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VOLUME 21 / ISSUE 4 / WINTER 2019

THE SOCIAL EQUITY ISSUE

INSIDE:

- HOW ROOFTOP FARMS ARE MAKING A DIFFERENCE TO THEIR COMMUNITIES.
- DOES GREEN INFRASTRUCTURE DEVELOPMENT HAVE TO LEAD TO GENTRIFICATION?
- THE FIRST THREE LIVING ARCHITECTURE PERFORMANCE TOOL PROJECTS!
- GREEN ROOFS AND REDUCING HAIL DAMAGE.
- WHY THE TWIN CITIES NEED MORE GREEN INFRASTRUCTURE!

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Photo courtesy Alison Hancock.



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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 green roofs, green walls, and other forms of living architecture through education, advocacy, professional development and celebrations of excellence.

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GREENING OUR CITIES CAN LEAD TO GREATER SOCIAL EQUITY

THE OLD LAKOTA WAS WISE. HE KNEW THAT MAN'S HEART, AWAY FROM NATURE, BECOMES HARD; HE KNEW THAT LACK OF RESPECT FOR GROWING, LIVING THINGS SOON LED TO LACK OF RESPECT FOR HUMANS TOO.

– LUTHER STANDING BEAR (1868-1939)

One of the first Native American actors, authors, philosophers and educators, Aglala Lakota Chief Luther Standing Bear understood that our relationship to nature influences how we treat one another. It follows then, that if we aggressively introduce nature back into our cities to adapt to climate change, this should also lead to greater respect and social equity. This Social Equity Issue of the LAM explores some of these ideas in the context of increasing green infrastructure in our communities. Currently, the greatest opportunity for making progress on both fronts appears to be found in the way rooftop farms operate. In our On The Roof With feature, we explore the many social benefits that accompany rooftop farming through interviews with three extraordinary rooftop farmers – pioneers all!

All too often it is the case, that investments in green infrastructure, particularly parks, result in the displacement of poor people, as incoming real estate investment is often accompanied by their displacement from low rent dwellings. Joyce McLean explores the concept of gentrification and eco-justice and provides examples of how green infrastructure development does not have to result in the loss of diversity and

community, when accompanied by other policies.

In this issue, we are also celebrating the first three projects that have gone through the Living Architecture Performance Tool (LAPT) certification process. Modelled after LEED and Sustainable SITES, the LAPT Version 1.0 provides designers with an opportunity to earn up to 110 points, in eight major subject areas. The LAPT is designed to help designers, building owners and policy makers achieve better performance outcomes from green roofs and walls. In addition to receiving points for rooftop farming, points are allocated for stakeholder engagement, including an equity and social justice plan with participatory budgeting and community partnering. There are also points for sourcing materials and equipment from companies that have pro-equity supply chains, and for local hiring practices.

Congratulations to Omni Ecosystems, Wight & Company and Recover Green Roofs for the three LAPT certified projects. You can download the LAPT for free at www.greeninfrastructurefoundation.org and projects are being accepted in this first round until May 30, 2020.

I am pleased to share with you that *CitiesAlive* is returning in 2020

to the beautiful city of Philadelphia from November 15 to 18. Since 2011, Philadelphia has embarked on a program to invest billions of dollars in green infrastructure to address its stormwater management challenges. Philadelphia Water is also tracking the resulting social benefits associated with employment, economic stimulus, crime reduction, aesthetic and property tax improvements. In the months to come, we'll be covering more of the successes and challenges associated with implementing Green City, Clean Waters, the City's 25-year plan to use green stormwater infrastructure to regenerate Philadelphia. Please save the date and join us in November 2020.

I hope you all enjoy the festive season and look forward to advancing our industry in 2020 with you!

Sincerely yours,



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

GO FOR IT: HOW TO GET YOUR PROJECTS CLIMATE POSITIVE

Landscape projects have the ability to remove more carbon from the atmosphere than they emit. 2018-2019 Landscape Architecture Foundation Fellow Pamela Conrad created the free, web-based Pathfinder tool to help you calculate the point (in years) that a project becomes climate positive. Within the tool, you can then make adjustments to the design and materials to see how they affect the time to positive. The Pathfinder tool: <http://app.climatepositivedesign.com/>

2019 AWARDS OF EXCELLENCE WINNERS



Photo courtesy Chantelle Gubert. Left to Right: Steven Peck, GRP, GRHC, Awards Host; Karla Dakin, K. Dakin Design; Andy Creath, Green Roofs of Colorado; Richard Sutton, Research Lifetime Achievement Award; Kathryn Ancaya, Living Roofs Inc.; Brendan Shea, Recover Green Roofs; Mark Morrison, GRP, MKM, Landscape Architecture; David Stokes for Jeffrey L. Bruce, GRP, Chair's Award; Allan Burchell, GRP, Urbanstrong; Tom Walsh, GRP, Parker Interior Plantscape Inc.

GREEN CITY, CLEAN WATERS IMPACT

A study of the multiple economic and social impacts of the first five years of the Green City, Clean Waters initiative by Philadelphia Water Department to invest in green stormwater infrastructure projects is now online. CitiesAlive 2020 will be held in Philadelphia November 15-18 2020. To download the study, see econsultsolutions.com/green-city-clean-waters/

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ON THE ROOF WITH...

THREE ROOFTOP FARMERS

REFLECT ON SOCIAL BENEFITS

INTERVIEW BY STEVEN W. PECK, GRP, HONORARY ASLA

Just ten years ago, you could count the number of rooftop farms on one hand! Now there are perhaps 100. This is no doubt due to the fact that rooftop farmers are not only a resilient bunch, but the ultimate multi-taskers too. Rooftop farming is still very much in its infancy, yet these farms are already making a unique and multifaceted contribution to the communities they serve. Three outstanding urban farmers from different regions reflect on the social aspects of what they do, in this special 20th Anniversary Edition of On the Roof With... Arlene Throness, Urban Farm Manager, Ryerson University, Toronto; Jamie Wallace, Director of Operations, Urban Harvest STL, St. Louis; and Ben Flanner, Co-Founder and CEO, Brooklyn Grange, New York City.

Living Architecture Monitor (LAM): *In what ways does growing food on the roof also meet or support social objectives, such as education, justice, and engagement?*

Arlene Throness (AT): In addition to the abundant harvest, one of the greatest advantages of having a rooftop farm here on the Ryerson University campus is the opportunity for people to enjoy the space, meet other garden enthusiasts and learn practical skills in urban farming. We had over 800 people visit the farm this year. It's a unique space, located in the heart of Toronto's downtown core, where people can interact with soil, plants, insects, birds and microbes. It's easy to forget we're on a roof.

Jamie Wallace (JW): Education and engagement is a huge component of what we do. We educate the community on urban agriculture, equitable food access for underserved communities,

and on the importance of eating fresh, local foods. In 2019 we graduated 37 interns from our Leadership in Urban Agriculture program and had nearly 700 students visit on field trips. In total, this year we welcomed over 2,700 visitors - whether they were visiting for educational purposes, attending an event, or just satisfying their curiosity about our rooftop farm.

Ben Flanner (BF): We run a farming operation which I'm really proud of, and grow nearly 100,000 lbs. of nutritious vegetables every year. And the education which takes place on our roofs is just as important as our food production. We host nearly 200 events per year which include a massive amount of education on healthy living, healthy lifestyles, nature, and of course – Green Infrastructure. Our educational non-profit partner, City Growers, has also hosted 50,000 NYC youth over the past nine years



A COMMUNITY DINNER IS HOSTED AT BROOKLYN GRANGE ROOFTOP FARM IN LONG ISLAND CITY, QUEENS

on our farms for educational field trips, after school programs, and summer camp sessions. Learning how food is grown is really important for our future generations – especially kids growing up in urban centers without regular access to greenspace, nature and traditional agriculture.

LAM: *It seems that using rooftops for farming provides greater employment and volunteer opportunities than say an amenity green roof, or sedum roof? Is this true and if so, how do your operations generate jobs and volunteer opportunities?*

BF: We now employ 20 full time people, in addition to at least that many seasonal crew, between the three areas of our business: Agriculture, Design & Build, and Events. This employment

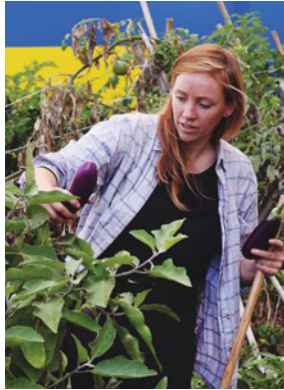
occurs on our three leased roof farms, plus in other green spaces all over the city. And yes, for sure – agriculture is a much higher rate of labor per square foot of maintenance compared with, for example, tending to a green roof planted with sedum.

JW: Our organization operates three rooftop farms in addition to several other at-grade sites, and a growing installation in Busch Stadium where the St. Louis Cardinals play baseball. Because all of our locations are food-producing, they require regular water and maintenance, much more so than a traditional sedum roof. As a non-profit organization, our staff is relatively small with six full and part-time employees, and we rely on the incredible amount of support we receive from interns and community volunteers to do



Image courtesy Brooklyn Grange

ROOFTOP FARMER PIONEERS



ARLENE THRONESS

Passionate about growing, sharing and enjoying food Arlene is the Urban Farm Manager at Ryerson University where she manages a quarter-acre rooftop farm. She studied Food Security at Ryerson's Chang School, earned a Bachelor of Arts in Political Science and Human Geography at Concordia and is a graduate of Linnaea Farm's Ecological Garden Design Program.



BEN FLANNER

Co-founder and CEO of Brooklyn Grange, a rooftop farm, sustainable events venue, and landscaping company based in NYC. More than 50,000 students from grades K-12 have visited the farm since 2011.



