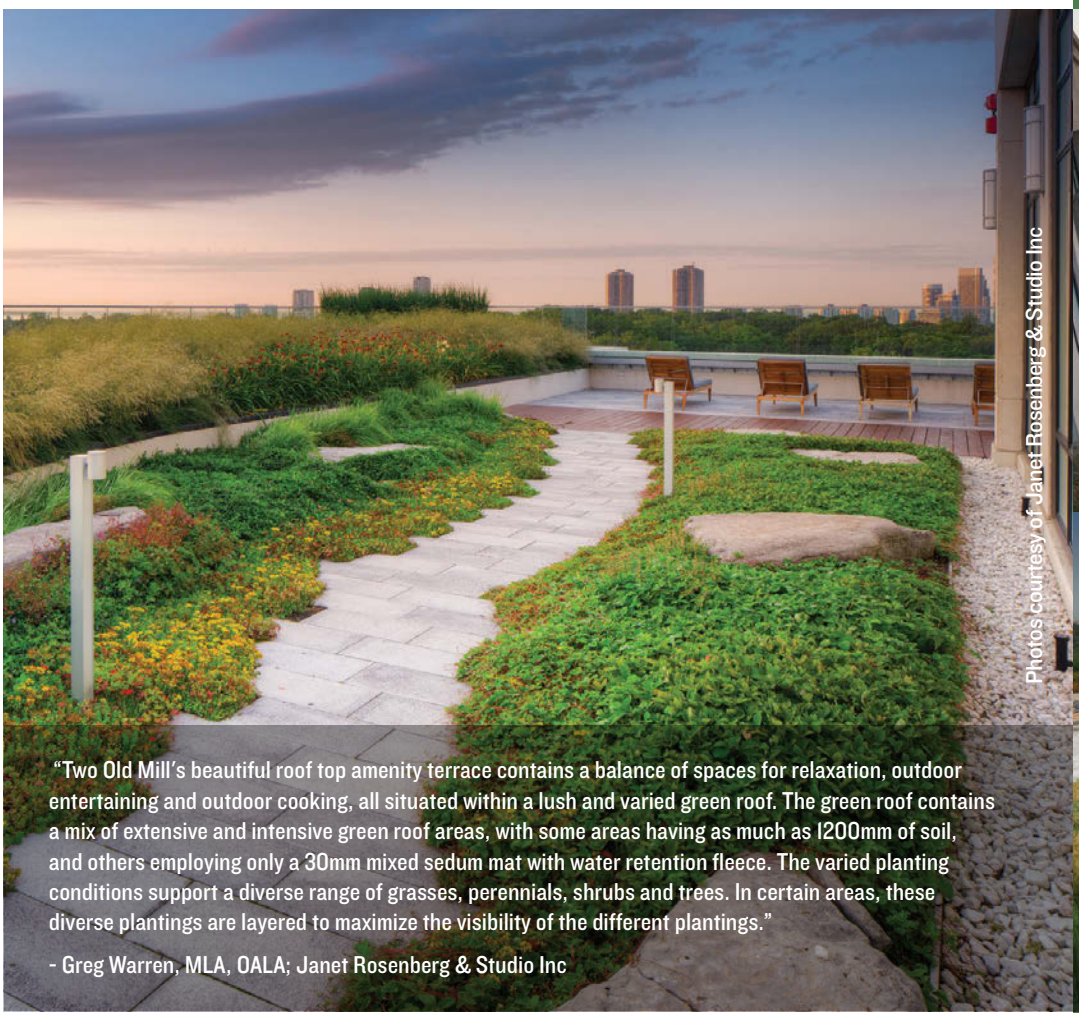
AWARD WINNER
Janet Rosenberg & Studio

TEAM MEMBERS

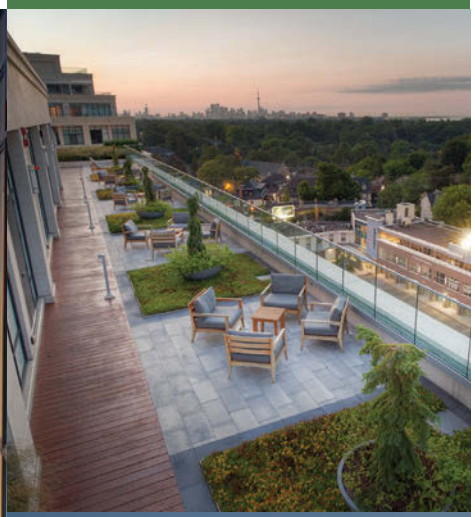
Green Roof Supplier
Sasha Aguilera, Next Level Stormwater Management

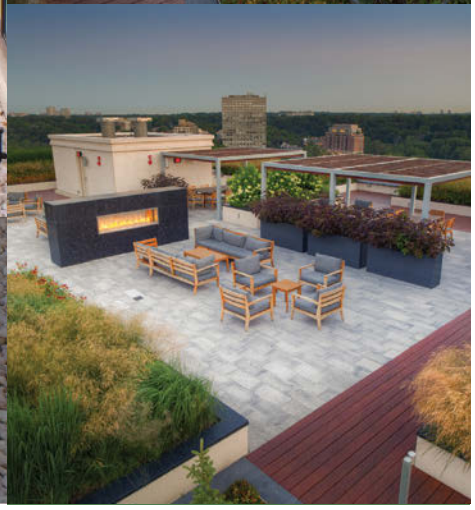
Landscape Architect & Green Roof Designer
Janet Rosenberg, Janet Rosenberg & Studio

