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IN CANADA

L'ARCHITECTURE  
DE PAYSAGE  
AU CANADA

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**trees**  
**les arbres**

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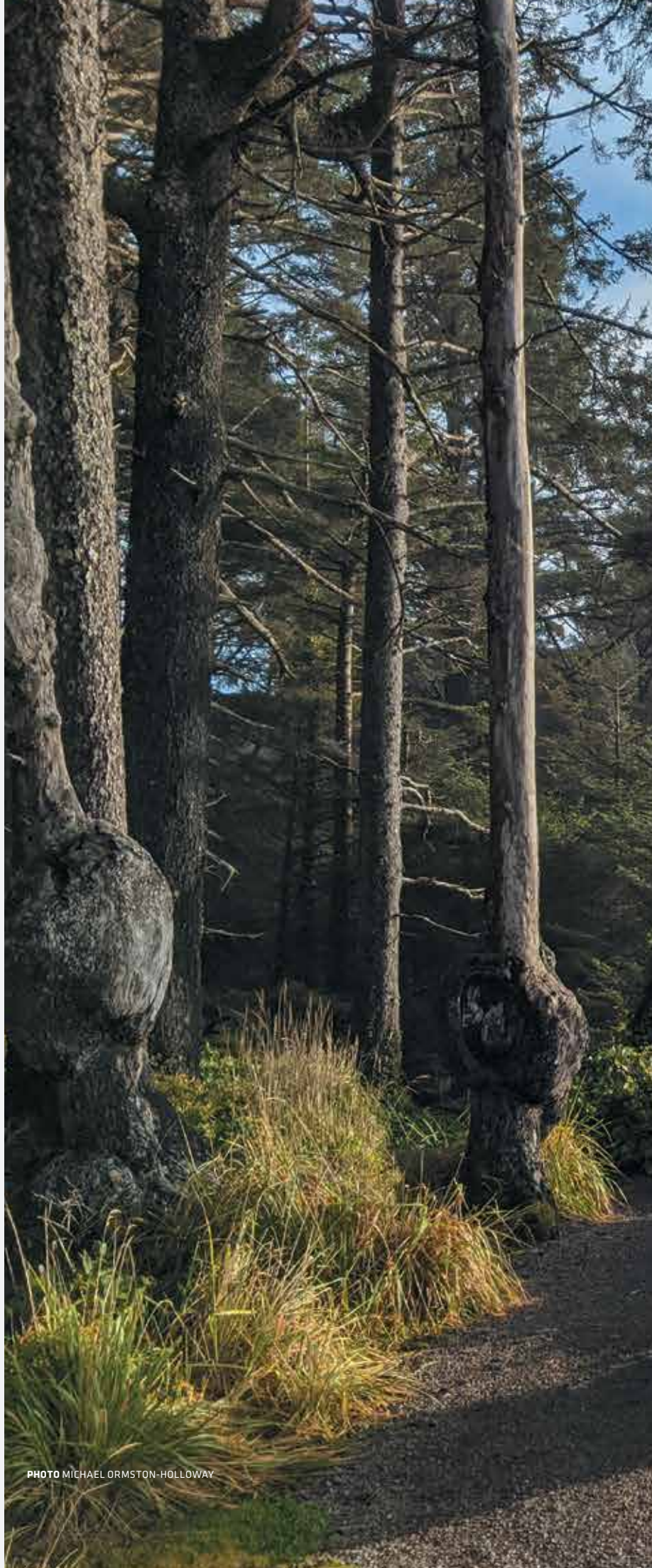


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ASPENS & BIRCHES  
PHOTO MICHAEL ORMSTON-HOLLOWAY



MICHAEL ORMSTON-HOLLOWAY  
GUEST EDITOR | RÉDACTEUR INVITÉ

## TREE CHAMPIONS

**AS A FOREST** ecology graduate student many years ago, I collected data from Northern Ontario research plots, comparing successional forests with managed plantations, trying to contribute to a broader discussion on trees to promote healthier forests with stronger ecological connections. This was not an easy conversation to have in an industry managed entirely for profit, but it started me on a path that would eventually lead me toward landscape architecture.

As a Master of Science student, I was primarily concerned with the forest as a collective, and I recall vividly the first time I crossed paths with a Master of Landscape Architecture student, who was focussed on the tree as a unit. To me, the idea of a tree failing was an important part of the healthy life cycle of the forest, but to her, the idea of a tree failing, particularly when that tree was the only specimen growing in a city block, was catastrophic.

We shared similar concerns, and an equal passion for our work. We both loved trees, and the stories we shared about championing trees were equally compelling, but her stories and conversations with landscape architects, urban planners and designers were far more interesting and effective than mine in my scientific community.

Urban trees promote more intense, often more complicated conversations. Consequently, the resources invested in their preservation can be immense. And thank goodness for that. Trees need more champions and better conversations to ensure their true value is recognized.

With this in mind, I feel very fortunate to have had such an incredible, diverse group of talented, relevant and front-line professionals contribute to this issue.

To the panellists and writers, I offer you a sincere thank you. This issue is orchestrated to bring together practitioners, theorists, researchers, educators, arborists, ecologists and landscape architects to facilitate a more comprehensive understanding of urban trees and our immense efforts to support them.

As urban intensification increases the pressures from development, we have more reason than ever to think beyond conventional solutions. Our cities need more trees, bigger and healthier trees, and a greater diversity of them. Our green networks should connect and be designed to achieve more than simply aesthetics. We need to value trees more and create effective policy and better design thinking so that trees live on as an invaluable part of future development.

So, keep telling those stories; keep advocating for trees. We are their champions. And they need us more than ever.

## DÉFENSEURS DES ARBRES

**EN TANT QU'ÉTUDIANT** diplômé en écologie forestière il y a de nombreuses années, j'ai recueilli des données sur des parcelles de recherche du nord de l'Ontario, comparant les forêts de succession avec les plantations gérées, essayant de contribuer à une discussion plus large sur les arbres afin de promouvoir des forêts plus saines avec des connexions écologiques plus fortes. Ce n'était pas une conversation facile à avoir dans une industrie entièrement gérée pour le profit, mais cela m'a mis sur une voie qui allait me mener vers l'architecture paysagère.

En tant qu'étudiant de maîtrise en sciences, j'étais principalement concerné par la forêt en tant que collectif, et je me souviens très bien de la première fois où j'ai croisé le chemin d'une étudiante en maîtrise d'architecture du paysage, qui se concentrait sur l'arbre en tant qu'unité. Pour moi, l'idée d'un arbre défaillant était une partie importante du cycle de vie sain de la forêt, mais pour elle, l'idée d'un arbre défaillant, en particulier lorsque cet arbre était le seul spécimen poussant dans un quadrilatère urbain, était catastrophique.

Nous partagions des préoccupations similaires et une passion égale pour notre travail. Nous aimions tous les deux les arbres. Les histoires que nous partagions sur la défense des arbres étaient tout aussi convaincantes, mais ses histoires et ses conversations avec les architectes paysagistes, les urbanistes et les designers étaient bien plus intéressantes et efficaces que les miennes dans ma communauté scientifique.

Les arbres urbains favorisent des conversations plus intenses et souvent plus compliquées. Par conséquent, les ressources investies dans leur préservation peuvent être immenses. Et Dieu merci ! Les arbres ont besoin de plus de défenseurs et de meilleures conversations pour que leur véritable valeur soit reconnue.

Dans cette optique, je me sens très chanceux d'avoir pu compter sur un groupe aussi incroyable et diversifié de professionnels talentueux, pertinents et de première ligne pour contribuer à cette question.

Je tiens à remercier sincèrement les membres du panel et les auteurs. Ce numéro est orchestré de manière à rassembler des praticiens, des théoriciens, des chercheurs, des éducateurs, des arboriculteurs, des écologistes et des architectes paysagistes afin de faciliter une compréhension plus complète des arbres urbains et de nos immenses efforts pour les soutenir.

Alors que l'intensification urbaine augmente les pressions du développement, nous avons plus de raisons que jamais de penser au-delà des solutions conventionnelles. Nos villes ont besoin de plus d'arbres, d'arbres plus grands et plus sains, et d'une plus grande diversité d'entre eux. Nos réseaux verts doivent être reliés et conçus pour aller au-delà de la simple esthétique. Nous devons accorder une plus grande valeur aux arbres et créer une politique efficace et une meilleure réflexion sur la conception afin que les arbres continuent à vivre en tant que partie inestimable du développement futur.

Alors, continuez à raconter ces histoires ! Continuez à défendre les arbres ! Nous sommes leurs défenseurs. Et ils ont plus que jamais besoin de nous.



# OUR WRITERS | NOS RÉDACTEURS



## OUR GUEST EDITOR | NOTRE RÉDACTEUR INVITÉ

### MICHAEL ORMSTON-HOLLOWAY

Michael Ormston-Holloway, BSc, MSc P, GDHort, MLA, ASLA, ISA Certified Arborist, Principal, Landscape Architecture + Urban Ecology, The Planning Partnership Michael takes the management of urban forestry, the rebalancing of soil chemistry, enhancements to species representation, and arboricultural best practice very seriously. It is at the core of his work, and he believes that with this approach to landscape design we can promote the highest quality work with respect to establishing, large, mature and rapidly developing trees. A healthy urban forest is critical to both continued city sustainability and economic growth, and with a thoughtful landscape plan, cities can be more green, more beautiful, and more ecologically balanced places to live, while managing air quality, detaining stormwater, and mitigating pollution, flooding and erosion more effectively.



### JONATHAN CHA

Jonathan Cha est docteur en aménagement de l'espace et urbanisme, urbanologue et architecte paysagiste AAPQ-AAPC. Il est conseiller spécial, aménagement à la direction générale du Parc Jean-Drapeau à Montréal où il a contribué à la coordination stratégique et au suivi de conception du Plan directeur de conservation, d'aménagement et de développement du parc Jean-Drapeau 2020-2030. "La vue sur la ville, le fleuve Saint-Laurent, les arbres et les marmottes depuis mon bureau au pavillon du Canada est une source d'inspiration quotidienne."



### ARIANE MALO-SAUVÉ

Ariane Malo-Sauvé est agente en architecture de paysage au Parc Jean-Drapeau et amène une expertise en environnement et en écologie du paysage. Elle est fraîchement diplômée en architecture de paysage après un parcours d'une dizaine d'années en éducation relative à l'environnement. Elle est préoccupée par la question du déficit nature et passionnée de la saisonnalité dans l'espace public montréalais. "Un oiseau à la fenêtre suffit pour faire jaillir sa passion de l'interprétation de la nature, même celle aux abords du circuit Gilles-Villeneuve..."



### HEATHER SCHIBLI

Originally from eastern Ontario, Heather Schibli now lives in Guelph, Ontario, where she works as a Landscape Architect, ISA arborist, and an ecologist at Dougan & Associates Ecological Consulting & Design. Heather is currently developing a tree identification guide for youth, which combines her two passions of design and the environment.



### NICK ASSAD

Nick Assad OALA, CSLA, ISA, grew up in rural Ontario where he developed an appreciation for rural landscapes and the plants and animals they support. As founding principal at the landscape architecture and consulting arborist firm, Affinity Habitat Studio, Nick's work focuses on providing practical advice and plans for ecological system enhancements in the built environment.





#### **RON WILLIAMS**

Ron Williams, CM, AAPQ, FCSLA, is a long-time professor at the École d'architecture de paysage, Université de Montréal, and a founding partner of the landscape architecture and urban design firm WAA Inc. (Williams, Asselin, Ackaoui & Associates). Ron received the Order of Canada in 2018. His book, *Landscape Architecture in Canada*, was published in 2014.



#### **CONNIE PINTO**

Connie Pinto joined Urban Forestry's policy and planning unit at the City of Toronto five years ago. In addition to responsibilities in the development of procedures and standards to support urban forestry operations, she works with internal and external stakeholders in strategic planning, including the recently completed 2018 Tree Canopy Study. With a background in watershed restoration and park development, her love of all things green is reflected in an office that is nearly overrun with potted plants in an effort to mimic the great outdoors.



#### **SARA BARRON**

Sara Barron is a lecturer in urban horticulture at the University of Melbourne. Her research focuses on how urban and suburban landscapes can be re-imagined to balance healthy forests with a range of co-benefits. Sara works across interdisciplinary boundaries due to her years of experience in landscape architecture, urban design and urban forestry.



#### **DOUG CARLYLE**

Doug, FSCA, RCA, is a partner with the integrated design practice Dialog. He is now based in Calgary after many years calling Edmonton home. Doug has been practicing landscape architecture for over 30 years. His passions focus on public infrastructure, institutional, commercial and residential projects. He strives in these projects to offer place centred moments of delight and beauty, that are meaningful and memorable, no matter how eclectic or messy. He is a passionate advocate for city building that is founded in the philosophies of 'being of the land' and community wellbeing.  
**dcarlyle@dialogdesign.ca**



#### **AMELIA NEEDOBA**

Amelia Needoba has 18 years of experience in the strategic planning, development and management of urban and natural forests in Canada and Australia. She specializes in developing and implementing strategies and policies to enhance the resilience of urban trees and forest ecosystems. She has worked with more than 20 municipalities across Canada, and has recently begun working with municipalities in Australia and the US.