JAMIE WALLACE

The Director of Operations at Urban Harvest STL Jamie loves helping people make meaningful connections with their food and farmers. She has spent the majority of her career in the hospitality industry while cultivating a passion for local food systems.

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this work and support our collective impact.

AT: The Urban Farm team has steadily grown as we expand our programming and operations. We began the project in 2014 with two part time staff and 20 dedicated volunteers who converted the Andrew and Pringle Environmental Green Roof on the George Vari Engineering and Computing Centre into an urban farm. Today we have three full-time staff, three part-time staff and six paid student positions in summer and fall. Our team will grow again in 2020 when we open our second site across the street on the new Daphne Cockwell Health Sciences Complex, which will be the first purpose-built rooftop farm under Toronto's Green Roof bylaw.

LAM: *Most of the rooftop farms I have visited have a robust relationship with the communities in which they operate. How do you approach this with your farming operations? What would you say are the main community benefits to having a rooftop farm nearby?*

JW: It's funny you ask - the FOOD ROOF Farm came into existence because our founder, Mary Ostafi, was a downtown resident without access to green space. She and many other downtown residents had the desire to grow their own food but lacked a space to do so. They started a community garden first by renting an under-utilized city lot, but were asked to relocate several times. After moving the garden repeatedly, Mary and her husband, who are both trained architects, began to look at the available rooftop space downtown. The FOOD ROOF Farm was built with community in mind and has ten garden plots reserved for downtown residents, along with a community hub space where we host educational workshops and events. One of the biggest advantages of a rooftop farm in downtown St. Louis is that it offers an opportunity to connect city residents with a local food system. They don't need to go far to learn about growing their own food or to see it in action.

AT: The Urban Farm is a very beloved space at Ryerson. It truly is our campus farm. Everybody pitches in and helps out to keep the farm running, whether on the farm or behind the scenes. No matter how busy volunteers are throughout the academic year, they never miss a shift on the farm as they say it's what allows them to decompress and re-energize in times of stress.

BF: It is important to find locations where we can engage at ground level too – especially by supporting the local economy. Accessibility is also a huge priority for us as well. We want to offer the public as much opportunity as possible to visit.

We have free open days at two farms, now on both days of the weekend, every weekend through the season. In terms of events, we are dedicated and proud to offer dozens of affordable educational workshops per year. This year, we were particularly excited to partner with a local food pantry. We secured funding via a generous grant that allows us to harvest, deliver, and donate thousands of pounds of free food, where it will be distributed to



THE ROOFTOP FARMS: BY THE NUMBERS

ABOUT URBAN HARVEST STL AND THE FOOD ROOF FARM

NUMBER OF EMPLOYEES: 6
NUMBER OF FARM SITES: 7
AVERAGE FOOD PRODUCTION ON THE FOOD ROOF: 2,500 LBS/YR
TOTAL NUMBER OF VOLUNTEERS: 828 VOLUNTEERS + 37 INTERNS;
2,344 VOLUNTEER HOURS
TOTAL AMOUNT OF PRODUCE DONATED: 50 TO 60 PER CENT

ABOUT BROOKLYN GRANGE

NUMBER OF EMPLOYEES: 20 FULL AND 20 SEASONAL
NUMBER OF FARM SITES: 3
AVERAGE FOOD PRODUCTION: 100,000 LBS/YR
TOTAL NUMBER OF VOLUNTEERS: NA. HOSTED 20,000 VISITORS, 2019

ABOUT RYERSON ROOFTOP FARM

NUMBER OF EMPLOYEES: 3 FULL, 3 PART AND 6 SEASONAL
NUMBER OF FARM SITES: 2 (AS OF 2020)
AVERAGE FOOD PRODUCTION: 8,900 LBS/YR
TOTAL NUMBER OF VOLUNTEERS: 100 HOSTED 800 VISITORS IN 2019
TOTAL AMOUNT OF PRODUCE DONATED 2019: 18 PER CENT



Image courtesy Eldar

our local Sunset Park, Brooklyn community.

LAM: *Are you planning anything in the future that supports or engages the community, particularly disadvantaged communities?*

BF: We worked hard to develop the capability to accept SNAP (Food Stamp) benefits in the middle of this season, and we very much look forward to a full season accepting those transactions. The food pantry relationship mentioned above will also be scaling up in this coming season, so we are excitedly planning and planting for that. Running a good business that operates within its community is an ongoing process. We are always seeking additional dialogue with neighbors to learn from them, and to help us all steer the business in a positive direction.

AT: We're currently doing accessibility upgrades on the rooftop farm in order to increase programming and engagement. This expansion, along with the new rooftop farm, will include accessible garden beds, a community gathering space and a greenhouse for year-round education. We'll continue to offer a range of programs, including drop-in volunteering, hands-on workshops, an Urban Farm training series and guided field walks and tours. We're increasing partnerships with campus groups, including a project with Aboriginal Initiatives to grow the four sacred medicines and native plants that support our surrounding

ecosystem. We continue to donate produce to The Good Food Centre where students can access emergency food relief and share community meals.

JW: Absolutely! Urban Harvest STL believes in food rights - all members of our community should have equitable access to fresh, healthy food regardless of socio-economic status, race or location. We grow healthy produce across a network of seven urban farms in the heart of St. Louis, Missouri, and empower communities to cultivate equitable access to healthy, sustainably grown food. Our farms are located in an area of low access, where food insecurity is prevalent. This means that there are few grocery stores nearby offering fresh, affordable foods. To increase the availability of fresh produce, we donate over half of the food we grow to partner organizations who then distribute the food within our community. We strive to be a resource and an inspiration to anyone who wishes to learn about growing their own food or integrating sustainable food choices in their daily lives. We are currently planning our program calendar for 2020 -- which includes collaborations with local chefs, wellness and agriculture experts -- to engage members of our FARMily through educational and celebratory food-focused events.

THE WONDERS OF DALEA PURPUREA

BY PROFESSOR BRADLEY ROWE, MICHIGAN STATE UNIVERSITY, EAST LANSING

Dalea purpurea (syn. *Petalostemon purpureum*) (purple prairie clover) is a herbaceous perennial native to most of North America within USDA hardiness zones 3 to 8 except for parts of the east and west coasts. It is widespread in the grasslands of the Great Plains. Although its common name suggests that it is a true clover (genus *Trifolium*), it is actually a member of the plant family Fabaceae (bean family). Because it is in the bean family, the plant is able to fix nitrogen in the soil. The plant also has some medicinal uses, its flowers attract butterflies, and it has no serious insect or disease problems.

The species requires full sun and typically grows 30 to 90 cm (1 to 3 ft) tall with a spread of 30 to 45 cm (1 to 1.5 ft). Depending on the year, it flowers during June to August and features numerous small showy purple flowers arranged on spikes up to 5 cm (2 in) long located at the end of the branches. The compound leaves are 1 to 4 cm (0.4 to 1.6 in) long with 3 to 7 narrow leaflets within each leaf. When mature, the plant has a coarse long taproot that can reach 1.7 to 2.0 m (5.5 to 6.5 ft) deep.

In its natural environment, *Dalea purpurea* grows well in sandy, well drained soils and gets much of its drought tolerance from the aforementioned deep taproot. Thus, one would assume that it may not do well on a shallow green roof. However, data collected in green roof plant evaluations doesn't support that assumption.

Dalea purpurea as well as *Dalea candida* and *Dalea villosa* were all trialed at the Chicago Botanic Garden (Hawke, 2015, Chicago Botanic Garden Plant Evaluation Notes, Issue 38).

Dalea purpurea was tested at substrate depths of 10, 15, and 20 cm (4, 6, and 8 in) and given an overall good performance rating of 4 stars (out of 5) for strong performance at all three depths. However, the plants exhibited larger flowers when grown in 20 cm compared to 10 cm with an average flowers size of 5 cm (2 in) compared to 3.8 cm (1.5 in). Plants in the deeper substrate also flowered earlier and for a longer period of time. Regardless, they all established quickly and remained

vigorous through the five year trial period. Plots were, however, watered regularly during the first year to ensure establishment and then during extreme drought periods in subsequent years.

In a plant evaluation study at MSU to measure long-term performance that began during May 2013, eighteen roof platform sections were filled to a substrate depth of 10 cm and seeded with a mix of native perennials and grasses. In addition to *Dalea*

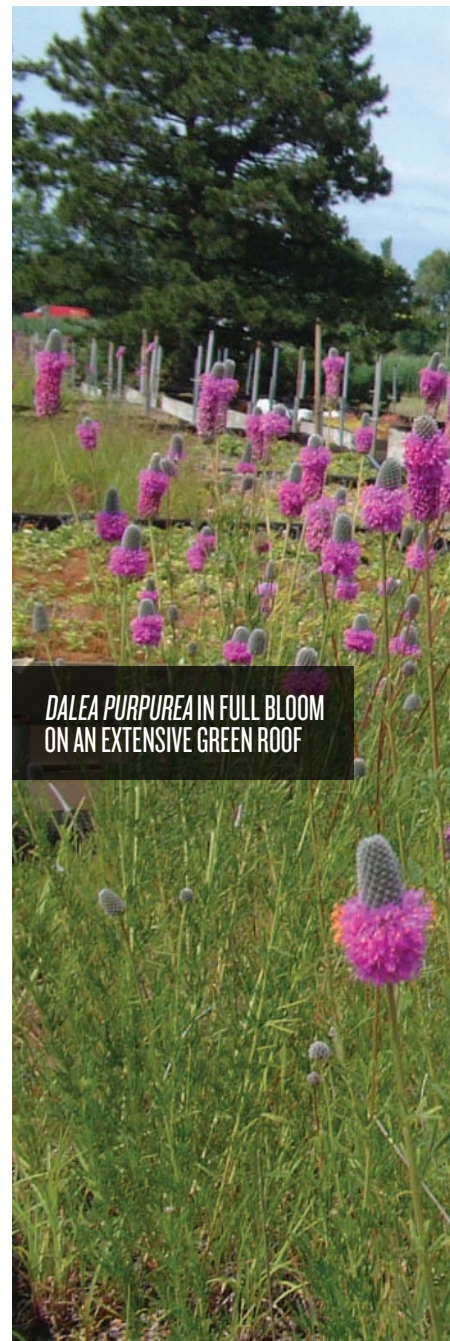




Image courtesy Brad Rowe

"IN ITS NATURAL ENVIRONMENT, *DALEA PURPUREA* GROWS WELL IN SANDY, WELL DRAINED SOILS AND GETS MUCH OF ITS DROUGHT TOLERANCE FROM THE AFOREMENTIONED DEEP TAPROOT."