Landscape Contractor
Dieter Goepfert, D. Goepfert Gardening, Inc



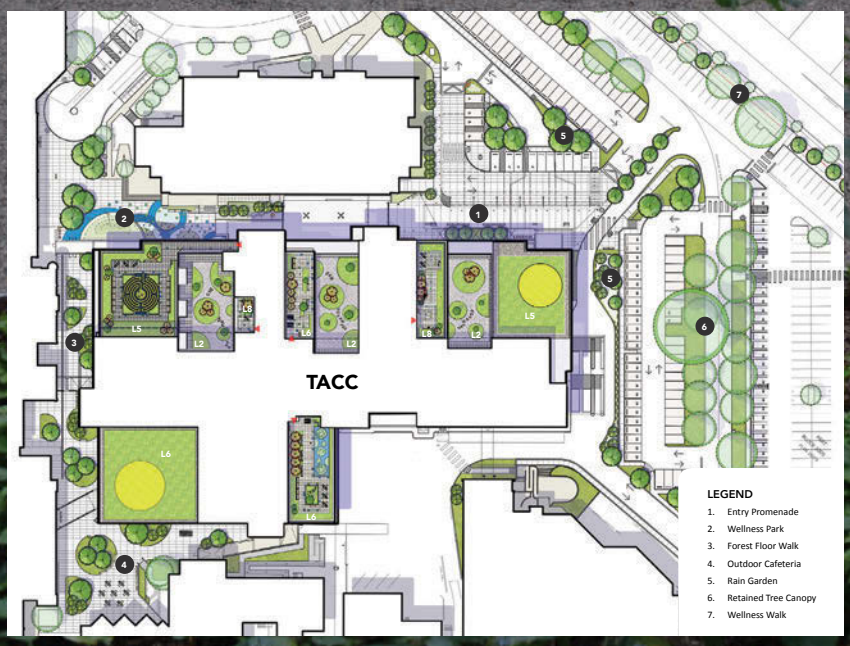
Photos courtesy of Janet Rosenberg & Studio Inc





"Two Old Mill's beautiful roof top amenity terrace contains a balance of spaces for relaxation, outdoor entertaining and outdoor cooking, all situated within a lush and varied green roof. The green roof contains a mix of extensive and intensive green roof areas, with some areas having as much as 1200mm of soil, and others employing only a 30mm mixed sedum mat with water retention fleece. The varied planting conditions support a diverse range of grasses, perennials, shrubs and trees. In certain areas, these diverse plantings are layered to maximize the visibility of the different plantings."

- Greg Warren, MLA, OALA; Janet Rosenberg & Studio Inc



"Sun-filled, colourful, peaceful, wondrous: these are not descriptions traditionally associated with a hospital experience, but they are essential to the care of children - and therefore a major consideration in the creation of the new TACC"

- Ken Larsson, Principal, Connect Landscape Architecture

Photos courtesy Connect Landscape Architecture

HOLISTIC HEALING FOR PATIENT, COMMUNITY, AND ENVIRONMENT

The overall vision for the Teck Acute Care Centre at the BC Children's and Women's Hospital embraces design and innovation supporting holistic healing - not only at the patient level, but also to the larger community and natural environment. Three key principles informed the landscape design.

Healing environments through evidence-based research demonstrating that access or views to nature has proven to lessen hospital stays. Patient-oriented environments foster healing by providing introspective and active spaces, promoting wellness and offering therapeutic functions at a variety of scales. The landscape design references and celebrates natural systems. Plants, wildlife, water and natural sounds all contribute to alleviating stress for patients and family.

Regenerative landscapes and the promotion of ecological health is accomplished through extensive and intensive living roofs, an irrigation reduction strategy, and a landscape design appropriate for a healthcare setting that adapts to dynamic climate, social and economic environments. The design anticipates growth and changing uses in addition to seasonal changes.

Finally, the spirit of place, symbolically responding to British Columbian ecological types moving from the 'Forest Floor' concept at the lower levels to a 'Mountain Meadow' on the roof decks. Public art is distributed throughout the exterior environment, providing opportunities for discovery, joy, and reinforcement of natural themes.

Described as a leading-edge example of living surfaces supporting a healing environment, judges praised the project for its inventive variable gardens exhibiting a range of green roof applications and excellent example of integration of living surfaces into site composition.

CATEGORY
Intensive Institutional

PROJECT
Teck Acute Care Centre, BC Children's and Women's Hospital

LOCATION
Vancouver, British Columbia

AWARD WINNER
Connect Landscape Architecture

TEAM MEMBERS

Architect
Clint Diener, ZGF Architecture
Frank Capistrano, HDR | CEI

Civil Engineer
Mike Kompter, Hub Engineering

Code Consultant
Michael J. Van Blokland, LMDG

Electrical Engineer
Paul Fritz, SMP

Landscape Architect
Ken Larsson

Landscape Contractor
Jeremy Miller, Houston Landscapes

LEED Consultant
Laura Hudson, Edge Consultants

Mechanical Engineer
Sean Lawler, AEI

Owner
Lynn Wong, Provincial Health Services Authority

P3 Construction & Financing
Pat Duggan, AFFINITY Partnerships (Ledcor & Balfour Beatty)