#### **ERIKA MASHIG**

Erika Mashig, BCSLA, CSLA, Manager-Parks & Open Space Planning, Design and Construction, has been practicing landscape architecture for over 15 years. Erika has led and co-led a number of initiatives at the City of New Westminster, including the Urban Forest Management Strategy and continues to collaborate with all city departments to explore private and public realm opportunities to protect, enhance and maintain the urban forest within key developments, streetscape designs, trails and greenways, natural areas, parks and open spaces as well as urban infrastructure projects.



#### **WENDY DE HOOG AND JULIE MCMANUS**

Wendy De Hoog and Julie McManus are planners in the Green Infrastructure Implementation branch at the City of Vancouver currently working to implement the Rain City Strategy action plans. Contact: **julie.mcmanus@vancouver.ca**, **wendy.dehoog@vancouver.ca**



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# PROLOGUE

## 01/ A FAMILY OF TREE PLANTERS

JEAN LANDRY + WENDY GRAHAM

**ONE EARLY MAY** morning, over breakfast, Jean and I were talking about the upcoming *LP* issue on trees. As landscape architects, we love trees and appreciate them for reasons that range from the spiritual to the practical. Our conversation soon shifted to the subject of tree planters, a unique community of tenacious adventure seekers, hired seasonally by the forestry industry to plant trees. In Canada, some 500 million trees are planted annually to establish new forests where trees have been harvested.

The people who plant these trees work under extreme and challenging conditions that may include nasty insects, inclement weather, forest fires, unbearable heat, wild bears, extreme slopes, slash and more. A recent Simon Fraser University study reveals that the physical exertion level and work efficiency of tree planters is among the highest recorded in human occupational performance studies. So, what is it that inspires tree planters to return year after year? Since three of our children and a daughter-in-law are tree planters, we asked them to reply.

> [See LP+](#) to read the complete version of their replies...



>>...Planting trees has become second nature to me. Smelling the fresh fir seedlings on day one in early March always brings joy to my heart... / [Read more...](#)

**Genevieve Bourke-Landry**



>>...Images artificially stimulate the mind while simultaneously limiting our understanding, while direct encounter with nature taps into something as large as life itself... / [Read more...](#)

**Nelson Elliott Landry**



>>...in those places where the lumber industry holds sway, planters are a seasonal commonality like so many raucous migratory birds. / [Read more...](#)

**Myles Graham Landry**



>>...we see the majesty of nature through confrontation with the places it is missing. Tree planting...is a repetitive dance of mourning, a heartfelt cry of camaraderie, and a promise to do better... / [Read more...](#)

**Alaska Elisabeth Macmillan**

TREE PLANTING NORTHERN TIP OF VANCOUVER ISLAND  
PHOTO JONATHAN CURRY



## 02/ OFFSHOOT

CAMERON DE LONG

**FOR MANY, THE** mention of “trees” evokes sensory experiences of smell and touch and memories of all things woodsy. But what if your experience of trees was informed by a geographical location where there were no trees? Imagine people whose only interactions with trees were through experiences with their by-products. For people living in parts of the world where there are no trees, only items manufactured of wood and wood products, the relationship with trees is quite different.

For most North Americans, the furnishings and features in our homes, beyond the home itself, are built from wood products: kitchen and coffee tables, bedframes, hardwood or laminate floors in living areas. How about the garden shed, the trellis over the pathway leading to the backyard, or the cedar sleepers around the vegetable garden? Without trees, some of these would simply not be.

Now imagine living in Canada's far north. The annual sealift resupply ship has just arrived carrying all the goods for the community – for the whole year – all crated and packaged with wood. Think of the possibilities for the uses of these by-products. The people of the north have a long history of being resourceful: re-using, re-purposing and, in some cases, recycling the wood

and wood packaging that has come to rest in the communities of our great northern hemisphere.

These products have been reshaped into cabins in all shapes and sizes, for hunting, storage, or play. When cabins are built with new material, often their additions and outbuildings still end up being built from shipping materials brought into the community by marine transport. Residents have a routine of scavenging at the local landfill for the few pieces of board to finish skirting in the bottom of the house. Wood pallets, once used to ship washing machines to the local department store, may be re-purposed into feed for a family bonfire down by the river. The wood found around us, like that found within the anatomy of our majestic trees, allows for growth in our communities, long after it has first physically grown as part of the tree.

As we continue to grow, like our woody friends around us, let's hope we find more innovative ways to reduce the wood waste in our northern communities.

A WOOD PILE FOR A RESIDENTIAL WOOD STOVE. WOOD WAS SALVAGED FROM CONSTRUCTION SITES AROUND IQALUIT.

PHOTO CAMERON DE LONG

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COMPILED BY JOANNE MORAN  
+ LAURIE BLAKE

# TREES – A PANEL

## PART 1

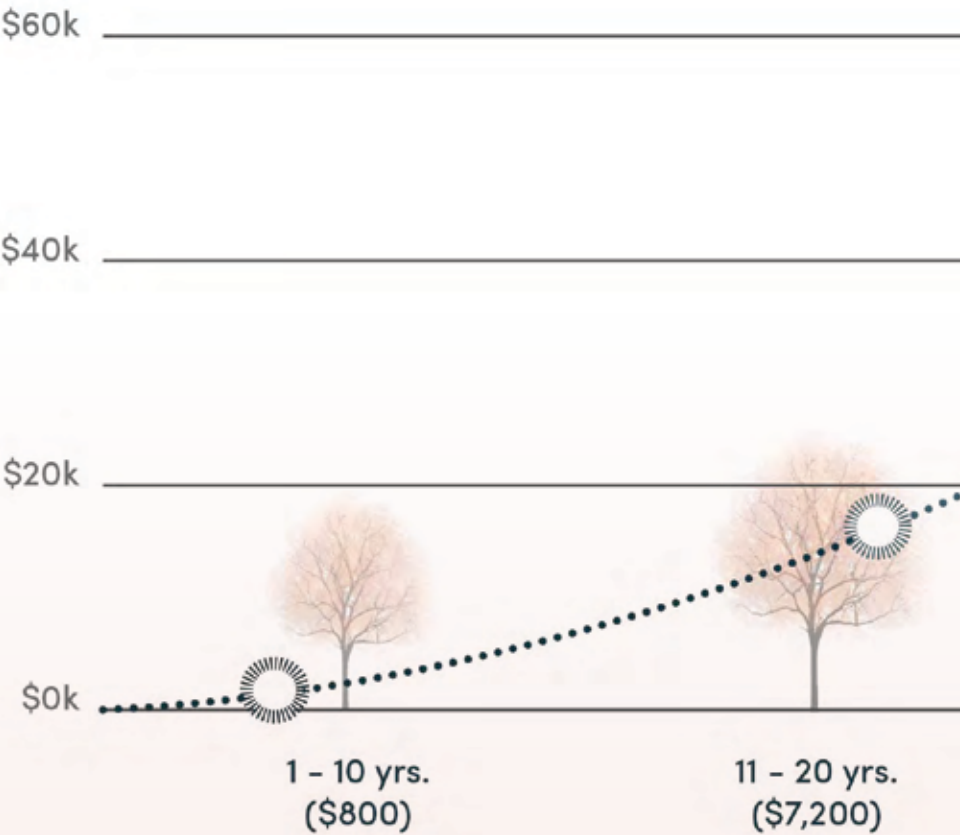
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TABLE RONDE SUR LES ARBRES - PARTIE 1  
Fin juillet 2020, six grands esprits ont passé quelques heures ensemble sur Zoom pour échanger leurs réflexions et leurs préoccupations sur les forêts urbaines. Ils avaient beaucoup à dire...




**AT THE END** of July 2020, six great minds spent a couple of hours together on Zoom to share their thoughts and concerns about trees and urban forests. They had lots to say. Appearing in the following pages are excerpts – Part 1 – of their conversation. Part 2 of the excerpts will be found in the Spring 2021 issue of *Landscapes | Paysages*. It's our plan to make the entire two-hour video available on CSLA's YouTube channel in the near future.

**Trees are part of our natural infrastructure in the cities and the places where we live. Do we understand the true value from a pure economic sense of what trees contribute to our infrastructure?**

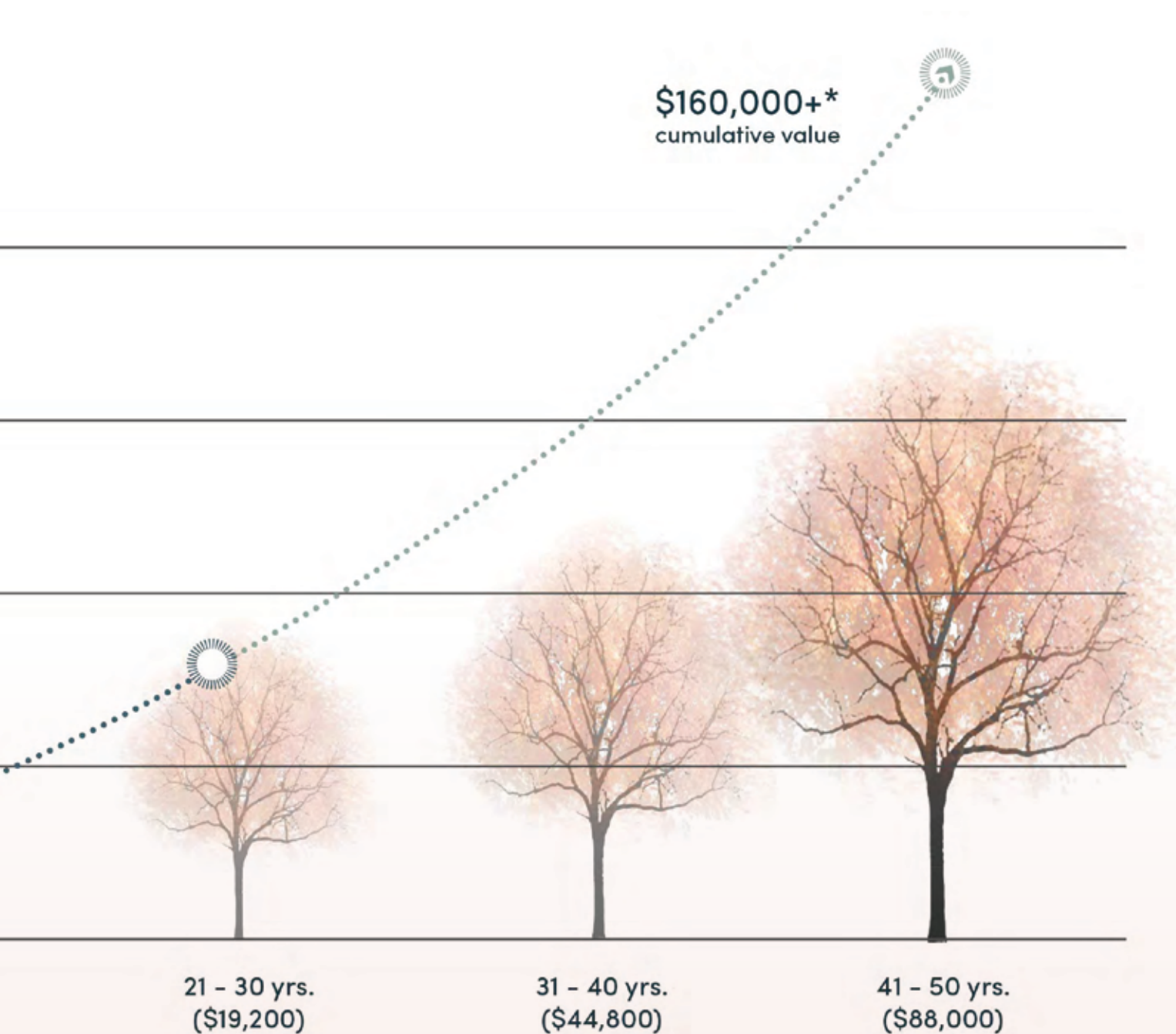
– Bob Somers

let's look at one tree:  
\$31,250 worth of generated oxygen  
+ \$37,500 worth of recycled water  
+ \$31,500 worth of soil erosion control  
\$80k  
\$162,250 total value in 50 year life span



-  7 year average urban tree lifespan \*\*\* (Current)
-  28-29 year average urban tree lifespan \*\*\* (Current)
-  50+ year ideal urban tree lifespan
- (\$) value at services performed/decade\*





\*source: US Forest Service, ISA (2013)

\*\*source: Gary Mall.  
Urban Forest Landscapes (1995)

\*\*\*source: Lara Roman, Frederick Scatena.  
Street Tree Survival Rates (2011)



# OUR PANELISTS



**JAMES URBAN**, FASLA, is well known for his skills in the areas of urban arboriculture and soils, including the preservation and installation of trees in the urban environment and the specification and installation of specialized planting soils for roof gardens, urban landscape plantings, and rain water management. He has written and lectured extensively on the subjects of soil and urban tree planting and has been responsible for the introduction of many innovations and current standards relating to urban tree plantings and soil specifications. His most recent book, *Up by Roots*, was published by the International Society of Arboriculture (ISA). Jim has received many awards, including the ASLA's National Merit Award (1997) and Medal of Excellence (2007), as well as the ISA's Award of Achievement (2013).