- BRADLEY ROWE

purpurea, species included *Allium cernuum* (nodding pink onion), *Coreopsis lanceolata* (lanceleaf Coreopsis), *Liatris aspera* (rough blazingstar), *Morinda punctata* (dotted mint), *Ruellia humilis* (wild petunia), *Schizachyrium scoparium* (little bluestem), *Symphotrichum laeve* (smooth aster), *Tradescantia obiensis* (spiderwort), and *Verbena stricta* (hoary vervain). During the establishment period, plots were provided with overhead irrigation on an as-needed basis, however,

no supplemental irrigation has been provided since after the first season.

After seven growing seasons, *Sedum* spp. have encroached from neighboring plots and *Allium cernuum* is by far the dominant species. Most of the originally planted species have disappeared or are present in small numbers. One exception is *Dalea purpurea* which was able to survive the drought conditions during the spring and summer of 2016. During a 57 day period from May to July,

total rainfall was 3.28 cm (1.29 in), which was roughly a third of the normal rainfall for that time of year. One difference between our study and the Chicago Botanic Garden study is that after establishment we never supplied supplemental irrigation, whereas the CBG watered during drought periods. However, the species still survived over time.

Although *Dalea purpurea* has great potential for green roofs, evidence suggests that like most herbaceous perennials, irrigation would ensure plant health and long term survival.

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 co-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.

LIVING ARCHITECTURE PERFORMANCE TOOL THE FIRST CERTIFIED PROJECTS

BY ROHAN LILUAWALA, GRP, PROGRAM MANAGER



Green roofs and walls finally have a certification system comparable to LEED – a huge step towards cementing them as quality investments with dependable benefits. The Living Architecture Performance Tool (LAPT) is a rating system and best-practice guide with a goal of certifying that green roofs and walls are planned to achieve certain measurable and replicable performance benefits. Its development was initially started with Green Roofs for Healthy Cities but the program is being run by the Green Infrastructure Foundation, under an independent board and Technical Committee.

Under the LAPT, which is much like LEED in its structure, there are up to 110 points that can be earned towards four levels of certification. If widely adopted, the LAPT will increase the performance of living infrastructure and bolster industry-wide credibility. Designers, building owners, and maintenance professionals can use the LAPT to optimize the range of benefits possible from their projects, while policy makers can also use the tool to maximize public benefits and create effective policies for to incent living architecture. The LAPT is designed to work in all climates, and is for all types of projects - from straightforward, sedum based extensive green roofs to complex projects that integrate multiple green roofs and walls.

The development of the tool is being led by Lois Vitt Sale, FAIA, LEED Fellow; David Yocca, FASLA, AICP, LEED AP; Steven W. Peck, GRP, Hon. ASLA, Founder and President, GRHC; and Rohan Lilauwala, GRP, Program Manager, GIF. Lois and David, the two co-chairs of the Technical Committee have been deeply involved in the development, early adoption, and promotion of rating systems such as LEED and SITES.

In Washington, DC at the Grey to Green Conference in

October 2019, the Green Infrastructure Foundation announced the first LAPT certified projects. These are Adlai E. Stevenson High School in Lincolnshire, IL (Wight & Company, Omni Ecosystems, and Nedlaw Living Walls); Carroll Rooftop Farm in Chicago, IL (Omni Ecosystems); and the Harvard Business School McArthur/McCollum Building (Recover Green Roofs and Omni Ecosystems).

The pilot phase of this program offers innovative and forward-thinking organizations the opportunity to participate until May 31, 2020. Becoming involved

in the pilot phase can help you optimize the range of benefits possible for your project, demonstrate your leadership and innovation, and set the stage for long term performance while receiving recognition in the marketplace. GIF is planning to release Version 2.0 of the LAPT at CitiesAlive in Philadelphia, November 15-18, 2020. For further information or to register for the program, please visit greeninfrastructurefoundation.org/lapt or contact Rohan Lilauwala, Program Manager, Green Infrastructure Foundation, at rlilauwala@greenroofs.org.

CREDIT/POINT SUMMARY FOR THE THREE FIRST LAPT CERTIFIED PROJECTS

FOCUS AREA/CREDIT	POINTS AVAILABLE	ADLAI E. STEVENSON HIGH SCHOOL EAST BUILDING ADDITION	CARROLL ROOFTOP FARM	MCARTHUR/ MCCOLLUM BUILDING
I. PROCESS	5			
I.1 INTEGRATED DESIGN PROCESS	PREREQUISITE	YES	YES	YES
I.2 STAKEHOLDER AND COMMUNITY ENGAGEMENT	3	2	2	0
I.3 LIVING SYSTEMS EXPERTISE	2	2	2	2
2. WATER MANAGEMENT	25			
2.1 STORMWATER MANAGEMENT	PREREQUISITE + 16	16	16	12
2.3 IRRIGATION	5	1	0	0
2.4 WATER BALANCE	4	0	0	0
3. ENERGY CONSERVATION	14			
3.1 ENVELOPE THERMAL MODERATION	5	2	0	0
3.2 URBAN HEAT ISLAND REDUCTION	4	2	4	2
3.3 RENEWABLE ENERGY	2	2	0	0
3.4 HVAC INTEGRATION	3	3	0	0
4. HABITAT AND BIODIVERSITY	11			
4.1 PLANTS	4	4	4	4
4.2 GROWING MEDIA DEPTH AND COMPOSITION	2	2	2	2
4.3 HABITAT ELEMENTS	2	2	2	2
4.4 BIOMASS	3	1	1	1
5. HEALTH AND WELL-BEING	21			
5.1 BIOPHILIC DESIGN – VISIBILITY	2	2	2	2
5.2 BIOPHILIC DESIGN – ACCESSIBILITY	4	4	4	0
5.3 FOOD PRODUCTION	10	10	10	7
5.4 AIR QUALITY IMPROVEMENTS	3	3	1	0
5.5 ACOUSTICS	2	2	2	2
6. MATERIALS AND CONSTRUCTION	14			
6.1 STRUCTURAL SOUNDNESS	PREREQUISITE	YES	YES	YES
6.2 ENVIRONMENTALLY SENSITIVE MATERIALS	3	0	0	0
6.3 SUSTAINABLE MATERIALS	3	0	0	0
6.4 CONSTRUCTION WASTE MANAGEMENT	2	1	0	1
6.5 EQUITY-FOCUSED SOURCING AND HIRING	3	2	3	2
6.6 BIRD-FRIENDLY GLASS	3	0	0	0
7. POST-CONSTRUCTION	10			
7.1 OPERATIONS AND MAINTENANCE	PREREQUISITE + 2	0	2	2
7.2 FERTILIZER AND PESTICIDE USE	2	2	2	2
7.3 MONITORING	3	3	3	3
7.4 EDUCATION	3	3	3	3
8. INNOVATION	10			
8.1 NEW APPROACHES OR STRATEGIES	5	5	5	4
8.2 EXEMPLARY PERFORMANCE	5	5	5	1
TOTAL	110	81	75	56
		PLATINUM	GOLD	SILVER

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ADLAI E. STEVENSON HIGH SCHOOL EAST BUILDING ADDITION

LINCOLNSHIRE, IL
WIGHT & COMPANY, OMNI ECOSYSTEMS,
AND NEDLAW LIVING WALLS

The East Building Addition at Adlai E. Stevenson High School was needed for anticipated student growth. However, a visionary leadership team had a larger goal - to redefine the learning experience for students. The building addition is designed to be net-zero, achieve LEED platinum certification and Energy Petal certification from the International Living Future Institute. The project features integrated green elements, flexible learning environments and a focus on biophilia and wellness. Living architecture in the project takes the form of a 7,100 sf green roof, a 1,250 sf rooftop greenhouse, and two two-storey living walls each 600 sf.

The green roof is approached through an ecosystem lens and designed to be rooted in place, by featuring a wide variety of plant types and species from the surrounding prairie, meadow, and farm land uses. The green roof does not manage stormwater in isolation - it is integrated into a campus-wide stormwater

TEAM MEMBERS

ARCHITECT, STRUCTURAL ENGINEER,
MEP/FP ENGINEER
Wight & Company

GREEN ROOF DESIGNER
Omni Ecosystems

GREEN WALL DESIGNER
Nedlaw Living Walls

ARCHITECT
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OWNER
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CONSTRUCTION MANAGER
Gilbane Building Company

CIVIL ENGINEER
Eriksson Engineering Associates, LTD.