CATEGORY
Interior Green Wall

PROJECT
Weiser Hall

LOCATION
Ann Arbor, MI

AWARD WINNER
Diamond Schmitt Architects

TEAM MEMBERS

Architect
Matthew Smith,
Diamond Schmitt Architects

Building Envelope Engineer
Chris Van Dongen, Entuitive

Client
Robert Johnston and Susan Monroe,
University of Michigan

Contractor
John Durst, DeMaria

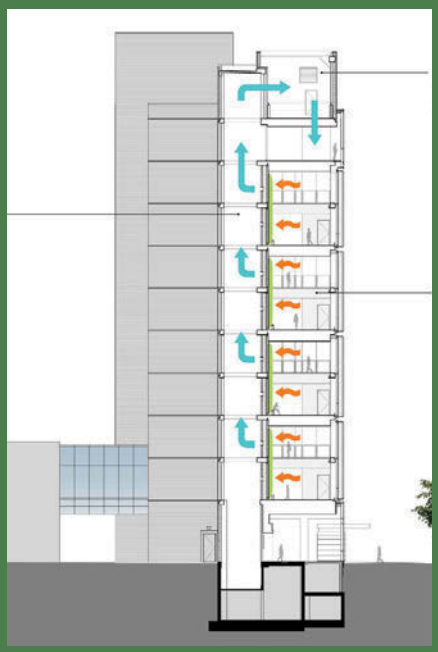
Cost Consultant
Riv Manning, Vermeulens

Electrical Engineer
Yilin Liu, Crossey Engineering Ltd

Green Wall Manufacturer
Alan Darlington, Nedlaw Living Walls

Mechanical Engineer
Dominic Ponamte,
Crossey Engineering Ltd

Structural Engineer
Karolina Jagielska, RJC Engineers



Photos & Images courtesy Tom Arban

CREATING A DYNAMIC LEARNING ENVIRONMENT FOR INTERDISCIPLINARY STUDY

The renovation of Weiser Hall repurposes the mid-century ten-storey tower, creating dynamic learning environments for interdisciplinary study and exchange. The renewed building now provides flexibility, daylight, and accessibility with highly sustainable design features.

Columns and ceilings were exposed enlarging open spaces and floors were uniquely configured to accommodate academic, social, and administrative use. Four double-height community commons are stacked at the southwest corner, each featuring biofilter living walls, serving as educational and botanical displays highlighting how biological systems can improve indoor environments.

The living walls provide air quality improvements, actively drawing air through the plant root systems relying on diverse microbial life to eliminate volatile organic compounds without the need for outdoor air ventilation. Plants provide transpiration cooling in the summer and humidification in the winter, further improving the building's energy performance. Additionally, due to the orientation and sunny conditions, supplemental lighting systems were not required. The walls also have important roles in the acoustic environment of the space. Water trickling through the system generates biophilic sound, which has a great impact on the aesthetics of the space while the plant and rooting material, structurally similar to acoustic tiles, increase sound attenuation.

The inviting green feature provides a focal point for encounters and is symbolic of the sustainable design principles that are as much a part of the facility as providing a coherent and engaging academic environment.

Judges praised the project as an amazing adaptation of interior green wall technology on building renovation in highly visible setting as well as the highly technical implementation.

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BEYOND ADORNMENT - IAC'S LIVING WALL IN THE ARID URBAN ENVIRONMENT OF LOS ANGELES

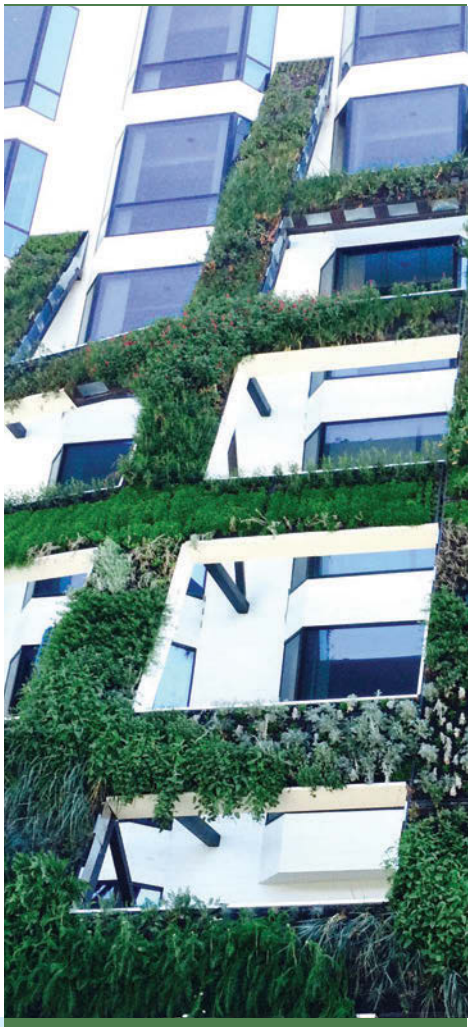
Draping 11,000 plants over an existing six-story building, Rana Creek and Rios Clemente Hale Studios created a living wall to revitalize the IAC Headquarters in Hollywood, CA. Suspended at an angle from the building face, the living wall grows along the structure, transitioning from vertical to horizontal, forming a dramatic canopy at the building entrance.

Seeking to create a new urban ecology, the living wall provides a breath of fresh air for pedestrians on the iconic Sunset Strip, and creates habitat opportunities and other resources for regional birds and pollinators. With an understanding of how essential it was to create meaningful links to the local ecology, the planting design prioritized species native to Southern California which can be found in the hills and canyons of Los Angeles.

Vertical troughs are attached to a white brick façade at their highest point and protrude as much as 14' feet at the second floor, creating a garden awning. The grid structure allows light to stream through, while the lines of the lattice create shade down below.

Located in an area of Los Angeles that was once wetland, the building had regular flooding issues in its subterranean garage. As a result of utilizing this resource for irrigation, zero potable water is used and roughly 100,000 gallons are saved per year.

Judges praised this project for its striking visuals, and prominence in a highly visible setting. They also praised the project for having overcome a variety of technical and environmental challenges in designing this project.



Photos courtesy of Rana Creek Design

CATEGORY
Special Recognition

PROJECT
IAC Sunset

LOCATION
Los Angeles, California

AWARD WINNER
Rana Creek Design

TEAM MEMBERS

Build
Alexander Ramey,
Rana Creek Design

Contract Grow Manager
Marta Kephart, Rana Creek Design

Design
Blake Jopling,
Matt Yurus,
Rana Creek Design

Brent Jacobsen,
Sebastian Salvado, Naseema Asif,
Rios Clementi Hale

CATEGORY
Small Scale Residential

PROJECT
Altadore Eco House

LOCATION
Calgary, Alberta

AWARD WINNER
Green T Design

TEAM MEMBERS

Architect
Bob Thornton, Studio T Design

Designer/Builder/Maintenance
Kerry Ross, Green T Design

General Contractor
Peter de Roy,
Peter Built Construction

Photos courtesy Green T Design

AN ECOLOGICAL HOUSE FOR AN ACTIVE FAMILY

With a love of plants, animals and their environment, a veterinarian couple sought to develop an ecologically-designed custom house for their active family. Located in Calgary's Altadore community, this newly built single family home includes four extensive green roofs across the house.