**ROBERT WRIGHT**, BSC, MLA, OALA, FCSLA, is Dean, John H. Daniels Faculty of Architecture, Landscape + Design, University of Toronto. Rob's design-centered and eclectic work does not privilege the traditional professional disciplines of architecture, landscape architecture or urban design; he places his work within a more contemporary and trans-disciplinary framework. As the Principle of iz-design, an open and exploratory design practice, Rob seeks to develop creative design experimentation not only in architecture, landscape architecture or urban design but also in fashion, furniture, art and the industrial arts. Rob was the Director of the Centre for Landscape Research. He has also been the Director of the Landscape Program, Associate Dean and Director of the Knowledge Media institute.



**BOB SOMERS**, FCSLA, Principal, Scatliff + Miller + Murray Landscape Architecture + Urban Design. Bob joined Scatliff + Miller + Murray (SMM) in 2000 after seven years in the horticultural industry. With SMM, Bob became involved in some of the most exciting projects Winnipeg had seen in decades. As a Principle at SMM since 2007, Bob has continually demonstrated the benefits of investing in landscape architecture with a number of CSLA-award winning projects for his clients including Waterfront Drive, The Plaza @ The Forks, East Side Road Revegetation, and Wascana Landscape Irrigation Master Plan. Continuing to recognize the team-based approach to all aspects of design, Bob works closely with SMM's group of planners, scientists, engagement professionals and others to find long-lasting solutions for an extensive list of clients across Manitoba, Saskatchewan and Northern Ontario.



**MARCHALLÉ**, BEng, MLA, OALA, Senior Landscape Associate, Claude Cormier + Associés Inc. Marc Hallé is a landscape architect at Claude Cormier et Associés, joining the practice in 2003. Trained in both Civil Engineering from the University of Saskatchewan and Landscape Architecture from the University of Toronto, Marc's technical and creative backgrounds combine to guide projects from concept to built form. Working back and forth between large scale and minute detail, Marc helps to maintain continuity and consistency between the detailed elements of a project and their conceptual origins.



**DARBY MCGRATH**, PhD, Senior Research Scientist, Environmental Horticulture, Vineland Research and Innovation Centre. Darby joined Vineland in 2013 and is Senior Research Scientist, Environmental Horticulture, and was named Program Leader for the Greening the Canadian Landscape Program in 2018. She works with land managers, cities and producers across the country and internationally to improve tree planting success in challenging settings. Her program work includes experimental research, education and outreach, and new technology development. She is also an adjunct professor at Brock University and the University of Waterloo. Darby obtained her master's degree from the University of Waterloo and her PhD in Social and Ecological Sustainability from the University of Waterloo.



**MICHAEL ORMSTON-HOLLOWAY**, BSC, MSC P, GDHORT, MLA, ASLA, ISA Certified Arborist, Principal, Landscape Architecture + Urban Ecology, The Planning Partnership, Guest Editor of the Winter 2020 issue of *LP*. Michael takes immense pride in designing, building, and reinvigorating urban forests in municipalities across Southern Ontario, Canada and beyond. The management of urban forestry, the rebalancing of soil chemistry, enhancements to species representation, and arboricultural best practice is at the core of Michael's work, through which he believes we can promote the highest quality work with respect to establishing, large, mature and rapidly developing trees.



## What are the biggest issues facing trees today?

**Rob Wright:** It's an issue around climate change and the associated evolutionary acceleration of pests, pathogens and diseases associated with trees. For example, in Ontario, we know about the Emerald Ash Borer. The evolutionary acceleration, which is happening mostly in urban areas now, is a direct result of climate change and assisted migration across ecotones.

**Marc Hallé:** We're in a time when the physical properties of soil have a higher priority than their biological ones. Few question the space given for roads and urbanization, utilities, all the hardware of the city. Trees have been at the bottom of the infrastructure chain. One of the biggest challenges is making room for trees in a rigid structure of standards that are hard to change. We often need to fight so that trees can receive a level footing with other urban systems. I'm encouraged by what's happened in Toronto, where bylaws enforce large soil volumes for street trees so that they can be taken seriously.

**Michael Ormston-Holloway:** I think there are fundamental issues here. I think they are infrastructural issues. I think they are policy issues. I think they are coordination issues in the planning and design phases. At the end of the day, real estate in urban environments is valuable. We have utilities with which we must compromise, and I don't mean to be simple about it, but we're running out of room.

**James Urban:** I see four big issues. First, we've actually made remarkably good, but glacially slow, progress on soil and soil volume. We never made much progress on the space right around the tree. I still see today, so many designs that just forget that this tree is actually going to grow. I recognize, as other people have said, that the space we're arguing for is inches here. I don't need feet more space, but I do need inches more space, in some cases a few feet where I've got nothing. But if we could just get the landscape architects and

engineers to draw the trunk of the tree at its mature size rather than the planted size, we would quickly solve the problem. The second issue, in the cold part of Canada, is salt. For all the good work you do here, we still haven't solved the salt problem. The problem of the root system in the nursery tree is another big one that's got to be solved. We don't get great trees if we don't start out with good roots. Finally, we have a long way to go trying to integrate trees and stormwater. That's an important thing to do and it can be solved. If it's done right, it works really well, and if it's done wrong, it can cause problems.

**Darby McGrath:** From my perspective as a scientist working in this space, I see the biggest challenge as translating new research into practice and rapidly moving that information out into the landscape. With things like climate change being a threat amplifier and many other challenges that we're facing and the pace at which those things are moving, finding a way to bridge that gap between research and practice is maybe one of the biggest challenges that I see on the horizon.

**Bob Somers:** We need to understand that no one is fighting for the trees. Trees are part of our natural infrastructure in our cities and the places where we live. Do we understand the true value from a pure economic sense of what trees contribute to our infrastructure? I don't think it's understood politically or economically, both of which have a significant bearing to start solving a lot of other problems in a world where climate change is somehow a political topic, not a scientific topic. In Winnipeg and in Regina and areas around the prairies, we're seeing just how much of our forests we are losing along riparian zones and in other areas within our agricultural lands to create more monolithic land operations. The solution is not just creating forests and trees for humans, but also thinking about our role in the bigger ecosystem.

## Do we need to retain more mature trees in urban environments?

**Marc:** Who would disagree that we need more mature trees in the urban environments? From an ecological services point of view, mature trees perform much better than younger ones do. So, when there's a good tree existing on a site, we try our best to preserve it. Often there is a wish by the public to save every tree, but there are some that are worth letting go when a poor existing tree will be replaced by something better. With good communication, this shouldn't be too controversial. For example, the restoration of Berczy Park in Toronto required removing 70 of the 80 existing trees in this small space, most of which were over-planted and diseased. Most had less than 10 years left of life in them. This was communicated to the public as the means to making a better park. Nobody disagreed with the assessment; it reinforced what they could already see in the park. It is honourable to try and retain as many mature trees as we can, but not all existing trees are worth preserving.

**Michael:** What is a tree worth? I'd say that a tree's worth a minimum of \$160,000 cumulative value over 50 years (*see chart on pages 16-17*). During one of my projects, the question was: do we want 40 new trees or do we want to move these three mature trees as part of the project? What do I do? Do I get some idea of what a tree's worth? Do I look at an ecological argument? Is there something bigger with bio amplification in mind? Are they feeding our little urban critters? Are we going to get a migratory songbird to come down that wouldn't have stopped here otherwise? It's trickier than just, "do mature trees matter?" because we all take that for granted.

**James:** We need a better definition of what a "mature tree" is. Some people think a 20-inch caliber DBH tree is a mature tree. I always try to couple the phrase with large, old, mature trees. They're quite different from relatively young, mature trees. We need to be very strong about when, as Marc said, it's time to pull the plug. There are a lot of times when



**...when you look at the scale of a site, and recall powerful examples like the elm-lined streets of Winnipeg, Saskatoon and Edmonton, these are landmarks in place-making, unforgettable moments that generate love for a place.**

– Marc Hallé

we try to save trees that we shouldn't. We know an awful lot about how to save trees. Now, that can be done very effectively if we have the right candidate. You can save almost any tree as long as you get to control everything, but you rarely get enough control. I've seen some enormous trees moved at huge expense – \$100K US to move a single tree. It seems so easy, but what is the long-term impact on the tree? The developer says okay, because the trees are not valued. A developer may say, \$100K US to move this tree over for an extra 100 or more square feet, times the height of the building added as leasable space, and think \$100K is cheap. We need to fight harder to save the tree and its soil space for continued long-term growth where it is currently growing. We need to work harder to identify what happens in an old growth tree. The book *The Overstory* by Richard Powers that came out a couple of years ago is a wonderful description of what happens after a tree gets to be about 200 years old, especially in the Pacific Northwest. We've got to latch onto those things. The biology changes, even the soil biology of the tree, not only in the ground but the developing soil up in the canopy, changes at somewhere between 100 and 200 years old. That's what we should be shooting for. We need to provide growing spaces so that these trees will become 100 to 200 years old. A thousand cubic feet of soil is not going to get you there.

**Darby:** I don't work on the tree preservation side of things, instead I work on the front end. The better we do our job at the beginning, the more likely it is that we will have trees to preserve. What we look at is tree establishment, especially in urban space, where there are finite soil volumes and certainly limited inputs in terms of natural soil ecosystems. This is something that we're constantly thinking about. And it's a challenge to work with a lot of different cities, to get them to stop thinking entirely in terms of tree counts. How many trees go in the ground versus the benefits

being generated by that inventory year-over-year is really the type of accounting that needs to take place. For our team, it's about trying to figure out what can we do at the front end to ensure success, like creating the space and conditions so that we have these trees persisting much past the typical lifespan of an urban tree.

**Bob:** I'm thinking about some of our work with planning and greenfield land development planning here across the prairies. We were invited, a little late to the game, to a new subdivision named for the iconic forests along the river corridor. We were brought in because the development planners and the engineers were having challenges getting approvals from the local municipality. They were required to provide a certain amount of land along the riverbank, showing they would save this iconic forest. But you know very well that as soon as they started doing that development, the tree stand was going to be destroyed by all the construction activity and disruption in that area. So, we negotiated with the municipality, the developer and a number of others to completely transform the way that the area was developed in order to preserve the forest, optimize the land subdivision for lot sales, and actually live up to its name! This situation demonstrates that we need to get closer to the front of the boardroom table so that we can be there long before decisions are made and embedded in a planning project to make sure that these trees can persist. Certainly, not by just installing fencing around the drip line but rather by doing the things necessary to transform the land, to protect those mature trees. Not necessarily all those trees have to be protected – it's making sure that you have the ones that carefully create the environment, the biology and/or make the most self-sustaining development that you're looking for.

**Rob:** I thought it was a trick question because you don't have mature trees unless

you've planted young trees. A population ecologist would never try to preserve a population by its eldest members. You would preserve it across the whole distribution of its population. I'll give you two stories. One was when I was a young student; I worked with Art Buckley who was a curator at the National Arboretum in Ottawa. We'd go to places and Art would stand there with all the developers looking to him and they'd say we have these incredible, beautiful, 100-foot high, mature sugar maples. What can we do here? Art looked at those trees and then turned around said, cut them all down. We were all in shock. They were scandalized. He said, "You're going to drop the water table. You're going to destroy the roots. Let's be realistic here. You'd be better off planting all new trees and letting them grow to 150." Art was being realistic about how you can preserve trees.

The second story is that Dr. Peter Rice at the Royal Botanical Garden has one of the most beautiful lectures: "Tall trees are your oldest citizens." By the time he's finished, there isn't a dry eye in the house. Would you take your oldest citizens and kill them off? No, probably not. You must look at the content of the ecological continuum that you're dealing with. If urban-heat-island-effect is the issue, mature trees are critical in terms of that overstory.

The last thing I'll say is that when I go out with a forester versus an arborist: an arborist will take out a chart and say the tree is a 16, so it can go. If I take a forester out, they'd say, "That tree has probably got another 25 years left, it's all good. The birds love it, the insects are in it, everybody's happy. Just plant something beside it. Then after 25 years, cut it down." A lot of judgement is about our attitude about the ecologies that we're working in, so it's not just one age versus another. You need that continuum. Let's face it, if you're in Toronto, 90% of our parks are all mature. In another 50 years, there won't be a tree left unless we start planting now.