WATERPROOFING MANUFACTURER
IRRIGATION SYSTEM MANUFACTURER
Rainbird



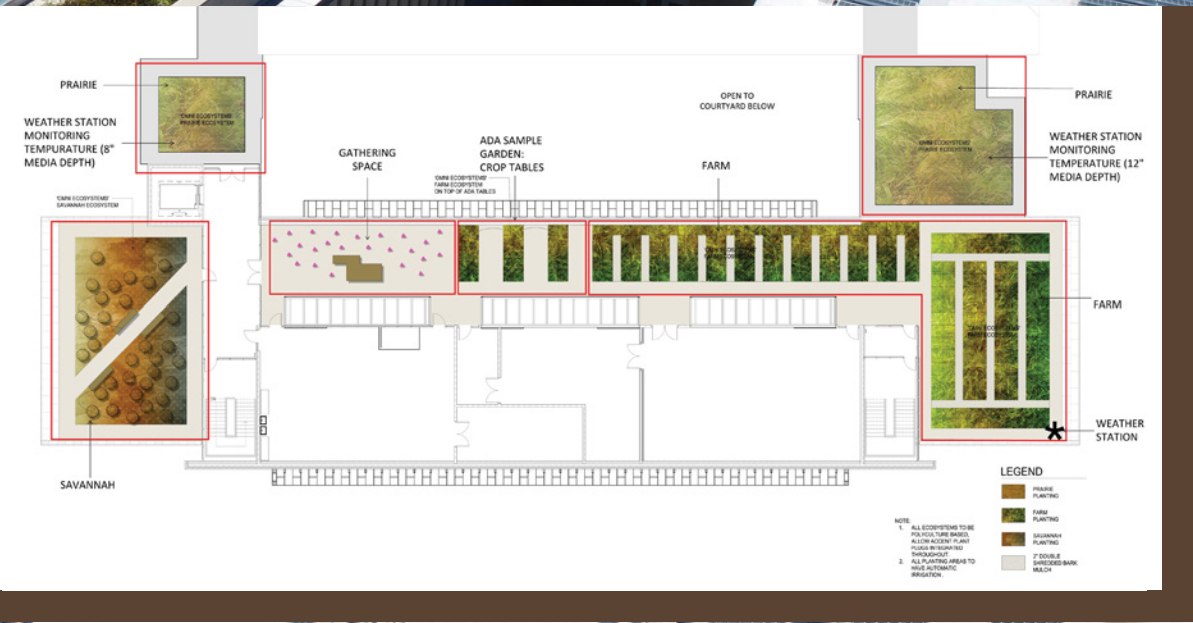
management system, designed to simulate natural hydrology. It was awarded the maximum possible credits through an alternative compliance path, by demonstrating no additional post-development runoff, and capturing over 90 per cent of total suspended solids in runoff.

Two 2-storey living walls installed in the atrium are integrated into the building's HVAC system, and treat return air to improve air quality and reduce outside air exchanges for greater energy efficiency. They were also found to reduce sound reverberation and produce natural sounds in the form of flowing water, improving the acoustics of the space. While the interior living walls were water intensive, they reuse 97 per cent of the water circulating through the system and humidified indoor air, improving the comfort of the building during the heating season.

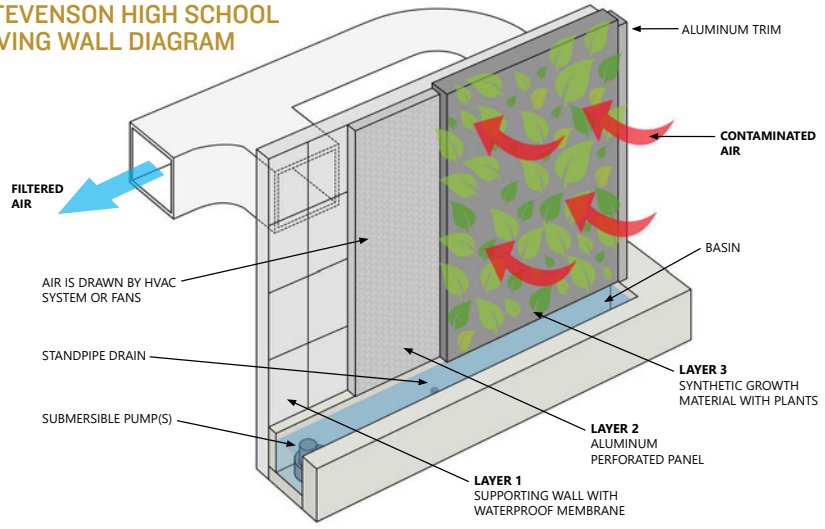
The project was awarded exceptional performance credits in five areas, as well as innovation credits for a number of



**STEVENSON HIGH SCHOOL
EAST BUILDING ADDITION
THE FIRST PLATINUM
CERTIFIED PROJECT**



**STEVENSON HIGH SCHOOL
LIVING WALL DIAGRAM**



unique features: the ADA accessible raised farm planters on the roof; the rooftop greenhouse that extends growing season for food production and provides greater educational opportunities; Net Zero Energy Certification pursuit of the project; and the contributions to biophilia and natural light brought by the 40 foot courtyard that is not recognized anywhere else in application.

The project scored extremely high in multiple categories, demonstrating what the educational buildings of our future should look like – flexible, innovative, healthy, biophilic, and most importantly, integrated into the curriculum and student learning-focused.

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A BIRDS EYE VIEW OF THE CARROLL ROOFTOP FARM

Image courtesy Omni Ecosystems

TEAM MEMBERS

ARCHITECT
Perimeter Architects

FARM MARKETING & OPERATIONS
The Roof Crop LLC

GENERAL CONTRACTOR
LG Construction

GREEN ROOF DESIGNER,
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Omni Ecosystems

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CARROLL ROOFTOP FARM

CHICAGO, IL
OMNI ECOSYSTEMS

The Carroll Rooftop Farm is a working urban farm and much more, located in Chicago’s West Loop. The site features four roofs, three of which are farmed commercially, and one 1,200 sf rooftop lawn used for observation and research. The food meadow is supported by an exceptionally lightweight growing media ranging in depth from four to eight inches. The roof is a polyculture system, combining perennials and food crops to establish a healthy nutrient cycle and generate bountiful harvests. Perennial cover crops, many of which are edible, create a stable and established ecosystem. Seasonal seedling crops, including tomatoes, peppers, and eggplant, are added to diversify the rooftop menu. The roof produces 44 crops in more than 100 varieties including apples, potatoes, radishes, turnips and raspberries. Every week during harvest season, produce from the roof is picked and packaged onsite before it’s sold to nearby restaurants and consumers.

The building below the commercial rooftop farm houses three education-focused non profits. Two of these are after-school programs which incorporate the farm into much of their

programming, teaching lessons in ecology, biology and food production, using the green roof as their classroom. Urban youth with little to no knowledge of agriculture are provided invaluable exposure to a fully-functioning farm. Select students who wish to continue their education are offered summer employment with the green-roof company. The third organization is a coalition of Chicago chefs who create food and nutrition programming for local schools. Rooftop produce is occasionally used in their classroom demonstrations and lessons, and the farm collabo-

rates with this group. The project scored highly on stormwater management, able to capture the volume of water from a 99th percentile event in Chicago. It also scored highly in the Habitat and Biodiversity, Health and Well-Being, and Post-Construction categories, where its ecosystem approach, availability for human use, and careful programming and community engagement were rewarded. The project was also the recipient of a 2017 Green Roofs for Healthy Cities Award of Excellence in the Intensive Industrial/Commercial category.



HARVARD BUSINESS SCHOOL MCARTHUR/MCCOLLUM BUILDING ROOFTOP MEADOW

BOSTON, MA
RECOVER GREEN ROOFS & OMNI ECOSYSTEMS

The seven sections of a multi-tiered roof on Harvard Business School's McArthur Hall and McCollum Hall feature a structurally complex extensive meadow, designed to be self-regenerating throughout the years.

An ultra-light media blend, developed by Omni Ecosystems as part of its 'comprehensive green roof' system mimics the physical, chemical, and biological aspects of soil. This allows for a diverse plant palette capable of growing a huge variety of wildflowers and native species, while being extremely lightweight, suitable for a retrofit of

an existing building with limited structural loading capacity.

The plant design takes inspiration from the adjacent Charles River ecosystem in Boston; milkweed, aster, rudbeckia, and other native perennials blend into a seeded mix of quickly germinating cover crops including flowering buckwheat, daikon radish, and clover. The meadow seed mix unifies the seven roofs while distinct clusters of herbaceous and woody perennials create a distinctive patterning. Honeybee hives, managed by The Best Bees Company, are monitored for data on bee foraging preferences. A creative

irrigation plan secured the seeded media during establishment and efficiently transferred water to plants, uninterrupted between all levels on the multi-tiered roof.

The project engages the school community and alumni in many ways: serving rooftop-foraged daikon radishes in the Dining Hall, giving away rooftop honey to alumni, and potting and distributing plants from the previous sedum green roof to staff and faculty. During installation, extreme care was given to salvaging and reusing building materials to maintain the existing heritage structure.

The project scored well in the Habitat and Biodiversity category, achieving credits for Species Variety, Plant Families, Native/Locally Adapted Plants, and Pollinator Support. It also scored well in the Post-Construction category, receiving credit for its robust maintenance plan, monitoring, and plans for community education and engagement.

The McArthur/McCollum rooftop meadow is the first of its kind in the region, and was the recipient of a 2018 Green Roofs for Healthy Cities Award of Excellence in the Extensive Institutional category.





HARVARD BUSINESS SCHOOL
MCARTHUR MCCOLLUM BUILDING

Images courtesy Recover Green Roofs

TEAM MEMBERS

GREEN ROOF DESIGNER AND INSTALLER
Recover Green Roofs

GREEN ROOF DESIGNER AND MANUFACTURER
Omni Ecosystems

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CONGRATULATIONS 2019 AWARDS OF EXCELLENCE WINNERS

BY BLAINE STAND

Every year, Green Roofs for Healthy Cities organizes the Green Roof and Wall Awards of Excellence for excellence in design, research, and policy. In the Fall issue, we profiled 2019's outstanding design projects, which featured a farm for a busy urban hospital, a living wall that utilized the very research subjects housed in the building, and spaces that speak with the local landscapes and biodiversities they inhabit. This issue, we present the individual awards, celebrating achievements in research, advertising, policy, and overall contributions to the industry. Congratulations to the 2019 award winners.