Designed for passive solar, the house uses space and energy effectively and efficiently. The orientation of windows provide natural light and winter warmth; while in the summer the overhangs and glazing create the shading necessary to keep comfortable interior temperatures.

The loose-laid green roofs are located adjacent to private living spaces, creating opportunities to bring nature closer to sleeping areas. Different plant communities were used for each roof; a grass roof which serves as a bedroom screen; a perennial garden on the upper courtyard; a chive meadow on the back roof; and a wildflower meadow on the bicycle shed. The roofs help mitigate stormwater runoff locally by reducing the amount of sealed surfaces, as well as providing additional opportunities urban wildlife habitats.

The geometry of the house was designed to create south-facing sloped roofs for a 3.3 MW array of solar panels and lower flat roof portions for green roofs. A protected courtyard at grade and the front-facing green roof above resulted in favourable microclimates for outdoor living spaces and produces lush growth of flowering perennials on the green roof.

Judges praised this project for its visual accessibility both inside and out, as well as the drive to create such a highly sustainable and efficient single family home.

Photo courtesy of Gotham Greens

CATEGORY
Special Recognition

PROJECT
The Southside Soapbox

LOCATION
Chicago, IL

AWARD WINNER
William McDonough + Partners

TEAM MEMBERS

Architect of Record
Karl Heitman,
Heitman Architects Inc

Civil Engineers
William Loftus, Spaceco Inc

Contractor
Adam Miller,
Summit Design + Build LLC

Design Architect
William McDonough,
William McDonough + Partners

Greenhouse Manufacturer/Installer
Jeff Warschauer, Nexus

Healthy Material Assessments
Jay Bolus, MBDC

Hydroponic Equipment Provider
Patrik Borenius, Green Automation

Landscape Architect
Keith Demchinski, Norris Design

Renewal Energy Consultant
Matt Herman, Buro Happold

Rooftop Greenhouse Operator
Viraj Puri, Gotham Greens

Solar Tree Vendor
Desmond Wheatley, Envision Solar

Structural and MEP Engineer
Arun Garg, KJWW

Photos courtesy of Patsy McEnroe Photography

"William McDonough + Partners' factory design for Method's South Side Soapbox honors a positive relationship between people and the natural world. Our introduction of Method to Gotham Greens has resulted in a building like a tree or even an orchard. It produces oxygen, absorbs carbon, purifies water, produces food and transforms solar energy. It is wonderful to see businesses collaborating to help people have beautifully clean, healthy places to live, work and even grow food!"

- William McDonough, Founder, William McDonough + Partners

A SYMBOL OF A COMMUNITY'S REVIVAL

Method Home's new manufacturing facility, located in the historic Pullman neighborhood on the south side of Chicago, provides a host structure for the Gotham Greens greenhouse on its roof. The first factory to open on the south side in nearly 30 years, the building serves as a symbol of the area's revival, bringing needed jobs to the community.

The building and landscape achieved a LEED Platinum rating for the use of renewable energy, including an on-site wind turbine, management of stormwater, incorporation of sustainably sourced building materials, and contribution to a livable community.

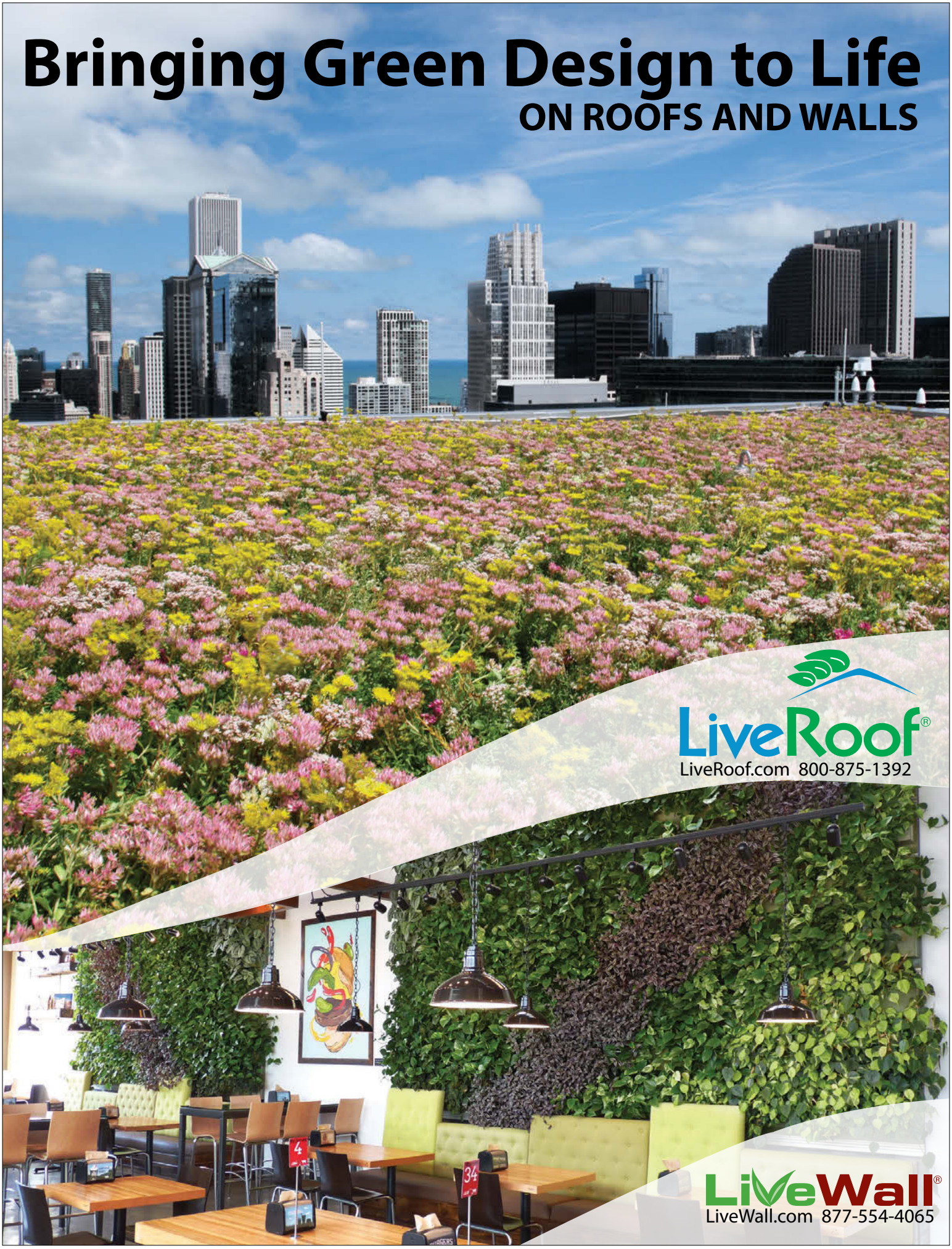
Method and Gotham Greens came together as a result of a joint goal to envision the "factory of the future". That vision included a large rooftop greenhouse, defining the aesthetic of the building and introducing the concept of a "clean factory." Once a design sketch was proposed, Method found a partner in Gotham Greens, who built and operate the greenhouse.