## Does species diversity matter?



**Bob:** We struggle when we are asked to make sure that no two of the same species of trees are ever side-by-side, referring to the species diversity. We start to lose those notable design characteristics of colonnades or a bosque of trees that will create a unique environment.

Species diversity has to be considered within a larger context. When you consider designed plantings within a greater matrix of trees, and understory, in a greater area, you begin to see diversity.

I've often made the plea to planners considering diversity to consider something like our Aspen Parkland within and around Riding Mountain National Park here, where the matrix of those trees would start to suggest a bit of a monoculture when you draw the invisible lines of "property." I do think species diversity matters, but I believe that there's still room to make sure that we're still achieving some of the loftier ambitions of design.

**Rob:** Diversity is a very interesting thing. If you've done your ecology and species richness, how do you know when you have a diverse forest? That's the key. If you talk to a sustainable forester and you looked at sustainable forestry practice, let's say, what they do up in the Haliburton Forest, they would claim that any forest that you must replant is a failure. Sustainable forestry is only the number of tree species that allows the forest to replant itself. In that case, species diversity is set by the ecological environment you're in, so that young plants, small plants and understory plants will grow. When we're in urban areas and we try to do the species selection, we're playing a very interesting game because we try to do it all at once and we're trying to do it immediately. For example, when I worked in Mississauga and tried to convince them to plant whips, I said, "Why would I plant 15 two-inch calliper trees for \$350 when I could plant 5000 whips at a dollar each?" Of course, the municipality's worried they'll break, they'll be vandalized.

I said, well, let them go. Just let them try to break them all over the place. If you go to the little Etobicoke Creek now, it's totally forested. Some died, usually around 10%, some didn't. They started this whole system. For real species diversity you need time.

**Marc:** There are two ways of looking at this. On the macro scale, it is important to understand the impacts of large-scale monoculture planting. But when you look at the scale of a site and recall powerful examples like the elm-lined streets of Winnipeg, Saskatoon and Edmonton, these are landmarks in place-making, unforgettable moments that generate love for a place. In some cities where climate can limit the choice of street tree, there may only be one option, like the Brandon Elm, which reaches a size and scale needed to create those moments that stay in your memory. It is unfortunate where these elms have had to be cut down because of disease, often replaced with a succession of other monocultures – a race to the bottom from ash to flowering crabapple. But like the saying, "It is better to have loved and lost than to have never loved at all," a half-century immersed in these iconic landscapes may be worth it. Diversity is important, but there are also key moments when these expressions are appropriate for a strong public space experience.

**Michael:** My grandparents grew up on a street where *Castania dentata* was the monoculture, my mother grew up on a street with American elms everywhere, and Green Ash lined my street. All were monocultures, and all of these trees are gone now. We do this over and over. I don't know how to break this cycle.

I look whenever possible to best practices and to the ISA and ANSI standards – let's start with no more than 30% of one family, no more than 20% of one genus, no more than 10% of one species. And that seems to be an acceptable peer-reviewed place to start. I do a lot of work with BIAs and

in Yorkville, for example, we did a large scale arboriculture study and began to catalogue this, so we could start to come up with specific street-by-street planting design guidelines that could say, "This site should not plant this species, or this genus, or this family, because these sites over here are already doing that." What are the limits that we think about species diversity? Because we're not getting it right at a larger scale, despite seeming to get it right individually, on our smaller projects. But then there's this different scene when we jump 10,000 feet in the air: what does this mean for the city? I'm not sure we know how to get there. We all wrestle with these things every day. I had a client call this morning; they wanted this one species of tree in front of their building because it would look fantastic. And it does look fantastic. I mean, I'm a designer too, and I get it when you get that consistent length of a standardized aesthetic. If we squint and look only at foliage, there's a common shape and form to a *Sophora*, a *Robinia* and a *Gleditsia*, so these are little tools I use to convince clients that a planting plan can be both diverse and resilient, while having a standardized aesthetic.

**James:** Where Michael went was exactly where I was going, that the species diversity is a much larger scale than most landscape architects can even begin to control at a project scale. We talk about species diversity because we don't want the elm problem to recur, but most of the benefit of the species diversity comes at all kinds of other levels and layers. It may be more important to have the other layers of our landscape have diversity so that we have a place for the insects that are feeding on another insect that is in our tree for one month of the year. But that predatory insect needs someplace to go when those harmful insects disappear. That may be moving into a shrub layer or a tree that is a block or two away. But on the other hand, I am still taken by the fact that if you stand on the west coast of



## How do you consider soils in your work? What tools would you suggest to help us advocate for best soils, more soil, and design with the right type/texture/structure of soil?

Alaska, and start walking due east until you get to the other side of Canada, you are really only going to run into two tree species across that entire transect. That's a monoculture in nature. And we have lots of monocultures in nature. We should be trying to say, "What else do these trees do for us in the landscape, both visually, the human side, the management side?" It's a lot more difficult to manage a street that's got 15 different species of trees than one that has three. Early in my career, I worked on Trinity College, where the elms all died in the courtyard so had just been completely cut down. One of the design requirements was that the tree we selected had to fit into the school song "Neath the..." We came up with ash, "Neath the ash" – it's a beautiful song. We planted the whole courtyard with ash and we all know where that went. If I was asked to redo that project now, I might actually go for disease-resistant elm. It doesn't take that long for them to grow back if you get everything right. I like both Bob's and Robert's thought, that they will grow back.

**Darby:** Yes, diversity matters, but it is hard to operationalize. I work with a lot of cities across the country and we often review their top performers list. Although cities have a diverse list, the reality is, what they purchase and plant are the top 10 that are acceptable for most urban settings. They are the bulletproof trees that everybody knows can take a beating. This is a continued challenge for us because there is so much risk around trying new things in uncertain areas and coming up with evidence that supports the ability to put new things into an urban landscape.

James' point about salt is a good one and is just one example of the many gaps we have for properly assessing and evaluating trees' suitability in an urban microclimate. That's where the species diversity question comes into play. There are regional scales that we can be looking at but there are also larger scales

when you think about how the forestry sector is using bioclimate envelopes and modelling tools to make informed decisions on assisted tree migration, for example. In addition to the de-risking side of it, from the perspective of the nursery sector, we want to be testing out and trying new things, but we need to be forecasting the supplies of trees for the future. This requires strategic demand planning on the nursery side, which is challenging to do because nurseries grow trees on speculation. There are very few instances of long-term growing contracts and certainly no municipality is going to contract-grow for trees that are unproven.

This is the space I exist in: trying to figure out how we get new trees that we can test in terms of species and genetic diversity, even into urban areas. And whose problem is it? Because the risk is everywhere from an asset management perspective; cities aren't going to plant 5,000 of something new and unproven. From the nursery sector side, they're certainly not going to line those trees out if they don't know they can sell them.

**The fact remains that there are no soils in Canada, except for a sand dune, that won't grow trees.**

– James Urban

**James:** I'm surprised that since 2008, I've actually found very few things I would change in my books and the one area that I really have evolved my thinking on is soil. Surprisingly, I was part of the group in the '80s and '90s that helped push manufactured soils as an idea. I wrote many of the early specifications – and I've gone full circle and I think that we need to stop using manufactured soil. The biggest problem in the whole process is the screener and the blender and the fact that we're asked to produce these specifications that are incredibly measurable and that everyone can just check boxes, and manufactured soil solves those problems. The fact remains that there are no soils in Canada, except for a sand dune, that won't grow trees. Especially in the Toronto area, there is a very monochromatic soil that runs across the whole region. It's beautiful stuff until you get the soil spreader. If we could just dig that soil, even the subsoil, where some soil sections are 5 to 10 feet deep, I'd be perfectly happy to take that layer out, throw some compost on the top of it and that would grow fabulous trees.

The brightest star on this whole discussion right now is Susan Day, of the University of British Columbia. She has developed this thing called soil profile rebuilding, which I've now translated into how we can build new soils. Essentially, instead of lifting the soil and putting it back down the way she wants to, I'm proposing digging it up, putting it in a dump truck and bringing it to the site and dumping it back in where we need it. We're way over-focused on soil chemistry. We should be mostly concerned with how does that soil feel? And look... how clumpy and lumpy, the clumpier and lumpier the better. If I could have a chunk of soil like a beach ball and throw it into the pit, that would be fabulous. We need to rethink the whole soil aspect. The soil specs I wrote for Toronto many years ago are not all that bad. They were getting me to the point of my rethinking. I was getting





rid of the soil screener. Keep it out of the soil screener, get rid of the Toronto spec that requires that you test every last living thing about it and just bring it in. It's not going to hurt anything to put soil in there that doesn't quite meet all the particular requirements. Canadians have made very good progress on soil volume and you're way ahead of the States on that. But 30 cubic metres will only support a tree that's about 20 inches DBH. I want to grow trees that are 40, 50, 60 inches DBH and you're not going to get there with 300 cubes or whatever those amounts are. On the other hand, I recognize that there are limitations with space. I think we can go deeper with our soils where we don't have space on the surface. I have a project in Miami where we have a 14-foot deep tree pit. I have not been able to get back down there, see how it looks. But my friend says the trees are doing pretty well, but it hasn't even come close to reaching the soil volume. I've been in mountainous areas where I've seen road cuts and tree roots going down crevices in rock to great depth: 40, 50 feet. I don't think there's a limitation on how deep we can make these soils except for drainage. So the next big frontier for me would be working out how to get much deeper in our soil to make the soil better by making it deeper.

**Darby:** We do a fair bit of work on soils and what we call *in-place restoration*, which is very much the idea of soil profile rebuilding. We've been working with the Ministry of Transportation, helping them develop a soil spec for highway soils. We're looking at a few key soil properties to help trees overcome their establishment period. In those cases where irrigation is absent, we've found there is a sweet spot in terms of the organic matter content. The idea that you can take the soil that is onsite and then amend it with some kind of product is a very good one. We often use something like a compost and just blend it on site. We've had really, really good success with it!

On James' point, working with cities, we are working with the City of Toronto right now and we're also working with York Region on this. We're doing this in two different kinds of settings, getting them to understand, for instance, in medians and boulevards where they're fully excavating the soil out of those boulevards and then bringing back in manufactured soil that if contaminants in those soil volumes are not a problem, that you can very effectively manage soil quality using some kind of organic amendment in place. This approach brings the cost of the planting project down a lot more, which then can be allocated somewhere else in the contract to tree care or tree protection. I think the soil is a place where there's still fundamental science that needs uncovering in order to connect the dots a bit more among those key properties, including the interrelatedness of texture, organic matter, proctor density, bulk density, soil strength. We're doing some of those trials in our lab right now, trying to understand what the thresholds are depending on the soil at the site. If you have a particular texture, what are the things to do to bring that soil to a condition that a tree will survive? This feels like we're moving from urban tree planting as a landscaping activity to using scientific principles and approaches, like we do in ecology and forestry. That's very exciting for me.

**Bob:** I'm not going to pretend to be a scientist. We have scientists in our office that do a lot of biological work with grassland revegetation and reforestation at field scale. The best thing that we've been seeing in the prairie regions is the development of trees that have changed significantly in our urban environment, based primarily on soil volume and acquiring a lot more soil volume for any of our boulevard-style and plaza style planting. These trees have shown such significant success compared to the past. In addition, different technologies, such as vaults and structures to support

pavements to allow for increased soil volume is seemingly doing a lot to take away or reduce the impact of salts in the trees. It seems to be almost like a first barrier for salts to get in. The work we're doing is trying to follow the science wherever it leads. Hearing the thoughts from both James and Darby has been encouraging and aligns with the kind of the leadership of science with which we're finding great results.

**Rob:** Soils are something that Michael and I talk a lot about, because soil is the Holy Grail for planting anything in the urban environment. And a lot of that starts from understanding that soils are made, the black, the pure clay. It just appears as we strip it off and to understand those processes is critical. I am always fascinated by places like the shoulder of the escarpment where we see these amazing trees and if you took a shovel and you tried to dig a hole in those things, you'd be hitting rock. The other thing to remember is that soils are alive. There's a lot of flora and fauna in inoculated soils that are key to their actual survival and long-term health. In urban areas, that is a real challenge. Salt is part of it. Pollution, lead, paint, we can go on about it, but soils are key to the long-term survival of the trees. On green roof work, we must be constantly supplying organic material in an urban environment because it decomposes at a fast rate and that takes huge amounts of nitrogen. We must understand the nutrient cycling that's taking place in these environments as well; it's a critical thing.

**Marc:** I was struck by a colleague's proclamation that "trees exist for their roots." It was a reminder how I have often emphasized only what's above ground and needed to give more care to the design of what's going on underground. James, I would say much of any success we may have had planting trees has come from what you've taught us. You've been revolutionary in creating this awareness,



## How can we imagine new ways to ensure trees are successfully included in new projects?

the impact has been huge. The effect on policy, in Toronto for example, has been phenomenal. There was a time when we'd go to meetings with developers and structural engineers who were often derogatory about accommodating loads for trees over structures. "Carrot growers," we were called. Now that a developer's approval is contingent on meeting soil bylaws, this is no longer a question. I am giddy knowing that we can now provide what is needed to produce large trees in a project, no more scraping by. We now have more authority to integrate systems that work and can endure. The impact on the street, in Toronto for example, will result in a future urban forest that has been set up from the start to be outstanding.