L to R: Matt Barmore, Greenrise, Chair, GRHC; Joe DiNorcia, Rooflite; Steven Peck, President GRHC. Photo courtesy C. Gubert.

CATEGORY

Advertising Award

AWARD WINNER

Skyland/Rooflite

Founded in 2005, Skyland USA, producer of rooflite soil products, has become known as the premier provider of high-quality green roof media in the industry. With a proven track record, Skyland USA has provided rooflite soil for more than 1000 green roof projects across the U.S. and the Americas. They are experts in green roof media, and long-time supporters of Green Roofs for Healthy Cities through their participation on the board of directors, research support; and the Living Architecture Monitor magazine providing case studies, interviews, and expertise.



L to R: Matt Barmore, Greenrise; Chair, GRHC; Liz Hart Morris, Henry Company; Steven Peck, President, GRHC. Photo courtesy C. Gubert.

CATEGORY

Civic Award

AWARD WINNER

Elizabeth Hart-Morris, GRP;
Green Roof Info Think Tank

Elizabeth Hart-Morris is the Executive Director of the Green Roof Info Think-tank, Director of Vegetated Roofing at Henry Company, and Green Roof Professional Representative on the Green Roofs for Healthy Cities Board of Directors. Elizabeth, with the Green Roof Info Think Tank, worked to successfully advocate for the successful passage of the Ecoroof Requirement, requiring green roofs on all new construction over 20,000 square feet in the Central City area, as part of Portland's Central City 2035 Plan in 2018. She is a passionate and dedicated green roof advocate who, for more than a decade, has worked tirelessly to promote green roofs. She is a leader and advisor, building bridges between green roof communities across the Pacific Northwest, and infusing her innate passion into everything she does.



Jeffrey L. Bruce, on the Chicago City Hall green roof. Photo courtesy Jeffrey L. Bruce and Co.

CATEGORY

Board Chair's Recognition Award

AWARD WINNER

Jeffrey Bruce, ASIC, FASLA,
GRP, LEED; Principal,
Jeffrey L. Bruce & Co

For more than 15 years, Jeffrey L. Bruce won numerous awards of excellence for his design work, chaired GRHC for nine years, pioneered the Net Zero Water Training Course, and helped promote green roofs internationally through the World Green Infrastructure Network. See his acceptance speech on page 22. He was instrumental in the development of the Green Roof Professional (GRP) training and accreditation program.

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For questions about joining the editorial review board or submitting manuscripts, contact Dr. Reid Coffman at rcoffma4@kent.edu

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.

DR. RICHARD SUTTON WINS THE LIFETIME ACHIEVEMENT AWARD



L to R: Dr. Reid Coffman, Kent State, Chair, GRHC Research Committee; Dr. Richard Sutton; Steven Peck, President, GRHC; Matt Barmore, Greenrise; Chair, GRHC. Photo courtesy C. Cubert.

This year, in place of our Annual Research Award, we are pleased to be granting a Lifetime Achievement Award in the field of green roof research to a very deserving member of our community, Dr. Richard Sutton, Emeritus Professor of the University of Nebraska – Lincoln. This award signifies a momentous contribution to advancing our comprehension and understanding of living architecture.

Dr Sutton was recognized for his extraordinary contribution in scholarship, leadership, and knowledge. Specifically, Dr. Sutton's investigations have led to discoveries and understandings of using the North American grassland and prairie ecologies as models for green roof systems; his ceaseless leadership and

advocacy has expanded the research domain; and his compassionate mentoring of younger faculty has led to the foundations for current and future living architecture growth in institutions worldwide.

Over his career, he has pursued many green roof topics including aesthetics, biodiversity, costs, and innovative materials. Most impactful has been his studies of the way in which roofs mimic natural prairie ecosystems.

Sentiment about his work can be summed up by a few comments of his peers:

“Sutton illuminated the often misunderstood components of green roofs; the growing medium and plants. He was able to connect green roofs with ecosystem function and then to local landscapes.”

As a scholar:

“I was lucky to meet him early in my living architecture journey, and his influence on my perspective as a scholar and teacher has been profound.” He has expanded the minds of green roof designers for over a decade.” and “his work will have impact for many years to come”

“Richard has provided a monumental impact upon the research environment of living architecture through his scholarship, leadership and knowledge. I would say it was his lessons of involving and motivating younger faculty in collaborative agendas that has been so unique. His books, papers, and pursuits will continue to be pervasive for generations of students, scholars, instructors and researchers.”

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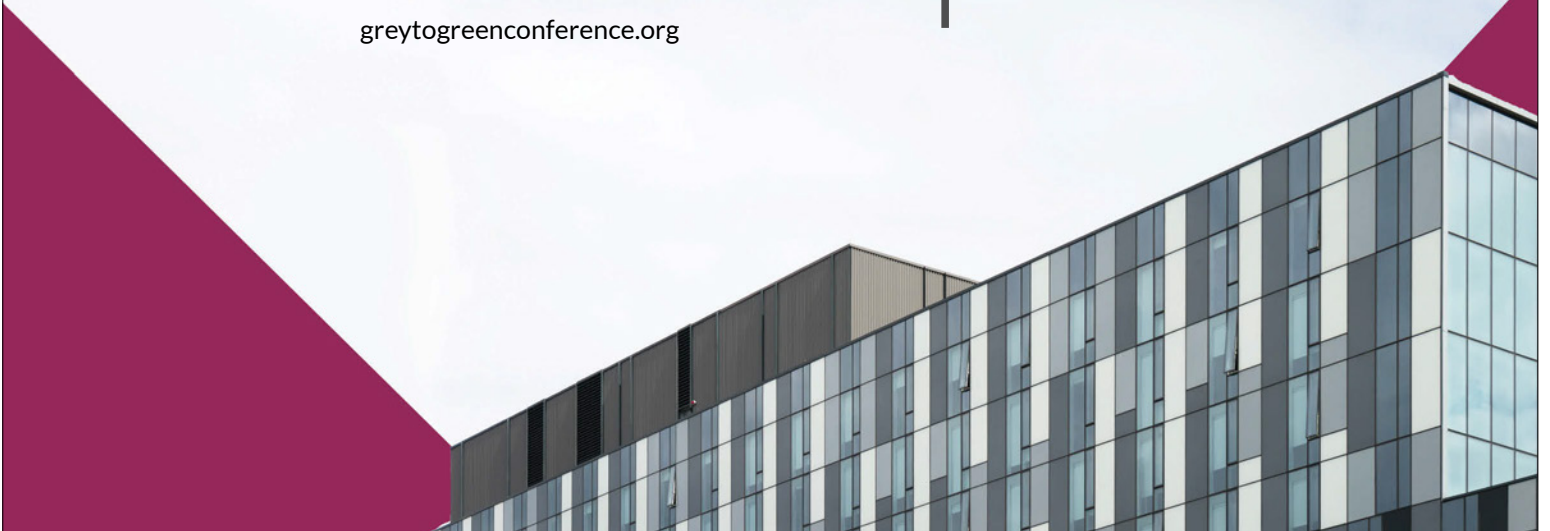


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A RETROSPECTIVE ON FIFTEEN YEARS OF INDUSTRY BUILDING

JEFFREY BRUCE'S ACCEPTANCE SPEECH OF THE CHAIR'S AWARD OF EXCELLENCE FOR OUTSTANDING CONTRIBUTIONS TO THE INDUSTRY, DELIVERED AT THE DC GREY TO GREEN CONFERENCE, OCT. 29, 2019

Thank you Chairman Barmore, the GRHC Board, Steven Peck, the GRHC staff and attendees. I regret that I am unable to attend this annual celebration of our industry. I am deeply humbled and honored to have been selected for this prestigious award. We all migrate to this organization under different circumstances but are bound by the passion of the possibility that this industry can change the world in fundamental ways. My first presentation at GRHC, 15 years ago here in Washington, DC was titled the "The Weakest Link: Challenges in Construction Implementation of Green Roofs". It detailed the emergence of green roofs and how the construction industry was ill prepared to implement the technology. At that time, there were no guidelines, no public policy, and significant resistance to adoption by owners, general contractors, insurance underwriters and public officials.

Flash forward to today and realize the progress we have collectively accomplished. It is astonishing and rewarding to see how our passion can fuel a world movement in the short period of 15 years. Our accomplishments are numerous, detailed and comprehensive. Training manuals and a Green Roof Professional certification program have produced a thousand professionals that understand best practices. We've advocated for mandatory green roof policies in Toronto, Chicago, New York, Washington DC, Denver, Portland and San Francisco and many other cities to help drive market demand. We've had policy symposia in over 100 cities, significant advancement in funding for and output from academic researchers, the

"IT IS IMPERATIVE TO CONTINUE TO ADVOCATE TO CORPORATE AND PUBLIC INTERESTS THAT THEY HAVE AN OBLIGATION TO INVEST IN THE DEVELOPMENT OF OUR INDUSTRY WHICH WILL SECURE ITS FUTURE FOR ALL."

- JEFFREY BRUCE

educational Living Architecture Centers of Excellence, the Living Architecture Performance Tool to promote comprehensive design and maintenance practices, and the creation of World Green Infrastructure Network representing over two dozen countries around the world. I would like you to give yourself a standing ovation!

I may be the recipient of this award today but it must be shared by everyone in this room and everyone that contributed resources, time and energy to this meaningful endeavor that binds us to a common vision. A fundamental belief that has driven my passion for this organization is that we all need to be motivated beyond personal interests and corporate proprieties to contribute unselfishly to a collective vision toward the advancement of the industry. We all can directly witness how a rising tide lifts all ships to the benefit of all. Compare the impact of the market share of the green roof industry in these intervening 15 years. It is imperative to continue to advocate to corporate and public interests that they have an obligation to invest in the development of our industry which will secure its future for all. No single company or collection of companies could have been able to achieve all the accomplishments of GRHC.