Gotham Green's 75,000 ft² rooftop greenhouse was the largest in the world at the time of construction and overlooks a green canopy over the entryway. The urban greenhouse was incorporated with the purpose of creating buildings modeled on natural processes through industrial agriculture. Located in a food desert, Gotham Greens further supports the local community by making regular donations to the Greater Chicago Food Depository.

Judges praised this project's impressive approach to roof-based agriculture and contextual design. They also spoke highly of the project's excellent example of living architecture integrated into a larger high-performance building and site.

Bringing Green Design to Life

ON ROOFS AND WALLS



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JOURNAL

OF LIVING ARCHITECTURE

A GREEN INFRASTRUCTURE FOUNDATION PUBLICATION

The Journal of Living Architecture (JLIV) is the official, peer-reviewed journal of the Green Infrastructure Foundation. The JLIV is written, reviewed, and edited by living architecture research professionals, sharing with their colleagues: successful educational applications, original research findings, scholarly opinions, educational resources and challenges on issues of critical importance to living architecture professionals and educators. The JLIV is published exclusively in the Living Architecture Monitor magazine and online at livingarchitecturemonitor.com. The magazine publishes the abstracts of each published JLIV manuscript, with a link to the full paper online.

Volume 5 Number 1 Pages 31-48

GREEN ROOF MICROCLIMATE: PATCH SEEDING NATIVE PRAIRIE PLANTS

Zhuquing Xu, Ellen T. Paparozzi , Elizabeth A. Walter-Shea, Richard K. Sutton

ABSTRACT

A suite of microclimate variables affected germination of five Great Plains native plants seeded on an extensive green roof. Germination was significantly (a = 0.05) greater in a greenhouse control versus the green roof for shortbeak sedge and prairie spiderwort (Carex brevior (35% versus 23% Tradescantia occidentalis 19% versus 0%). No significant germination difference between the greenhouse and green roof existed for two, warm-season species, Liatris squarrosa and Eragrostis spectabilis. Significant differences in microclimatic conditions between green roof plot locations suggest a heterogeneous environment can decrease seed germination. This impact was attributed to differences in the receipt of solar radiant energy, surface temperature, and vapor pressure deficit. Light reflection and thermal emission from the adjacent buildings supplied additional energy in some locations (depending on time of year or time of day) that varied greatly over only a few meters. Designers must carefully analyze microclimate impacts and consider those implications for plant selection and seeding. Establishment of some native seeds in high temperature zones may take more irrigation or benefit from mulching than those in moderate temperature zones. Increased seeding rates and targeted seeding dates may also be useful strategies. Future green roof research should examine germination across steep microclimate gradients, seed a wider suite of native plants to broaden plant biodiversity, and follow seedling development and mortality.

MEETINGS AT *CITIESALIVE*

Join the Research Committee Meeting on Tuesday September 25 from 2:15 to 3:15 at the Marriott at the Brooklyn Bridge.

Joint Corporate Members and Research Leaders Beer & Learn Combined Networking Meeting is 3:30 to 4:30 pm on September 25th.

LIVING ARCHITECTURE PERFORMANCE TOOL PILOT PHASE PROJECT REGISTRATION CLOSES SEPTEMBER 14

BY ROHAN LILAUWALA

The registration deadline for Living Architecture Performance Tool (LAPT) pilot projects is now September 14. The pilot phase offer 25 innovative and forward-thinking organizations a chance to participate in this revolutionary program.

The LAPT is a rating system and resource, designed to certify that green roofs and walls are designed to achieve certain measurable and replicable performance benefits, so that they can be funded, designed, installed, and maintained with a higher degree of confidence.

Getting involved in the pilot phase will help participants optimize the range of benefits possible from their projects, demonstrate leadership and innovation, set the stage for long-term performance, receive recognition in the marketplace, and receive personalized support through the process.

Participants will also receive complimentary access to a workshop on September 25 in Brooklyn as part of *CitiesAlive*, This workshop, hosted by LAPT co-chair David Yocca, FASLA, will offer registrants detailed information on each of the credits, clarity on areas of ambiguity, and a chance to work through challenges with tool administrators.