**Michael:** I came to landscape architecture out of a desire for better-performing living systems. I used to take my knowledge of soils for granted, thinking that we all had this knowledge of soils. I've studied soil science. I've achieved degrees in biology and ecology, which I complemented with soil science courses. I studied soil chemistry, but I wouldn't call myself a soil chemist. As a discipline, it occurs to me that we started to get soil chemistry down, and then we got soil volume down. I would argue, and you've been hinting at this the whole time, Jim, that it's time for even more aggressive standards. We all said at the beginning there's no way we can possibly get this much soil to work. And now we're consistently finding a place for it, so it's time for more. And next we need to consider soil quality, and specifically also soil texture and soil structure. Soil texture is a common conversation on projects now, as are soil report analyses. I'm getting soil reports daily, and I don't remember getting these unless I specifically requested them or they were written into my specs – which they always are, for the record. But it's a different story with soil

structure – we don't get that generally as a discipline, some of us get it a little bit, but we don't get that enough, and this is a real problem, and one that needs to be a much larger conversation. The last thing that I would add is, how do we educate more about soil? What courses should we take or books should we read? At what point does soil come up in our curriculum? I work as adjunct faculty and multiple times a year, at all year-levels, I am asked to give soil lectures to complement other courses. That is heartwarming to me because I hire a lot of these grads and they're now speaking more like a soil scientist than the grads I used to hire. This is a promising and critically important thing to me. I used to be the only designer speaking about soil at my office, and now I find these are much more fluid and common conversations. And this is as it should be. At the end of the day, academia has got to be there, and it is getting there. These conversations need to be more comprehensive. We must lead with soil. The trees are then secondary to the substrate. After all, if we don't get the soil right, our best planting plans don't have a hope.

**What we need in our urban areas is more of an ecological mapping and an understanding of the ecology of the urban area.**

– Robert Wright

**Darby:** The most exciting thing about some of the projects that we're being brought in on is that these conversations about trees and soils are happening at the *beginning* of the development rather than being tacked on to the end where it's like, whatever's left over becomes the green space. On a project that we're working on in the Niagara Region, we are having these conversations before the development exists. Basically, we're looking at the soil quality, structure, volume, all of that. They're trying to avoid having a large catchment at the front of the development. Instead, they're thinking about what we can do, literally from the ground up, to have an entirely permeable development. This may be the biggest frontier for urban forestry: that tree planting is no longer an afterthought. We've been talking about soil volume and about species selection. This integrated approach is going to be the most critical stepping stone that will advance urban forestry into the future, not just building the bridge between research and practice. What I see is that we need a much more coordinated and connected value chain for these kinds of projects.

I'm starting to think about a chain of custody: If anyone touches the tree anywhere along the chain of custody, they need to be part of the conversation. We have these important transdisciplinary teams thinking about the value chain from the perspective of where the tree will be, not just at the time of planting, but hopefully much further out than 20 or 30 years. I think that the new frontier for urban forestry is forecasting tree needs. Thinking about these things first and often from an ecosystem services perspective.

**Bob:** We're slowly seeing our urban environments erode as we now create lanes of traffic for vehicles, lanes of traffic for bikes, lanes of traffic for pedestrians, lanes of traffic for those using wheelchairs – our urban rights of way are getting larger and larger. We continue to ignore the least





defensible in our cities. Trees are our oldest citizens in the urban landscape.

Recently, I was having this conversation about accessibility standards with a colleague. I was suggesting that we have to stick to our guns to heighten the standards for those that are more at risk in our urban environment and that it should be the policy across all of our urban landscapes. The response was that this is simply not the way it's done. It was very unfortunate to hear this comment that our policy makers are still, to this day, prioritizing the car as the dominant force in urban environment and we are unwilling to move any of our infrastructure to protect the least defensible.

We need to start taking that back a little bit. When we think about this COVID-19 world and what we've learned from it, with our value in public space. And when I say *public space*, I include the roadways. These spaces must be populated by the ecology that we're part of, which our trees are part of. For urban forestry, we need to prioritize those systems within our rights of way, and we need to prioritize them just as much as the car has space and just as much as the pipe underground has space. If we start taking this moment to look at how important our public spaces are within our rights of way, I think we're at the precipice where we can really start pushing the quality and the importance of our urban forest.

**Rob:** Our urban areas need more of an ecological mapping and an understanding of the ecology of the urban area. The first thing you understand when you do that is the boundaries are not the same as the regulatory boundaries. For example, in the vertical forest, there is no value to the Urban Forestry Department for trees on private balconies because they don't regulate them and they can't control them and so they don't want to give any value to them. That's one example. When you plant on a building, the north, south, east and

west sides are totally different ecosystems from a microclimate standpoint and there's a vertical aspect of it. It just represents the kind of complexity that we're facing relative to using ecological thinking. I try to get everybody to think of biodiversity, biomass, and can it be some of the values that we have in our urban areas? *Urban forestry* was a term that was coined by a man named Dr. Jorgensen at the University of Toronto 70 years ago. He was vilified by the foresters; they said there's no such thing as an urban forest because how many trees are forest, right? What is the composition? I think we are changing that. But when we look at it, we must change our whole way of thinking the way we regulate the urban forest. You talked about the value chain and we talk about supply chain and all those other ecological chains and ecological values. Our challenge in urban forestry right now is to get that into our thinking.

**Marc:** The distinction between urban and natural areas seems to be getting blurred. So much talk around me during COVID has been about moving from the city to the country. It reminds me of the old dream about the suburbs, which for so many didn't quite work out as originally imagined. Everywhere is urbanized now. And the needs for urban infrastructure seem to be diametrically opposed to what trees and living systems need to flourish. How can we bring these two opposite conditions together, perhaps in a way that they could even reinforce each other? Can we bring some of these qualities into the city, instead of having to leave the city to find them?

Toronto has the advantage of its ravine network, a head start towards a connected urban ecology. How can this become even better, as both an ecosystem and as a cultural landscape? And for other places that don't have this kind of connectivity baseline, how do you build it into the urban fabric? Perhaps it goes beyond

planting rows of equally spaced trees towards alternatives such as, for example, integrating forest patches that can attain a critical density and self-sufficiency. How do we choreograph all the other urban forces around it to produce an interconnected hybrid?

**Michael:** So, how do we get there? And how do we get the people in charge to enforce policy on those with particularly sharp teeth? As Jim said, it's merely a drop in the bucket to move that \$100K tree. I was part of a project where there was \$180K in consulting fees that went to the arborist on the project. That's significant; particularly when the much broader landscape fees were under \$100K. But that's what this particular developer decided to spend on tree advice. They determined that the issues that would come up through the larger city process, and the optics of going through that conversation and the public meetings without having a solid position on these important trees, that getting ahead of all of this was the better deal. I'd like to move beyond policy. I work in many municipalities and sometimes I'm standing beside a mayor who is saying we're going for a canopy cover of 35%. Or perhaps it's a conservative 25% at the end of the day. But how close are we to that? Are these targets reasonable? Are they even achievable with the policies we have in place? I'd say that we're overzealous on that. I'd say, in some cases, many cases, not only are we not growing our urban forest, but that our urban forest is diminishing. And too many of these trees are juvenile 80mm caliper specimens struggling along boulevards, as opposed to the mature trees that straddle numerous rear yards and have infrastructural value. In fact, urban forests are declining despite the lofty targets. We all unfortunately know that the ideas that we bring to concept drawings are very different from what is implemented. The idea of a vertical forest is bold. That's an important and timely project. There's a reason that Rob and Darby are on this team

(no pressure!). But we need researchers on these projects. We need academics on these projects. And there are the variables with that vertical face, with the dynamic sun that lights and shades the building in a shifting daily cycle. There is a very different microclimate on the northeast corner of the 12th storey, than the southwest corner of the 3rd storey. We must design appropriate horticultural areas that are driven by performance and a rigorous understanding of environmental conditions. We must understand intimately how these landscapes will perform differently. And we've got our work cut out for us. Absolutely. But these are things that we need to wrap our heads around, particularly when we have a market that's willing to pay a million dollars for a terrace that incorporates these robust living systems. A bold idea for sure, but we need to think outside of the box more and more, and this project is an exemplar of that.

**James:** I think we're going to see two emerging ideas and one is to plant fewer trees. Make sure that every tree you plant will live so that most of the trees on your plan will at least get to be 100 years old. I started out thinking a 50-year tree was my target and then it was 100 years and now I'm ratcheting that up to 200 years. I'll leave that to the youngest people on this panel, and their grandchildren to solve. I've spent a fair amount of time roaming around England looking at trees and they may have more 500-year-old trees in England than we have in the U.S., east of the Mississippi. They have a huge collection of ancient trees in England; they're generally all

freestanding open-growing trees. We have to get much larger spacing and huge soil volumes. I think we are generally planting too many trees. One tree can do the work of 15 closely spaced trees if it can actually be assured that it will grow.

The second idea is the opposite. Plant way more trees. The idea of a self-generating forest as a landscape image. I'm not talking about the urban forest. But a true functional forest with a canopy, a story and understory system that is connecting everything together. It turns out we actually are building those now. There is a wonderful forest patch idea at Malmo, Sweden, where there is a patch of forest, in an otherwise urban park, is about 60 or 70 feet on one axis and 40 feet on the other axis. It's just plopped down, beautifully done because it's got a Corten steel edge around its perfect ellipse. In that forest, there were toys, and there were trails that had been built by children who live in the area. They're using it as their play space. The other one that really struck me was Michael Van Valkenburg's Brooklyn Bridge Park. It's now grown enough. They ran the Google machine through all the pathways in this park so that you can actually walk through the park. It's not even 10 years old and there is a true emerging forest that is starting to be evident there. We say, "We can't do this in dense urban," well, that corner of Brooklyn is about as dense as you can get. And they figured out how to do it.

Those two ideas are totally opposite each other, but if we can solve both of those problems – a few old trees and a forest – the spaces in between those ideas will be where the majority of landscapes will end up. We'll learn a lot from both.

**...the most exciting thing about some of the projects is that these conversations about trees and soils are actually happening at the beginning of the development rather than tacked on to the end where it seems whatever's left over becomes the green space.**

– Darby McGrath







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# PLAY

Play never told me you can't  
or don't  
or you shouldn't  
or you won't.

Play never said be careful!  
You're not strong enough.  
You're not big enough.  
You're not brave enough.

Play has always been an invitation.  
A celebration.  
A joyous manifestation.  
Of the cans  
and wills  
and what ifs  
and why nots.

Play isn't one thing. It's everything. Anything.

Play doesn't care what a body can or cannot do.  
**Because play lives inside us. All of us.**

Play begs of us:  
Learn together.  
Grow together.  
Be together.  
Know together.

And as we grow older.  
As the world comes at us with you can't  
or don't  
or you shouldn't  
or you won't.  
We come back to what we know.  
That imagination will never fail us.  
That words will never hurt us.  
**That play will always shape us.**

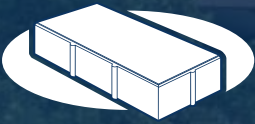


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JAMES URBAN

# SOIL – WATER – SALT

## > FR\_LP+ TERRE - EAU - SEL

La récente table ronde sur les arbres, parrainée par l'AAPC, a donné lieu à un échange stimulant sur les nombreuses questions qui ont un impact sur le succès des arbres dans les villes canadiennes. Je suis sorti de cette réunion en considérant trois éléments comme essentiels dans l'équation complexe de ce qui prédit le succès à long terme des arbres sur un projet donné conçu par des architectes paysagistes : le sol, l'eau et le sel.

## THE RECENT CSLA-SPONSORED

*Landscape/Paysages* panel discussion on trees was a stimulating trip into the many issues that impact the success of trees in Canadian cities. I came away from this meeting seeing three elements as critical in the complex equation of what predicts the long-term success of the trees on any given project designed by landscape architects. Despite my more than 40 years of study and research, we still struggle with soil, water and salt.

**Soil:** Yes, we have made progress on soil volume but still do not understand soil assessment, soil quality and installation at the project level. Over these many years, we emerged from having almost no understanding of these issues but then went down a number of tortuous paths struggling to find the "perfect soil." We went from not considering soil at all to overthinking soil as a specified commodity. Our clients, particularly government agencies that oversee urban tree planting, demanded increasingly tighter specifications full of boxes to

check and tight tolerances around what makes the perfect soil. Anything less than this was rejected. This led us to manufactured soils that, while fitting the engineer's view of a consistent commodity, were a less-than-ideal solution. The promise of manufactured soils suggested that we could apply the same approach used for concrete or steel in a construction project but did not provide the best or a sustainable soil approach.