While my name is on this award, everyone that answered my phone calls, agreed to sit

on a committee, provided an educational session, attended a conference or symposium, or provided leadership on the board should understand that they are the real recipients of this recognition. I enter the coming year with great pride and optimism about what we will accomplish. It will require investment, commitment and dedication, but our future is bright and filled with new possibilities.

In closing I would like to thank each one of you for your guidance and counsel, for your unyielding advocacy on my behalf, for your unselfish contribution of knowledge, but most of all for your warm and lasting friendship. Fifteen years ago, I would have never imagined that I would find a family of peers that would change my life in such meaningful and fundamental ways. To this family I remain eternally grateful and humbled to share such rich experiences and accomplishments. I can only dream about what we can collectively accomplish in the future. I look forward to continuing our dialogue and expanding our passionate family. Thank you for your sincere support and recognition to which I am deeply honored to share the spotlight with all of you today.

Sincerely yours,
Jeffrey L. Bruce, GRP, FASLA



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DOES GREEN INFRASTRUCTURE DEVELOPMENT HAVE TO RESULT IN GENTRIFICATION?

BY JOYCE MCLEAN

Those of us who live in cities have all been exposed to the effects of gentrification. Remember that neighborhood that used to be run down, kind of scary really, that has been so transformed that it's now a desirable place to live?

How did that happen? Is it a good thing overall? What about the lower income people who ultimately get forced out when a gentrified area goes from bad to good? What happens to them? Is this an inevitable part of the urban revitalization cycle? What is gentrification exactly?

Gentrification is a general term applied to urban areas when wealthier people arrive to live, and a related increase in rents and property values occurs, creating distinct changes in that area's character and culture. It's typically used in a negative sense, because of the implied and actual displacement of poor people by wealthier outsiders.





Images courtesy Wikipedia Commons

"IF WE WANT TO BUILD GREEN AND EQUITABLE COMMUNITIES, IT ALL COMES DOWN TO POLICY, AS DICTATED BY VARIOUS LEVELS OF GOVERNMENT THROUGH THEIR URBAN POLICIES, FUNDING AND CONSTRUCTION PROPOSAL CALLS."

- JOYCE MCLEAN

Across North America, there are many examples of cities that have seen once impoverished areas now thriving as a result of gentrification, spurred on in part by green infrastructure investments. Think of New York's High Line, Toronto's Distillery District or the Mission District in San Francisco.

According to a March 2019 study by the National Community Reinvestment Coalition, more than 1000 neighborhoods across the US experienced gentrification between 2000 and 2013. Seven cities accounted for nearly half of these changes – Baltimore, Chicago, Los Angeles, New York, Philadelphia, San Diego and Washington DC. This makes sense. Cities attract people. They come for work or for education and are drawn to stay by attractive community amenities.

Washington saw 40 per cent of its neighborhoods become gentrified during 2000 – 2013, displacing approximately 20,000 people. Overall, according to Jason Richardson, one of the study's authors and the director of research for the National Community Reinvestment Coalition, "We've also shown that revitalization of struggling neighborhoods is unevenly distributed. The big investments that fuel gentrification and cultural displacement didn't reach most of the nation's poorest neighborhoods and rural areas."

There is corresponding evidence to suggest that the greener the neighborhood, the higher the income of the residents. "Green" driven gentrification is not a new concept. In the 1980s, environmentalists began to notice that poor urban areas, diverse in language and culture are also the ones with the power plants, the landfills, the polluting factories – all of which fuel our consumptive society – but all of which are sited away from those with privilege and power. This recognition birthed the eco-justice movement and drew attention to the fact that where you live and your economic status, very much dictated the kinds of surroundings you live in, including the levels of air and noise pollution you are subjected to.

We know that green infrastructure investment in our cities has massive health, environmental and economic benefits. Lowering the urban heat island effect by embracing green infrastructure – trees, green roofs, green walls, community gardens, for example, has tremendous positive benefits for all, including reducing greenhouse gas emissions by using less air conditioning and protecting people's health. We know about the mental and physical health benefits of being in green space; we know about the recreational pluses of living close to green space and about better management of storm-

water; and we know how re-connecting with nature in our cities is essential to community and individual well-being.

If we want to build green and equitable communities, it all comes down to policy, as dictated by various levels of government through their urban policies, funding and construction proposal calls. Tackling climate change, according to a 2017 report by the California Environmental Justice Alliance, is also about equality.

Elizabeth Yeampierre, the head of UPROSE, in Brooklyn couldn't agree more. "It's not just happening here in Brooklyn," Yeampierre said. "It's happening all over the country, where really amazing, diverse communities are being homogenized." The opening of the High Line, an elevated park on the west side of Manhattan, led to the rapid gentrification of the surrounding neighborhood. In Washington, DC, new parks and bike lanes along the north side of the Anacostia River set off a rush of development that sent many longtime residents packing.

Yeampierre argues that cities should see climate change as an opportunity to address inequality, arguing officials should reinvigorate struggling neighborhoods, not only by cutting pollution and shoring up affordable housing, but also by

creating new jobs preparing for a new climate future, installing community solar PV and/or building green infrastructure.

Chicago's 606 Trail has some similarities to New York's High Line. This is a signature initiative by former Chicago Mayor Rahm Emanuel. His vision was to create 800 new parks, recreation areas and green spaces throughout Chicago. Extensive community consultation followed once this former rail line was identified. The 606 Trail is now an elevated 2.7 mile (4.3 km) multi-purpose trail connected to six street level parks. Unfortunately, while the linear park is a success, gentrification did contribute to ousting poorer residents.

According to a December 2018 Chicago Business article, "The public and not-for-profit sector did the infrastructure – the parks and the transportation route – but then housing was left to the marketplace," said Alessandro Rigolon, a professor of recreation, sport and tourism at the University of Illinois, and co-author with Jeremy Nemeth of the University of Utah on their July 2019 study, entitled Green Gentrification or 'Just green enough: Do park location, size and function affect whether a place gentrifies or not?'. "And of course, if you leave it up to the marketplace,

gentrification is almost inevitable around such a desirable amenity," said Rigolon.

Officials in Los Angeles are also grappling with green gentrification issues. On one side are advocates for parks, health equity and eco-justice and on the other are developers who want to maximize their profits. Three proposals under consideration in L.A. to help keep neighborhoods intact while greening them are:

- Rent control or incentives for developers, such as inclusionary zoning or density bonuses or allowing "granny flats" in existing properties to ensure affordable and social housing units are in fact built;
- Capturing the value of the improvements – as housing prices go up, so does the city's revenue through property taxes. Creating a mechanism such as an Enhanced Infrastructure Finance District to ensure the rising tax revenues are re-directed to increase affordable housing is underway. Of course, the definition of infrastructure must include greening measures;
- Collaborative development – all parties need to be at the table, to ensure cohesive, friendly, affordable neighborhoods are built around desirable green space.

The type of park or green space built does have an impact on the degree of gentrification. In the previously mentioned study, Alessandro Rigolon points to some interesting statistics. "Accord-

ing to the study, being located within a half-mile of a new greenway park increases the odds that a neighborhood will gentrify by more than 200 per cent. Five of seven new greenway parks in the study spurred significant gentrification in their surrounding neighborhoods, including New York's High Line, Chicago's 606 trail, and Houston's Buffalo Bayou Park."

The study is notable because it characterizes different kinds of parks to reveal nuances in gentrification effect. The study distinguished parks based on "size, overall quality, whether they are new, proximity to downtown, and whether or not they are linear "greenway parks," longer than a mile, that include an active transportation

component like bike lanes," explains commentator Richard Florida, Director of Cities at the Martin Prosperity Institute at the University of Toronto's Rotman School of Management. The study concludes that the establishment of smaller parks near affordable housing can also help reduce associated gentrification.

As cities evolve, so must our efforts to ensure that policies to support greening urban areas be harmonious with social, cultural and financial equity issues being proposed by advocates for lower income people. Green infrastructure investment does not have to lead to gentrification.

Joyce McLean is a freelance journalist.



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A RAINDROP IN TIME: WHY MINNEAPOLIS-ST. PAUL NEEDS A GREEN INFRASTRUCTURE STRATEGY

BY MICHAEL KRAUSE, KANDIYO CONSULTING, DIRECTOR, GREEN INFRASTRUCTURE FOUNDATION

In 2019, Green Roofs for Healthy Cities brought its Grey to Green conference to the Minneapolis-St. Paul region for the first time in part, to demonstrate how green infrastructure investment can help address climate change.

The “climate disruption index” developed by The Weather Channel ranked the U.S. cities most impacted by climate change with populations over 200,000. Not too surprising, New Orleans was #1; but Minneapolis was #2, and St. Paul was #8. Another ranking found the urban heat island in Minnesota’s “Twin Cities” is among the ten worst in North America. From the 1950s to the 2010s, average annual rainfall in Minneapolis-St. Paul has increased by 34 percent, with major and localized flooding now a regular occurrence. And for the first time, when the Kaiser Foundation poll asked Minnesota voters what issues are of greatest concern to them, “climate change” was second, right after health care. And for voters who identify as Democrats, which includes most urban voters, climate change was number one.

If you spend any amount of time in the Twin Cities, you are likely to see advertising on buses, trains or on billboards that says: “Minnesota schools are worst in the nation for students of color.” Racial disparities in household income, educational attainment and employment are greater in Minneapolis-St. Paul than nearly anywhere in the U.S., and based on these economic indicators, Minnesota is the fourth worst place to live among the 100 largest metro areas if you are African American.