For more information or to register, visit greeninfrastructurefoundation.org/lapt
Rohan Lilauwala is the Program Manager at the Green Infrastructure Foundation

GREEN INFRASTRUCTURE: DESIGNING THE FUTURE OF RESILIENCY

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AGENDA AT A GLANCE

TUESDAY, SEPTEMBER 25
Emerging Professionals Day: Training, Opening Plenary, Trade Show Reception, Land8 Happy Hour

WEDNESDAY SEPTEMBER 26
Morning Plenary, Concurrent Sessions, Trade Show & Sightseeing Social on the Hudson Networking Cruise

THURSDAY, SEPTEMBER 27
Morning Plenary, Concurrent Sessions, Trade Show, Awards of Excellence & Tours, The Rooftop Farm Mixer

FRIDAY, SEPTEMBER 28
Local Project Tours

TRAINING & TOURS

NEW! LIVING ARCHITECTURE PERFORMANCE TOOL WORKSHOP
The Living Architecture Performance Tool (LAPT) is a rating system and resource, designed to certify that green roofs and walls are designed to achieve certain measurable and replicable performance benefits, so that they can be funded, designed, installed, and maintained with a higher degree of confidence.

NEW! VALUING THE BENEFITS OF GREEN INFRASTRUCTURE
The benefits of green infrastructure are well known, but difficult to value. The goal of this course is to introduce individuals to introductory economic principles and methods, that will them help them begin to value the benefits provided by green infrastructure in their communities.

BIOPHILIC DESIGN, THEORY, PRACTICE AND PROCESS WORKSHOP
This workshop will review the science, theory and practice of biophilic design while intermittent design vignettes will allow attendees to explore the biophilic design process. There will be a 10-minute stretching/snack break each hour.

Photo courtesy of Chrystal [illegible]

Photo courtesy of Friends of the High Line

Photo courtesy of Etsy

NETWORKING

NEW! SUNSET SIPS: THE ROOFTOP FARM SOCIAL
On Thursday, September 27, *CitiesAlive* in partnership with Agritecture is hosting the Closing Reception at the famous Brooklyn Grange, the world's leading soil rooftop farming company. Enjoy an open bar and light snacks. *Seats are limited, so register early!*

SIGHTSEEING SOCIAL ON THE HUDSON CRUISE
The dedicated *CitiesAlive* Local Host Committee plans and hosts the Local Host Committee Reception. This year, join us on Wednesday, September 26 for a networking cruise on the Hudson River. Soak in views of Lower Manhattan and Lady Liberty while enjoying a light dinner and an open bar.

LAND8 NETWORKING HAPPY HOUR
Join Land8: Landscape Architects Network for a networking happy hour at sponsored by Permaloc at The Kings Beer Hall. Complimentary drink tickets will be given to all of those that purchase a pass for the conference and free to attend for those who RSVP! A cash bar will be available for those who do not participate in *CitiesAlive®*.

ALL THE INDUSTRYS LEADERS IN THE HEART OF BROOKLYN

All programming, and the trade show are all conveniently taking place at the New York Marriott at the Brooklyn Bridge. *CitiesAlive®* attendees receive a significantly reduced room rate of only $309 per night for a double or single room if booked before September 7, 2018.

Book your room online at CitiesAlive.org through the "Book Your Hotel button on our home page or through the 'Venue tab.

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CITIES ARE OVERHEATING AND THE CHALLENGE IS ONLY GOING TO GET WORSE.

BY JOYCE I. MCLEAN, ASSOCIATE EDITOR

As the world continues to become increasingly urbanized and hotter, our city leaders need to implement strategies to ensure they remain healthy for all of their citizens amid a rapidly changing climate.

Increasing temperatures in our city-regions is due in part, to a phenomenon called the urban heat island effect that causes air temperatures to be much warmer than in the neighboring countryside. Warmer temperatures are caused by the way we currently design and build our cities – with lots of tall buildings, black pavement, black roofs and little vegetation. These methods and approaches have largely excluded green infrastructure systems, which are designed to cool our communities by lowering temperatures, capturing stormwater to use for cooling buildings and thereby reducing summer air conditioning demand.

Warmer air temperatures in city-regions increase ozone production, which negatively affects air quality and public health. The urban heat island also significantly increases electricity demand for cooling - which is very expensive. The US Environmental Protection Agency estimates that between 5 to 10 per cent of community electricity use is associated with the urban heat island effect.

As the climate changes, the problems associated with urban heat islands are further compounded by more frequent heat waves.

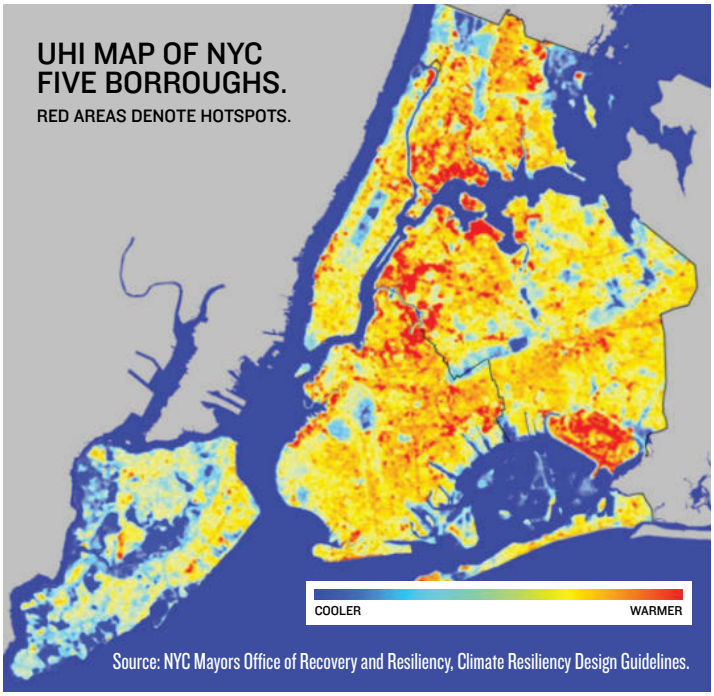
The city of Montreal suffered 53 heat-related deaths when temperatures climbed as high as 36ºC (96.8ºF) for the first week of July 2018, even though there were no power failures. This is on top of certain sections of the city where temperatures can be 12ºC (22ºF) warmer than surrounding rural areas. According to Natural Resources Canada, Montreal currently has nine days per year on average where the temperature is above 30ºC (86ºF). By 2070, that number is projected to climb to 27 days per year.