We focused on soil chemistry, soil organic matter and soil texture (the proportion of sand, silt and clay) as the primary determinants. These are useful but hardly the best predictor of a soil's functionality. We ignored soil structure (how the texture is glued together) and how harvesting, processing and installation changes structure. We forgot that the soil profile (how soil changes with depth) is just as important as the texture of soil.

The reality is that soil is a natural material as varied as the environment itself. There are almost no native soils in Canada that will not support great tree growth as long as we match the trees to the soil's properties and limitations. Starting with natural soils is a sustainable soil direction. Landscape architects can and must learn much more about the art as well as the science of assessing and working with soils. It is not rocket science, but natural soils are much more nuanced than just reviewing soil lab tests. Soil structure and soil profile cannot be tested in a lab. Soil colour and odour may be better predictors of soil functionality and are missing from our skill set and specifications altogether.

I challenge the profession to become experts in what is the most important skill a landscape architect may need. You do not need to become a soil scientist but you

do need to have enough skill in this area to make good decisions and argue for a more nuanced approach to the craft of soils.

**Water:** We need a better understanding of how to get water to the plantings we design. When our understanding of water/soil/plant relationships were limited to the soil on the surface, we could use the crutch of mechanized irrigation to solve our water problem. If we are to fulfill the dream of sustainable landscapes, we must design landscapes that work with the natural rain cycles. Grading, soil design and plant choice all contribute to the solution.

We often rely on soil tucked quietly below the pavement to increase our soil volumes. I certainly contributed to this idea but bringing water to these soils is critical and our systems are simply not adequate. Let us increase our understanding of how much water we need and at what times of the year. Understand how urban dirt, silt, trash and chemicals impact the functionality of the water and the soil. Have we designed maintainable systems that can be cleaned, and are able to express to the operator when maintenance is required? Do we also design suitable systems to remove excess water from the soil?

The added requirements of using installed soils as part of the control and treatment of storm water adds to the complexity of the water-design equation. We blindly go forward with approaches that are not well developed and often not based on principles of soil hydrology. We must add this new skill set to our toolbox.

Long ago, our profession gave up the fight with engineers about who designed and documented the way sites are graded. I feel this was the biggest mistake we made during my short tenure in the profession.

PHOTO ISTOCK.COM/  
WATERSTREETPHOTOGRAPHY



If we are to fulfill the dream of sustainable landscapes, we must design landscapes that work with the natural rain cycles.

Grading controls everything that makes water, and thus soils and plants, work. Relearn to grade and understand how grading impacts functionality. Renew the fight to regain this area of practice back into our portfolio.

**Salt:** Particularly in eastern Canadian cities, the use of salt is a huge factor in the prediction of plant success. In my early involvement with trees in Toronto, I naively wrote that the salt problem could be solved by simply increasing the soil volume, assuring good drainage through that soil and bringing the needed flushing of salt from the soil after the winter. The solution to pollution was dilution.

I could not have been more mistaken, and I apologize for my misguided direction. The salt solution will rely on using less salt. Landscape architects must join together to find better snow and ice management solutions. We need to reduce the salt flow into the expensive soils we are adding to our projects, while at the same time permitting water into soil systems in spring and summer. We need to research the threshold of salt damage for different plant species and soils. We need to understand that not every tree in the city is subjected to the same salt impact. Clearly our central business districts suffer greater salt/tree damage than trees even a block away from main street. New design approaches, species changes and landscape management practices must all be brought to bear to the solution.

Soil, water and salt, all three interrelated. Each alone able to cause tree failure but all three considered together to develop future solutions.







DARBY MCGRATH

# LISTENING TO TREES, AND OTHER LESSONS FROM A LIFE-LONG LEARNER

>FR\_LP+

ÉCOUTER LES ARBRES ET AUTRES LEÇONS  
D'UNE ÉTERNELLE ÉTUDIANTE

Les défis auxquels sont confrontés les arbres ne sont pas propres à un groupe de chercheurs, de professionnels, d'industriels ou d'associations. Nous avons besoin de plus d'arbres à maturité dans nos paysages bâtis. Or, comment y parvenir? Face au changement climatique et à un nombre croissant de recherches sur l'importance cruciale des arbres en tant qu'écofournisseurs dans le paysage bâti, nous voulons des arbres plus que jamais à l'Anthropocène.

**WHEN I WAS** invited to participate in the CSLA panel on trees, I was concerned about having something valuable to contribute to the discussion and, while preparing my remarks, I was ready to listen and learn. During panel discussion, I heard a group of wonderful people, passionately discussing the challenges and opportunities facing trees in the built landscape and I realized something, perhaps not profound, but important, nonetheless.

The challenges facing trees are not unique to any one group of researchers, professionals, industry, or association. Certainly, the main objective discussed by panelists was the same: we need more mature trees – and that is FULLY mature trees – in our built landscapes, so how do we get there? In the face of climate change and a growing body of research about the critical importance of trees as eco-providers in the built landscape, we need trees now more than ever before in the Anthropocene.

I would like to reflect on some of the lessons that have shaped my thinking on the changes needed to succeed in our urban forestry objectives.





### Lesson 1: Urban Forestry is Still a Relatively New Research Area

Cobbling together knowledge from other fields of research, as many of us have been doing, leaves significant gaps in the evidence-base that need to be filled to help urban forestry succeed. For example, my team is collaborating with the nursery sector on a management practices project to improve soil health for in-field tree production. Nursery producers told us the resources they commonly consult to help guide their soil management practices are from agricultural field crops – *annual* crops – because there are so few resources on caliper tree production for them to use.

On the other end of spectrum are the gaps in resources related to soil qualities in urban landscapes to support tree establishment. There, too, we are borrowing from agricultural recommendations. For example, 3% soil organic matter is considered “sufficient” when interpreting soil analysis results; however, when looking at soils in forested landscapes, organic matter content is significantly higher. With this contradictory information, what is the right value for soil specifications in urban landscapes? Important resources needed by professionals doing the hands-on work to get trees into our landscapes are often missing and we have been asking them to fill information gaps on their own. That is a big problem.

### Lesson 2: Taking a Disciplinary Approach to Urban Forestry Is Fraught with Problems

A tree's life in the built landscape is a complex interplay of ecological, biological, physiological, morphological and

sociological processes. No one group alone can achieve success in urban forestry. As a researcher concerned with urban tree establishment, I often think about the “tree chain of custody” when I consider the many actors playing a role in the success of urban tree establishment and how to create tools to support them. From propagators, nursery producers, designers, specifiers, soil suppliers, purchasers, installers, maintenance and tree care and the community welcoming the tree into their landscape – each hand touching a tree along the journey is part of this chain of custody.

Until we begin treating tree establishment and urban forestry as the interconnected value-chain it truly is, we will not make radical advances in urban forestry in Canada. Until we understand that tree establishment cannot be fully understood using a disciplinary approach, I fear that we will fail to make the big changes needed to achieve the objective of fully mature trees in our built landscapes. We need to find a way to advance and support a value-chain approach to research to help fill those information gaps we keep bumping up against.

### Lesson 3: Listening and Sharing

My initial trepidation about contributing value to the panel is perhaps less trivial than originally thought. How often do we effectively communicate to professionals outside of our niche or discipline? How often do we think that what we have to say is obvious or self-evident, so we don't share it? I suspect that this happens all too often and as a result we do not share experiences and knowledge nearly enough. Further,

we often do not take the time to listen to the chorus of voices that can inform us and open our eyes to different ways of doing things. In this urban-tree value chain, we need to listen and collaborate to figure out how the puzzle pieces of what we do influence one another.

### Lesson 4: Nature/Trees Will Find a Way, if We Let Them

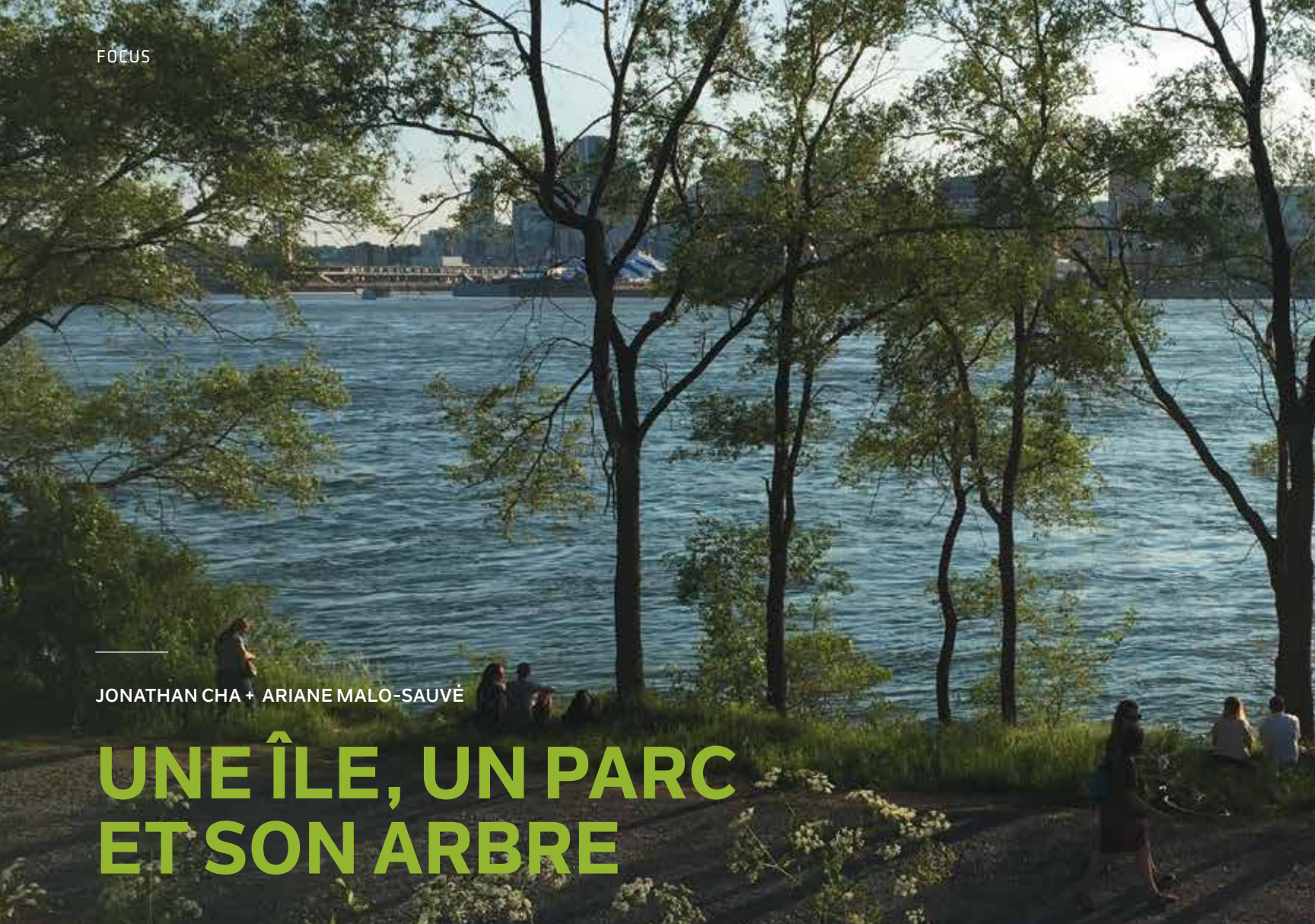
The final lesson is that trees know what they need to grow, persist, mature, die, decompose and give life to their ecosystem. Sometimes when I stand in an urban setting, the built landscape appears to me as a tableau of human hubris. Absent from human construction and design, forests begin anew after disturbances. With time and many ecological processes (that, let's face it, we only partially understand), they grow and reshape the landscape. Somehow, we have managed to build landscapes that exclude them – in fact, in many instances, we have created conditions that are diametrically opposed to their existence.

I learned this lesson many years ago and it shapes my work every day: to truly integrate trees into our landscapes, we need to approach design considering trees' needs early and often. Frequently we see trees stressed, struggling and failing in the landscape, telling us that we have missed the mark – it is time we start listening to them.

PHOTOS DARBY MCGRATH







JONATHAN CHA + ARIANE MALO-SAUVÉ

# UNE ÎLE, UN PARC ET SON ARBRE

1

## > EN\_LP+ AN ISLAND, A PARK AND ITS TREES

In 2005, Montreal adopted a tree policy (*Politique de l'arbre*). It created a set of tools and actions allowing municipal employees, residents, partners and major landowners to contribute to tree preservation in the city.

### L'arbre dans la ville et dans ses politiques

L'arbre est depuis le XIX<sup>e</sup> siècle une composante majeure des villes canadiennes et un symbole partagé à l'échelle du pays. Nous traiterons de la place de l'arbre dans nos villes, de son capital santé pour les citoyens et présenterons le paradoxe qui peut exister entre les actions visant à le protéger et celles ayant peu de considérations à son égard. Nous proposerons des pistes de solution pour réduire la disparité entre ces deux façons d'agir sur le territoire et prendrons pour cas d'étude

le parc Jean-Drapeau à Montréal qui a subi de nombreuses transformations dans son histoire et qui se dotera prochainement d'un nouveau *Plan directeur de conservation, d'aménagement et de développement*.