As a region, Minneapolis-St. Paul is an affluent, progressive community with a reputation for good government and the highest number of Fortune 500 headquarters per capita of any metro area in North America. There is an impressive cluster of water technology companies that are focused on global markets for solutions to clean water and stormwater problems.

The question is: will this community with so many resources take action to mitigate and adapt to the effects of climate change, and will it do this while also fighting poverty and narrowing the gaps in op-

portunity for people of color?

Of course it is not an “either-or” problem and we can fight poverty and climate change at the same time. In fact, engaging students and young adults from diverse backgrounds in science and engineering, and building awareness and skills for career paths in energy and water-related fields, is part of the solution. To do that, the region needs to double or triple its capacity for education and training that is accessible and inclusive of urban core neighborhoods and young people of color. Ambitious goals for more clean energy, green infrastructure, more efficient buildings, and more sustainable food and transportation systems will not be met without an army of new skilled and craft workers.

Unlike many other regions dealing with heavier rainfall events and flooding, Minneapolis-St. Paul lacks a coordinated regional strategy

and targeted public policies to accelerate broader use of green infrastructure strategies. There are hundreds of examples in the Twin Cities of effective green roofs, rain gardens, tree-planting and other applications of green infrastructure. But this “let flowers bloom everywhere” approach is not enough to develop green infrastructure at-scale and accelerate its use in time to mitigate the effects of climate change before conditions get even worse. Minneapolis-St. Paul needs a regional coalition of public, private and non-profit actors and advocates to push for policies and to educate the public about green infrastructure.

We are already on the front lines of the battle against climate change, and we need everyone to take action. That will take leadership and political will---and time is of the essence.

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CAN GREEN ROOFS PROTECT AGAINST HAIL DAMAGE?

BY OLIVER GILLINGS-PECK

Within the last decade the negative impact climate change inflicts on our infrastructure has started to become more noticeable around the world. Every year there are multiple destructive weather events that strike urban and rural dwellings, often resulting in billions of dollars in damage to public and private property.

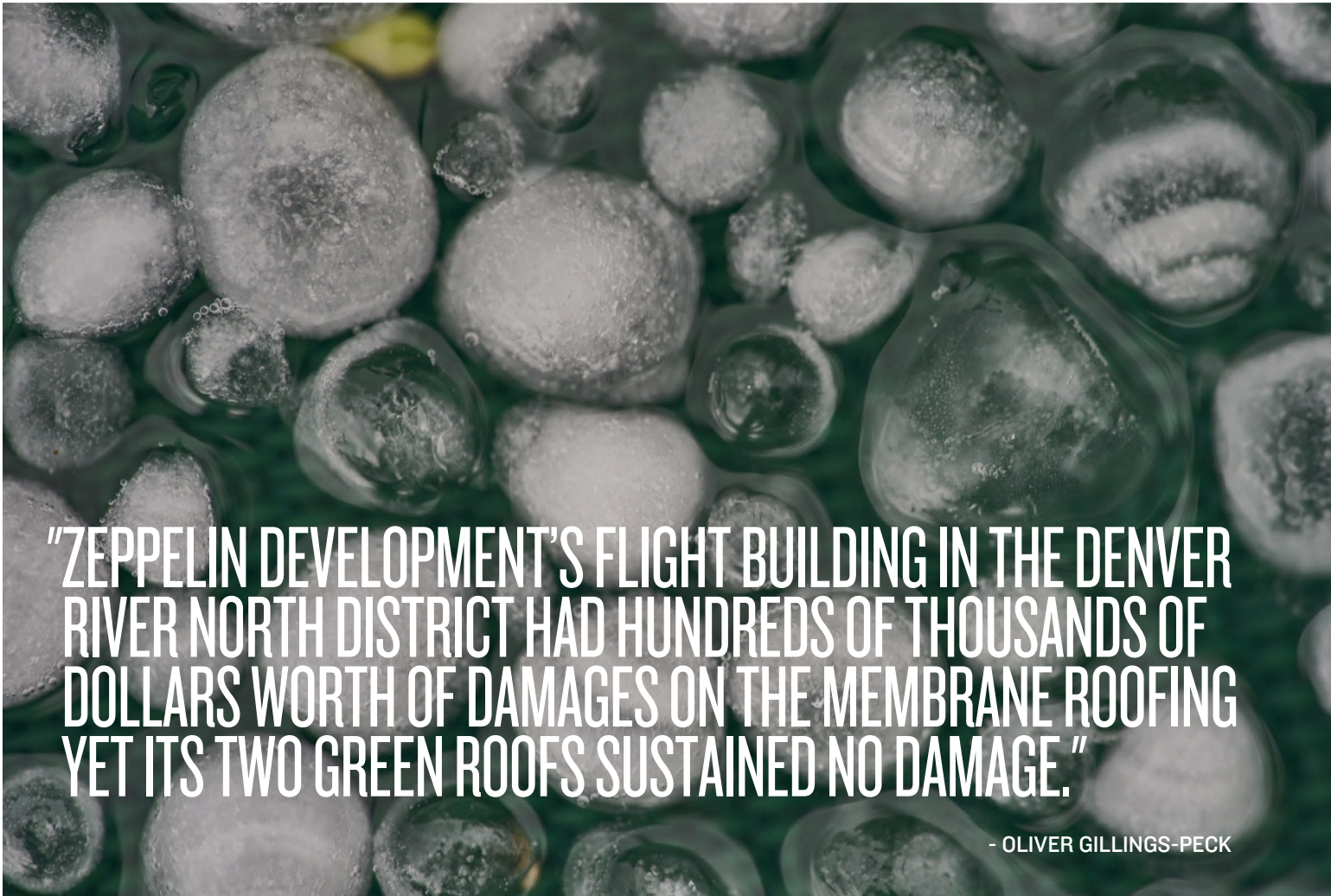
In an attempt to mitigate these impacts, it would be beneficial to design infrastructure that is more resistant to extreme weather. One often-overlooked example of this, due to its widespread and less severe nature, is the damage caused by hailstorms. In 2017 alone, hailstorms in the US caused \$22 billion in damage to buildings, people, cars and crops as reported by the Insurance Institute for Business and Home Safety. From 2000 to 2013 insurers paid out almost 9 million claims amounting to \$54 billion dollars in damage. Green roofs may provide a solution to hail damage on flat roofs.

Every year thousands of hailstorms occur around the world but only a handful of them produce hailstones that are big enough to cause damage. Hailstones that are considered to be medium to large in size are anywhere between one to four inches in diameter and can travel up to speeds of 72 mph (115 kmph). The formation and precipitation of larger hailstones is a direct result of a supercell thunderstorm that characteristically produces a strong updraft within the storm, causing water droplets to rise above the freezing level and thus turn into hail. The stronger the updraft the more time a water droplet has to collect water and grow in size, until it eventually becomes too heavy for the updraft to support and falls to the ground as a hailstone. Hailstorms are expanding in reach. Over the past decade, hailstorms are now occurring more frequently outside of Hail Alley, an area made up of Colorado, Nebraska, and Wyoming.

The UL 2218 is the current standard testing protocol for impact resistance of prepared roof covering materials. This standardized test involves dropping a steel ball, with various weights and from various heights, onto a given roofing material to determine which class of impact resistance it falls into. There are one to four class designations with class four being the highest impact resistance. Roofing companies recommend installing a roof that has at least a class four UL2218 rating in order to sufficiently protect against a hailstorm. This means that in order for green roofs to be proven to mitigate the damages caused by hailstorms they need to score a class four rating. The actual test for class four rankings involve a one to two pound steel ball being dropped from a height of

12-20 feet in the same location of the material. Unfortunately the test is designed for traditional sheet or panel rooftops that have multiple layers and are on inclines exceeding 25 per cent, but with that being said it would be quite easy to replicate the test on a green roof to determine its impact resistance class ranking. Students and faculty at the University of Colorado have recently completed research on green roofs and hail damage, soon to be published.

Although the standardized test has not been officially administered to a green roof there is direct field evidence that suggests that green roofs are in fact a better option for hailstorm protection than traditional roofs. On May 8th 2017, a supercell formed over the city of Denver, Colorado



"ZEPPELIN DEVELOPMENT'S FLIGHT BUILDING IN THE DENVER RIVER NORTH DISTRICT HAD HUNDREDS OF THOUSANDS OF DOLLARS WORTH OF DAMAGES ON THE MEMBRANE ROOFING YET ITS TWO GREEN ROOFS SUSTAINED NO DAMAGE."

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causing a massive hailstorm. The resulting cost amounted to over \$1.4 billion in damages. This particular hailstorm was classified as severe due to the golf ball sized hail; however some rooftops located in the storms path sustained little to no damage at all. Zeppelin Development's Flight building in the Denver River North district had hundreds of thousands of dollars worth of damages on the membrane roofing yet its two green roofs sustained no damage. Kyle himself admitted in a local news interview that the green roof had more than paid for itself as it provided adequate hailstorm protection. Andy Creath, a Green Roof Professional in Denver reported that green roofs located on two separate university campuses

reported no damages during the hail storm on their 17000 sf and 3000 sf green roofs.

Other than specific examples of green roofs withstanding hailstorm damage it seems almost intuitive to assume that a green roof would function well as a material that would not be damaged by hailstorms. This is because the velocity of a hailstone, that is to say its amassed speed built up from being dragged down to earth by gravity, is effectively absorbed and dispersed when the hailstone hits the growing media. Growing media has a relatively low density and because of that, it can absorb the impact of the hailstone. The average green roof has four to six inches of growing media that acts as a barrier and helps absorb the impact as well as a drainage layer which also

protects the membrane. A metal or asphalt roof has a much higher density which means that when a falling hailstone hits the roof the energy from the hailstone is released in a much more concentrated and violent manner as two dense objects are colliding.