In New York City, it's a similar story. Every year an average of 100-200 deaths are attributed to heat waves. This is on top of an ongoing average heat island impact of between 2 and 8ºF, depending on the location in New York. At night, this number is even more dramatic – upwards to 22ºF hotter, depending on the "greenness" of the neighborhood – as the urban fabric's dark surfaces absorb heat during the day and release it at night. A 2016 Columbia University study projected that by 2080, up to 3,300 New Yorkers could die each year from intense heat made worse by climate change.

A 2018 study conducted by Zhao et al of Princeton University, based on 43 US communities found that the risk of death rose as temperature increases during a heat wave. Using the estimate of 7.9 per cent increase in mortality risk for every 1ºC increase in average temperature during a heat wave, and assuming that formula remains constant in the future, this leads to the conclusion that there will be a 3.2 per cent mortality risk

"URBAN FORESTS, BIOSWALES, GREEN ROOFS AND WALLS ARE PROVEN APPROACHES TO ADDRESSING THE URBAN HEAT ISLAND EFFECT AND THEY CAN USE STORMWATER CAPTURE TO COOL BUILDINGS AND THE SURROUNDING AIR."

- JOYCE I. MCLEAN



increase in cities. In other words, Dr Zhao et al is proposing a methodology to indicate the risk of death associated with heat. Additionally, the study authors note that the health and social problems associated with urban heat island impacts and additional greenhouse gas emissions are made worse by more frequent heat waves. (Lei Zhao et al 2018, Environmental Research Letters)

Urban adaptation and mitigation strategies that involve increasing the green fraction and water availability such as green roof and street vegetation (Georgescu et al 2014, Li et al 2014, Zhao et al 2017) could help reduce the synergistic effects of heat wave and the urban heat island. Increasing and maintaining the greenness in cities demands freshwater supply, especially for those in dry climates. Freshwater is not a free resource and is projected to become scarcer. Additionally, heat waves are usually accompanied by droughts. Hence, in many cities, capturing and reusing stormwater during rainy periods as well as air conditioning condensate are important methods of reducing the impact of additional greenery on water supplies.

In April 2018, The Climate Atlas of Canada was updated. The 250-layer interactive map is based on data from 12 global climate modules. It contains data for about 2,000 regions across Canada and includes 25 climate variables that fall under hot weather, cold weather, temperature, precipitation and growing season. The number of days with temperatures of 25°C (77°F) in Toronto, Canada's largest city, has historically been 64, but this is projected to be 100 in a low carbon scenario and 114 in a high carbon scenario by 2050.

Urban forests, bioswales, green roofs and walls are proven approaches to addressing the urban heat island effect and they can use stormwater capture to cool buildings and the surrounding air. With these climate change driven realities upon us, working together to ensure green infrastructure is woven into the urban fabric, particularly in areas that are prone to extreme temperatures, will become increasingly essential to ensuring human health and well-being.

Joyce I. Mclean is the associate editor of The Living Architecture Monitor and a freelance communications and strategic planning consultant.

For more information:

Climate Atlas of Canada - https://climateatlas.ca

http://www.nasa.gov/centers/goddard/news/topstory/2005/nyc_heatisland.html

https://grist.org/author/justine-calma/

Interactions between urban heat islands and heat waves, Lei Zhao, Environmental Research Letters, Vol. 13, Number 3 (2018)

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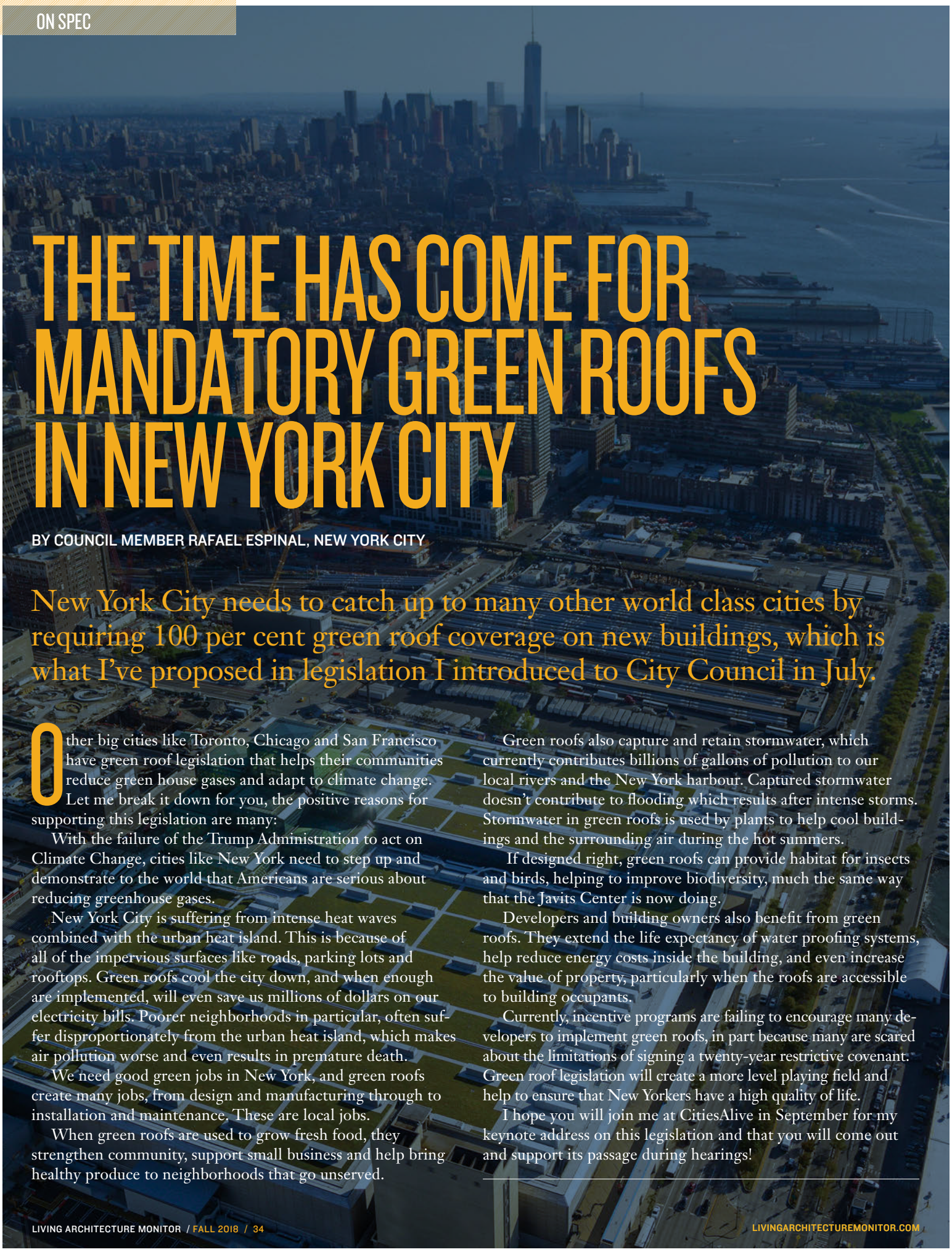