Pendant que le *shinrin-yoku* (bain de forêt) a la cote, le cardiologue François Reeves continue de partager le fruit de ses recherches en cardiologie environnementale et martèle que la pollution atmosphérique ravage les milieux de vie où les arbres se font rares; que dire des études démontrant que les villes moins arborées sont plus touchées par la COVID-19. Malgré la reconnaissance des services écosystémiques rendus par l'arbre urbain, sa valorisation et sa protection peinent à y rendre justice. Leur influence sur l'espérance de vie humaine en témoigne, ils sont parmi les services essentiels et constituent la plus précieuse des infrastructures du territoire des villes.

Avec plus d'un million d'arbres, Montréal «est sans conteste une ville d'arbres<sup>1</sup>», une «île d'arbres<sup>2</sup>». La moitié des arbres se trouve dans les grands parcs et les boisés naturels. L'administration municipale, sous la gouverne de la mairesse Valérie Plante, nommée ambassadrice pour la biodiversité locale par les Gouvernements locaux pour le développement durable (ICLEI), a planté 22 000 arbres sur le domaine public en 2018 et 28 000

1 UNE LISIÈRE D'ARBRES FILTRE LA VUE VERS LE CENTRE-VILLE MONTRÉAL ET AGRÈME LE RAPPORT AU FLEUVE SAINT-LAURENT. 2 LE PONT JACQUES-CARTIER, GÉANT D'ACIER, POSE LE PIED SUR L'ÎLE SAINTE-HÉLÈNE ET SON BOISÉ DE MICOCOULIERS. 3 L'EXPÉRIENCE PAYSAGÈRE DES CANAUX DE L'EXPO 67 A GRANDEMENT ÉTÉ RENOUVELÉE PAR LA CROISSANCE DE LA VÉGÉTATION. 4 VUE AÉRIENNE DE L'ESPACE 67 AU COEUR DE L'ÎLE SAINTE-HÉLÈNE, 2019.

PHOTOS 1-3 JONATHAN CHA, SPJD. 4 SPJD.





arbres en 2019. L'objectif s'élevait à 40 000 arbres pour 2020. Depuis 2012, le *Plan d'Action Canopée* s'affaire à augmenter le couvert arborescent de l'agglomération de Montréal de 20 à 25% d'ici 2025. Les efforts déployés pour inventorier le territoire et bonifier sa canopée sont considérables. L'objectif de cinq points de pourcentage représente un défi de taille et les obstacles à l'étalement du couvert arborescent sont nombreux.

Rappelons que Montréal a adopté en 2005 la *Politique de l'arbre* qui propose une série d'outils et d'actions permettant aux employés municipaux, citoyens, partenaires et grands propriétaires fonciers de contribuer à la préservation de l'arbre sur le territoire montréalais. Les actions prioritaires incluent la production de plans arboricoles, d'inventaires des arbres publics, la plantation d'arbres, l'établissement de critères de plantation, de règles de protection et de types d'entretien, des dispositions pour protéger les arbres et leurs racines pendant les travaux de construction, la protection des peuplements d'arbres rares, matures, centenaires ou d'intérêt local dans les nouveaux projets de développement de même que la création d'un programme de reconnaissance, de protection et de sensibilisation pour les arbres remarquables et d'un programme de recherche appliquée. Mais qu'en est-il vraiment, les arbres existants ont-ils suffisamment de mesures de protection avec une telle politique pour assurer leur pérennité ? La métropole



2



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**Avec plus d'un million d'arbres, Montréal «est sans conteste une ville d'arbres» ...**

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québécoise profite actuellement d'un essor immobilier dont l'un des effets collatéraux est la disparition progressive d'arbres et de boisés urbains. D'un autre côté, les zones densément urbanisées rendent la bonification de la canopée complexe pour les architectes paysagistes, qui doivent conjuguer avec les surfaces minérales ainsi que les infrastructures souterraines. À la pression exercée sur les boisés et aux potentiels de verdissement limités en zones fortement urbanisées s'ajoutent d'autres défis pour l'île de Montréal, soient la gestion des espèces exotiques envahissantes, le contrôle des infestations (par l'agrite du frêne par exemple) et la préservation des arbres en terrains privés.

### **L'arbre au cœur de l'identité du parc Jean-Drapeau**

Depuis son ouverture comme premier parc public de Montréal en 1874, l'île Sainte-Hélène est reconnue comme un véritable joyau naturel. Sa forêt mature de micocouliers témoigne du groupement climatique primitif de l'île et se démarque aujourd'hui comme une zone forestière remarquable à préserver<sup>3</sup>. Cette population de feuillus contribue grandement à la valeur paysagère du parc et rehausse la valeur de son contexte biophysique exceptionnel. Bien avant qu'en 2007 le Service de la mise en valeur du territoire et du patrimoine de la Ville de Montréal officialise la reconnaissance du site patrimonial cité de l'île-Sainte-Hélène en vertu de la Loi sur le patrimoine culturel, l'architecte paysagiste Frederick Gage Todd – récemment désigné personne d'importance historique nationale –, y voyait déjà dans les années 1930 une grande richesse arboricole : «[...] *This wooded island paradise seems destined to exert an increasingly important influence on the health and happiness of Montreal's present and future generations* [...]»<sup>4</sup>.

Les années 1950 puis l'Expo 67 marquent le début d'une succession de grands bouleversements alors que le paysage construit s'inscrit en forte dissonance avec l'identité pittoresque du parc, et vient exercer une forte pression sur les arbres de l'île d'origine. L'agrandissement du territoire donne le ton à la compartimentation des espaces verts; une organisation spatiale encore observable aujourd'hui qui pose certaines limitations à la biodiversité des îles. Pendant ce temps, Don W. Graham crée de toutes pièces un paysage «canadien» composé d'un lac et d'îlots paysagers sur l'île Notre-Dame justement pour améliorer l'équilibre entre les paysages construits et naturels et faire écho à la colline de l'île Sainte-Hélène. Si le tracé du Bassin olympique et du circuit Gilles-Villeneuve détruisent cette composition une décennie plus tard, les Floralies internationales de Montréal de 1980 contribuent à enrichir la collection d'arbres de l'île Notre-Dame par la plantation d'une variété d'espèces indigènes et exotiques. Au tournant des années 1990, le *Plan directeur de mise en valeur et de développement du Parc des Îles* résulte en un important projet de naturalisation et de végétalisation de l'île Sainte-Hélène. À la fin des travaux d'aménagement, en 1993, l'AAPC décerne un prix d'excellence national à ce projet et à son équipe de conception<sup>5</sup>.

Au fil des années, des visions opposées ont alimenté les débats et guidé les interventions. Pourtant, nous savons aujourd'hui qu'il est nécessaire de planter 23 arbres pour compenser la perte de séquestration du carbone d'un seul arbre mature abattu<sup>6</sup>. Nous convenons aussi que l'arbre doit être considéré comme une constituante d'un ensemble, contribuant à l'expérience esthétique et paysagère et à la consolidation de la continuité des espaces. À cela s'ajoute un rôle clé dans le maintien de l'intégrité des milieux naturels. Or, l'arbre est parfois perçu comme un objet, un bien meuble, un élément de décor

<sup>5</sup> VUE AÉRIENNE DES ÎLES NOTRE-DAME ET SAINTE-HÉLÈNE QUI MET DE L'AVANT L'IMPOSANT BASSIN OLYMPIQUE, 2019. <sup>6</sup> VUE AÉRIENNE DU SITE DE L'EXPO 67, 1967. <sup>7</sup> LES ARBRES MAGNIFIÉS PAR L'EAU CALME DES ÉTANGS DE LA GRANDE POUDRIÈRE. **PHOTOS** 5 SOCIÉTÉ DU PARC JEAN-DRAPEAU (SPJD). 6 ARCHIVES DE LA VILLE DE MONTRÉAL, VM94-D267-2. 7 JONATHAN CHA, SPJD.





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inerte amovible et interchangeable. Son système racinaire, souvent ignoré, est victime des dommages liés au piétinement. Dans un parc au territoire morcelé, façonné par la multiplication des routes et divisé par des stationnements, le continuum paysager arborescent n'est pas à sous-estimer.

### Un changement de culture envers l'arbre

La Société du parc Jean-Drapeau (SPJD) prend actuellement un virage important avec la publication d'un *Plan maître forestier* (2018) qui positionne l'arbre comme un élément central du parc et d'un nouveau *Plan directeur de conservation, d'aménagement et de développement du parc Jean-Drapeau 2020-2030*. La révision du cadre stratégique, l'adoption d'indicateurs de performance, la mise en place d'objectifs, d'actions et d'un processus pour atteindre et dépasser ces cibles, et des orientations phares de conservation pavent la voie à un avenir prometteur pour le parc et les 17 500 arbres qui le composent. Nous sommes persuadés que ce plan directeur permettra d'opérer un changement de perception et d'atteindre l'objectif ambitieux de la *Politique de l'arbre* : celui de confirmer que l'arbre, composante importante du patrimoine vert de Montréal, est un être vivant, une richesse à protéger et à développer.

Les actions à venir viendront consolider les efforts de plantation et de bonification de son patrimoine forestier. La Société du parc Jean-Drapeau s'y applique déjà en s'engageant à accroître son indice de canopée de 30 à 35% grâce à un programme triennal de plantation de 1000 arbres. Ces efforts devront s'ajouter à la conciliation des usages par la production de guides des bonnes pratiques d'utilisation et d'intervention (*Lignes directrices de conservation*).

En assurant l'application du plan de conservation, la réalisation du plan d'aménagement et la continuation des objectifs du *Plan maître forestier*, les architectes paysagistes et responsables des

espaces verts, parmi d'autres, joueront un rôle stratégique de première ligne. Cet engagement ne peut cependant reposer sur eux seuls. Que ce soit au parc Jean-Drapeau ou à l'échelle de la Ville, un encadrement réglementaire plus serré visant à protéger les arbres existants en balisant davantage l'octroi de permis d'abattage, serait nécessaire. Les parcs ont un grand rôle à jouer quant à la protection, la valorisation et la favorisation du contact avec l'arbre. Ressentir ses bienfaits dans notre environnement concrétise le plus tangible des apprentissages. Propager l'expérience positive de prendre un bain de forêt contribue à l'appréciation des arbres. Le parc public et l'arbre urbain sont deux biens communs de valeur inappréciable à défendre, particulièrement dans le contexte des changements climatiques et de la COVID-19, un défi auquel le Parc Jean-Drapeau est amené à répondre avec force, innovation et conviction.

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HEATHER SCHIBLI + NICK ASSAD

# SEEING THE FOREST FOR THE TREES

> FR\_LP+

VOIR LA FORÊT ET PAS SEULEMENT L'ARBRE

Les forêts sont étonnantes, et cela ne reflète pas seulement mon opinion biaisée d'amoureuse des arbres. D'innombrables études ont déterminé que les forêts offrent de nombreux avantages...Mais même l'étonnante forêt a des problèmes. À l'époque de l'Anthropocène (l'époque géologique marquée par l'homme), la prise de conscience de notre impact sur la nature s'est brutalement imposée.

**FORESTS ARE IMPORTANT**, and that doesn't just reflect my biased tree-loving opinion. Countless studies have determined that forests provide numerous benefits. They maintain biodiversity, protect watersheds, prevent soil erosion and mitigate climate change. They benefit our economy with materials and jobs. They feed us. Forests improve mental health, air quality and counter noise pollution.