While installing a green roof will add additional costs upfront, in the long term it provides building owners with a long list of benefits that save them on energy, replacement and maintenance costs. Hailstorm protection should be added to the general list of benefits associated with installing a green roof on buildings in Hail Alley. The next step is for scientific research to be done about which types of green roofs provide the best hail protection and to determine whether or not a green roof has a class four UL2218 rating or even better.

Oliver Gillings-Peck is a researcher and freelance writer.

Resources

<https://www.cbsnews.com/news/hail-damage-costs-this-year-could-hit-new-annual-high-in-u-s/>

<https://www.denverpost.com/2017/05/23/hailstorm-costliest-ever-metro-denver/>

<https://www.nssl.noaa.gov/education/svrwx101/hail/>

<https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/08/08/costly-hailstorms-are-rapidly-increasing-heres-what-the-weather-community-is-doing-about-it/>

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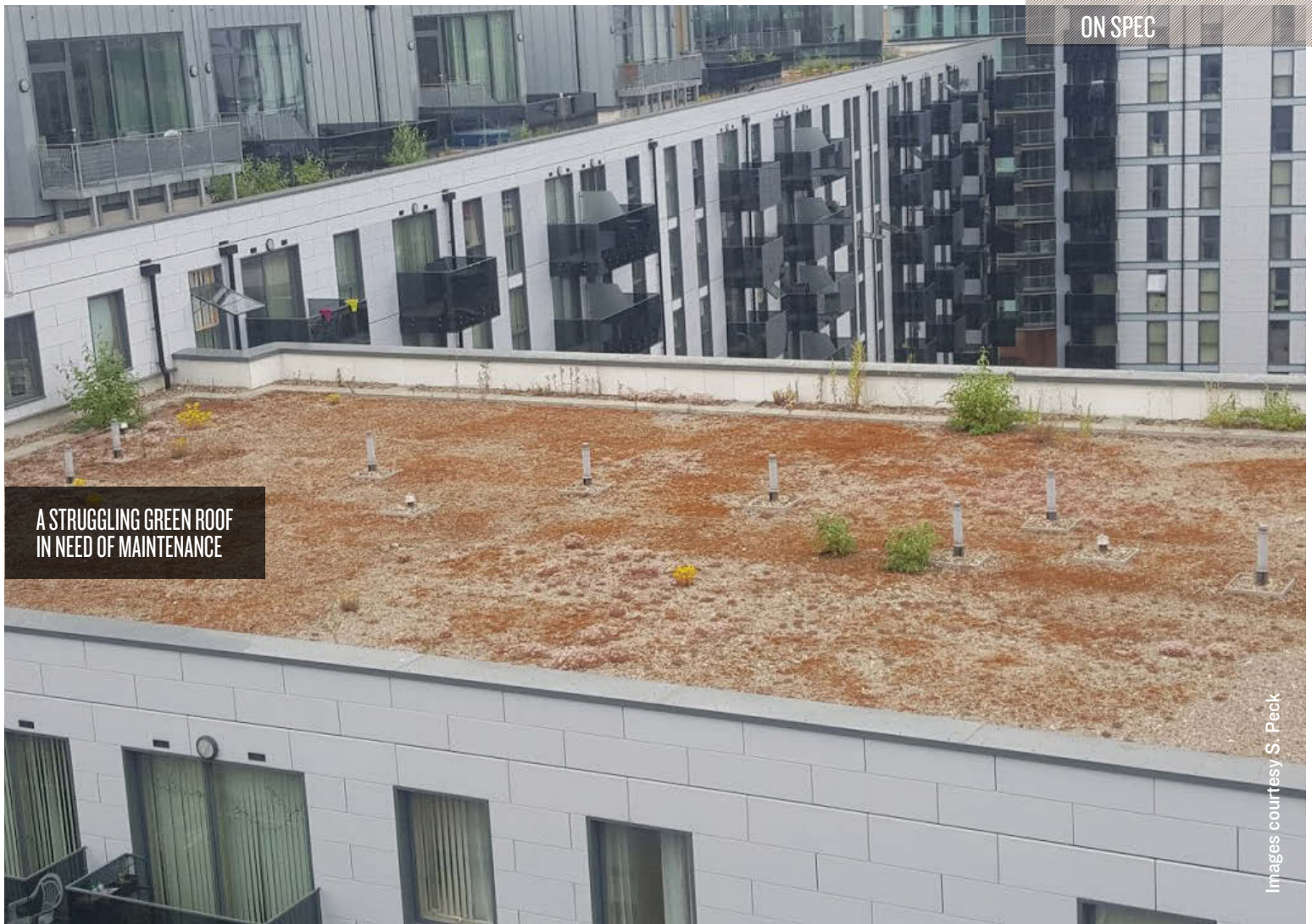
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WE'RE FAILING OUR GREEN ROOFS: HERE'S HOW TO STOP

BY GREG RAYMOND, GRP

In a world of inconvenient truths, perhaps the most inconvenient of all is that even our best technologies and smartest environmental solutions only work when used as intended. Sadly, when it comes to green roofs, that's often not the case.

Many cities, even the ones with excellent green roof mandates for new buildings, have poor regulations when it comes to stewarding those same roofs after they're built and handed off. While we pour lots of government funding, private money and enthusiasm into green roofs, both enthusiasm and cash are sorely lacking when it comes to maintaining installations over time – with predictably negative results.

Making the issue harder to handle is the fact that statistics

are hard to come by. By my estimate, at least 50 per cent of green roofs suffer from some level of neglect. At best, the plant balance is off, nutrient levels are low or stormwater components are clogged. All too often, green roofs die and remain dead. Even if the statistical evidence is slight, the anecdotal evidence is everywhere; I see many brown roofs

(and not the good kind) during my frequent trips to Chicago's upper stories.

"We've noticed that too," says Jack Pizzo, Past President of the Illinois Chapter of the American Society of Landscape Architects and founder of Pizzo Group. "The stewardship of those roofs drops off after the contractual requirements, and then what

"BY MY ESTIMATE, AT LEAST 50 PER CENT OF GREEN ROOFS SUFFER FROM SOME LEVEL OF NEGLECT. AT BEST, THE PLANT BALANCE IS OFF, NUTRIENT LEVELS ARE LOW OR STORMWATER COMPONENTS ARE CLOGGED."

- GREG RAYMOND

we see are green roofs that are basically brown. They're not performing at the level at which they were designed."

This is a waste not only of private investment, but of public institution funds and taxpayer money. Moreover, it means that the benefits supposedly accruing to the building and city (stormwater management prime among them) are not in fact doing so. It's not overstating the case to say that people are being passively misled about the benefits of green roofs in the absence of maintenance.

This needn't be a permanent condition, of course. It's perfectly feasible to revive green roofs and turn them into thriving ecosystems, and to maintain them in topnotch condition from the beginning, but we have to get the word out.

"Post-installation green roof monitoring and maintenance support are essential for long-term success," says Clayton Rugh, Manager & Scientific Director at Xero Flor America. "To avoid misunderstandings or pre- to post-build transition disruptions, it is important to have maintenance management responsibilities included in the project design specifications and bidding documents to ensure that a qualified service provider will be involved from

date of installation completion if not sooner."

Given that stewardship contracts are in the interest of both green roofers (who profit off them) and owners (who maintain the benefits of green roofs), why aren't they de rigueur?

Many reasons. I can't count the number of people who assume that green roofs are "good to go" after installation. Especially in the presence of native plants, many owners just assume they'll take care of themselves. That's true, to an extent. They're certainly more tolerant of local conditions than exotics. Yet we place harsh demands on green roof plants in these created environments. They often don't have what it takes to go it alone, native or otherwise, and I'm not convinced we're doing enough to convey that reality to owners.

What's worse, says Michael Furbish, President and Founder of Furbish, "some industry suppliers claim green roofs don't require maintenance. That is a myth." This is a matter of communication. "Most specs call for two years of maintenance," he adds, but we should "encourage owners to renew their maintenance after the initial two years is up."

In other cases, the green roof only got the green light

because it was required as part of new construction. It's much likelier in this scenario that an owner simply won't care about the state of the roof post-handoff. Which is where better mandates come in.

"We need to require a change in the laws and ordinances that require the use of green roofs to have periodic inspection as well as statutory required maintenance," Pizzo says. "Much like if you're building starts shorting out with electricity, you're required to maintain a safe workplace and fix the electrical system. You could get busted for code violations. This would be the same thing, a change to the municipal code."

With the right changes in place, I fully believe that we can get to a place where green roofs simply don't die. The plants remain healthy and diverse, they get the right nutrients, they provide cooling and energy savings as promised to owners, and they help to manage the deluvial rates of stormwater our cities increasingly face.

That starts with better education, both of individual clients and of the populace in general, who needs to understand that green roofs are not self-sustaining systems. As one of our Chicago clients, James Corirossi, points out, "it is not a job for do-it-yourselfers. Installation and maintenance needs to be done by someone trained for rooftop gardens." In the latter case, that means regular inspections – between four and six a year – for healthy green roofs, and more for those in need of rescue. It means pest inspection, nutrient monitoring, and plant diversity checks. When necessary, it might mean some replanting.

"With routine and competent maintenance, there should be no total roof die-offs," Furbish says. "The expectation should be zero."

Lastly, we need to provide better resources to the public later in the lifecycle, both to help them understand their choices after that two-year contract is up and to steer them in the right direction when they discover their green roof is ailing. If we do this conscientiously, we can steward healthy green roofs into a long, bright future.

Greg Raymond is the founder of Ecogardens and has 30 years of experience in the green roofing and sustainable landscaping space. He was a member of the inaugural class of accredited green roof professionals. Today he spends his time building and restoring green roofs, as well as teaching others how to steward green spaces.



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