THE TIME HAS COME FOR MANDATORY GREEN ROOFS IN NEW YORK CITY

BY COUNCIL MEMBER RAFAEL ESPINAL, NEW YORK CITY

New York City needs to catch up to many other world class cities by requiring 100 per cent green roof coverage on new buildings, which is what I've proposed in legislation I introduced to City Council in July.

Other big cities like Toronto, Chicago and San Francisco have green roof legislation that helps their communities reduce green house gases and adapt to climate change. Let me break it down for you, the positive reasons for supporting this legislation are many:

With the failure of the Trump Administration to act on Climate Change, cities like New York need to step up and demonstrate to the world that Americans are serious about reducing greenhouse gases.

New York City is suffering from intense heat waves combined with the urban heat island. This is because of all of the impervious surfaces like roads, parking lots and rooftops. Green roofs cool the city down, and when enough are implemented, will even save us millions of dollars on our electricity bills. Poorer neighborhoods in particular, often suffer disproportionately from the urban heat island, which makes air pollution worse and even results in premature death.

We need good green jobs in New York, and green roofs create many jobs, from design and manufacturing through to installation and maintenance. These are local jobs.

When green roofs are used to grow fresh food, they strengthen community, support small business and help bring healthy produce to neighborhoods that go unserved.

Green roofs also capture and retain stormwater, which currently contributes billions of gallons of pollution to our local rivers and the New York harbour. Captured stormwater doesn't contribute to flooding which results after intense storms. Stormwater in green roofs is used by plants to help cool buildings and the surrounding air during the hot summers.

If designed right, green roofs can provide habitat for insects and birds, helping to improve biodiversity, much the same way that the Javits Center is now doing.

Developers and building owners also benefit from green roofs. They extend the life expectancy of water proofing systems, help reduce energy costs inside the building, and even increase the value of property, particularly when the roofs are accessible to building occupants.

Currently, incentive programs are failing to encourage many developers to implement green roofs, in part because many are scared about the limitations of signing a twenty-year restrictive covenant. Green roof legislation will create a more level playing field and help to ensure that New Yorkers have a high quality of life.

I hope you will join me at CitiesAlive in September for my keynote address on this legislation and that you will come out and support its passage during hearings!


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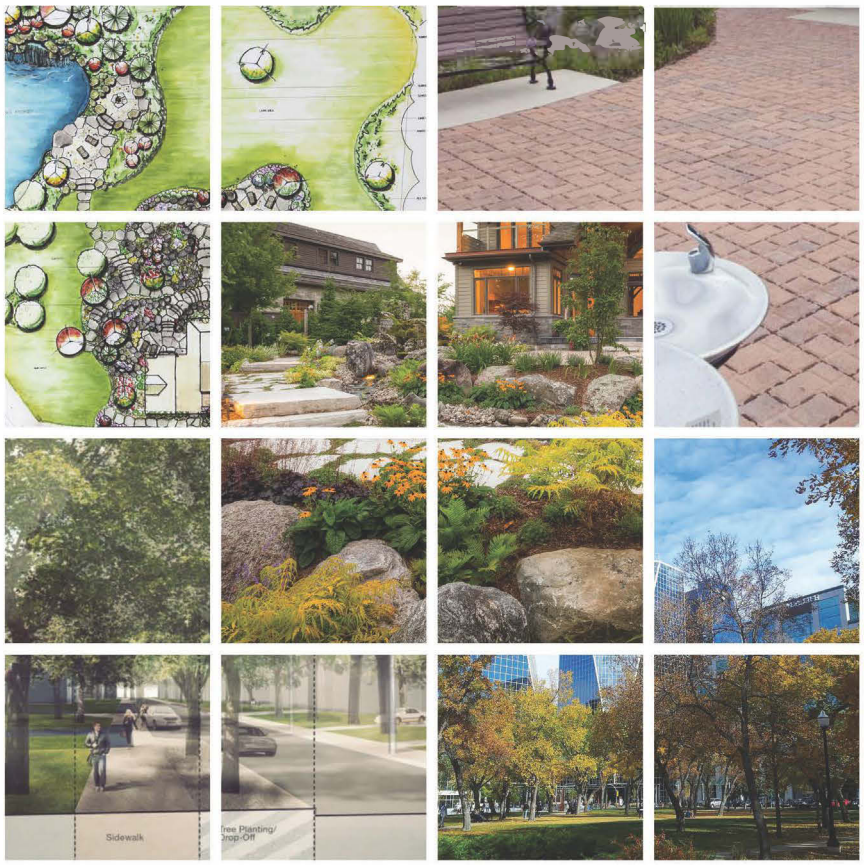

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