Even the amazing forest has problems. In the age of the Anthropocene (the geological epoch of humans) the stark

realization of our broad sweeping impact on nature is sinking in. Fragmentation and climate change cause insurmountable impacts on remaining forest patches. The forest has impressive abilities to respond and adapt to impacts. Animals assist with plant dispersal, plants have developed tricks for spreading, and fungal networks tie entire communities of trees together in marvelous underground economies. But the efforts of nature are not enough to keep persisting against the cumulative forces of one species – humans. Taking



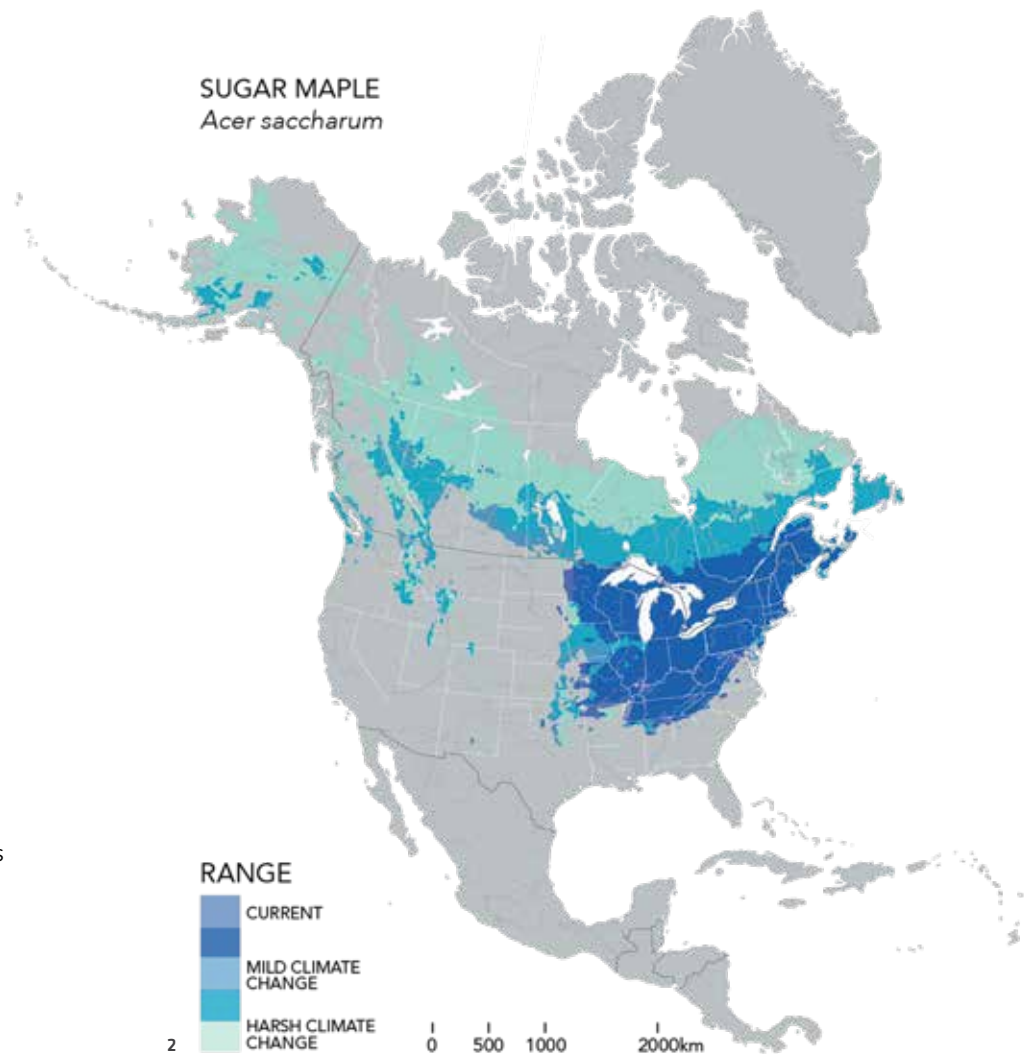
**Taking a leaf out of nature's book, we need to learn how to promote connection among forest patches. Long-term species survival depends on it.**

a leaf out of nature's book, we need to learn how to promote connection among forest patches. Long-term species survival depends on it.

Wildlife from bacteria to birds use trees for shelter, food and protection. In addition to these benefits, communities of trees offer the opportunity for protected wildlife movement to forage, mate and migrate. Several companion species, such as trilliums, depend on the growing conditions that arise from tree communities. So yes, forests are important. This is reason enough to design and plan our landscapes beyond individual trees, but rather to view individual trees as components of a larger living entity: the forest.

Fragmentation and climate change are two major causes of species population decline. Fragmentation is the division of habitat into smaller and more isolated pieces separated by a human-transformed landscape. It is a byproduct of habitat destruction (i.e., deforestation) and human land uses such as farming, industrial uses and urban development. This loss of habitat increases isolation of individuals, which leads to inbreeding. Often the leftover habitat patches are surrounded by the built environment that obstructs species movement.

With the onset of human-induced climate change, it is predicted that species habitat ranges will shift to reflect a new pattern of precipitation and temperatures. During severe climate change events over the last ten-thousand years there have been comparatively few extinction occurrences relative to what would be expected. This has been attributed to many species' ability to shift their range to track desirable climate, persist in climate change refuge areas, and develop tolerance to climate changes.



The key to persistence is dispersing at a faster pace than that of climate shifts. It is estimated that many tree species' migration rates post-glaciation were 100 to 500 metres per year. However, as noted by the U.S. Forestry Service, rates of change in climatic conditions are currently occurring 1,000 to 10,000 metres per year in the Midwest, Great Plains and Southeast of North America.

#### **Tree Reproduction**

Trees need mobility during two very important yearly reproductive events: fertilization and propagation. Let's begin with fertilization – since trees can't venture out to find a mate, they rely on others to do the searching for them. Those tree species that trust air currents for pollen dispersal need to be close enough for their lightweight pollen to reach their counterparts downwind. Some species have no problem with finding recipient trees in neighbouring woodlots. White spruce, for instance, has been found to sire seeds at a distance of 250 to 3,000 metres. Ash-species pollen tends to stick closer

to home, with 90% falling within the first 150 metres. And tree species that rely on insects and animals to pollinate? Studies have shown bumble bees typically pollinate within one area of flowering plants and forage in a range of 70 to 631 metres from their nest. Needless to say, tree species require mates nearby to reproduce.

This brings us to the second reproductive event. Not only do trees need genetic diversity nearby, they also need the opportunity to propagate. Seeds, like pollen, can be dispersed by wind and animals and also by water. If tree species are to shift their range in keeping with climate change, some of these seeds must overcome hurdles like paved surfaces and farm fields. Fortunately, seeds and nuts have evolved in some very creative ways to help themselves get around.

**1** SPECIES THAT RELY ON TREES ARE USUALLY PART OF A SYSTEM, THUS EVEN WOOD BORING INSECTS BENEFIT THE OVERALL HEALTH OF NATURAL SYSTEMS. **2** CURRENT AND CLIMATE CHANGE MODELLED SUGAR MAPLE RANGE.

**GRAPHICS** HEATHER SCHIBLI **PHOTOS** HEATHER SCHIBLI + PAUL SCHIBLI + CARL-ADAM WEGENSCHIMMEL



FIGURE 4



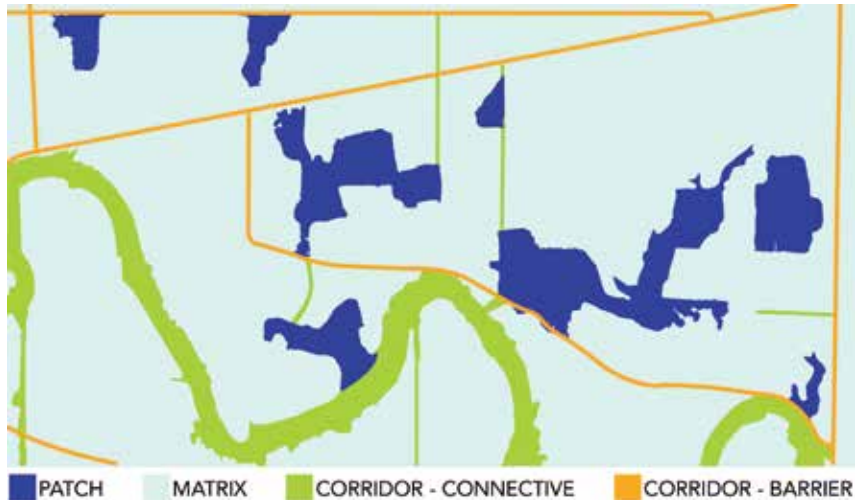
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For example, European buckthorn, an introduced species that easily spreads over a fragmented landscape, offers up shiny black berries to birds in the fall. This species' botanical name is *Rhamnus cathartica*. "Rhamnus" means thorny bush (which it is) and "cathartica" means to purge the body – especially the bowels – of unwanted material. And that is exactly what the birds'

bowels do: they empty themselves of these viable seeds all over the place.

Oaks, hickories and other nut-bearing trees rely on animals to spread their offspring too. However, they depend on scatter-brained scatter hoarders like eastern grey squirrels and blue jays rather than avian bowel movements. An eastern grey

FIGURE 5

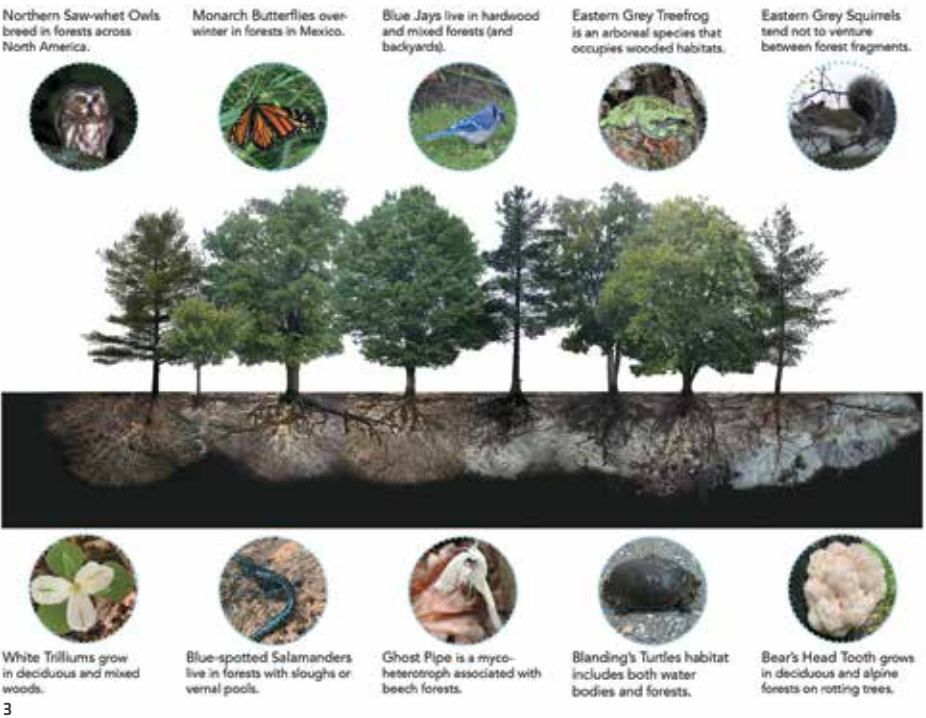


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squirrel will spend most of the fall foraging and stashing nuts throughout its territory, which rarely extends beyond a 180-metre radius from the nest. Is it thanks to their poor memories that stashed nuts are left to grow into trees? Not quite. Surprisingly, squirrels don't heavily rely on their memory to uncover their stashes. Rather, they lick their food before they bury it and let their nose guide the way, which sometimes means they end up stealing other squirrels' reserves. Jays too scatter hoard. This means they spread their stash of food all over their territory. For jays, that is about 0.5 to 6 hectares. Indeed, we can credit blue jays for successfully spreading oak trees after the last glaciation period, as it has been noted that blue jays cache between 3,000 and 5,000 acorns per year and usually in ideal habitats for tree growth. Because of their ability to transform landscapes into forests, blue jays are a keystone species. The acorns squirrels and jays fail to find grow into trees that will feed future generations.

A Whole Other Layer

These types of mutually beneficial relationships are found throughout the natural world. Forest ecology professor Suzanne Simard takes our understanding of tree relationships to a whole other level. The apparent lines separating individual trees effectively blur once we consider the subsurface connections made by mycorrhizal associates (fungus and plant root companionship). These fungal networks act as a sort of underground economy, connecting communities of trees including cross-species connections. What resources do trees share? Trees



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3 ILLUSTRATIVE INTERPRETATION OF THE MYCELIAL NETWORK AND SOME SPECIES THAT RELY ON FOREST HABITAT. PRESERVING FORESTS PROTECTS THE COUNTLESS SPECIES FOUND WITHIN. 4 SATELLITE IMAGE OF LANDSCAPE THAT INCLUDES FOREST PATCHES, A RIVER, ROADS, WINDBREAKS, AND AGRICULTURAL FIELDS. 5 LANDSCAPE ELEMENTS FROM FIGURE 1 DIVIDED INTO LANDSCAPE ECOLOGY UNITS. 6 SITE ANALYSIS FOR IMPROVED NATURAL HERITAGE CONNECTIVITY. 7 FURTHER OPPORTUNITIES TO CONNECT PATCHES EMERGE AS WE LOOK AT THE SITE'S CONTEXT. 8 CONCEPTUAL DESIGN PROMOTING ENVIRONMENTAL HEALTH. INCLUDES PATCHES (PURPLE) WITH SURROUNDING BUFFERS, AND CORRIDOR LOCATIONS (GREEN) FOR INTERNAL CONNECTIONS AND POSSIBLE FUTURE CONNECTIONS TO SURROUNDING NATURAL HERITAGE. GRAPHICS HEATHER SCHIBLI PHOTOS HEATHER SCHIBLI + PAUL SCHIBLI + CARL-ADAM WEGENSCHIMMEL.

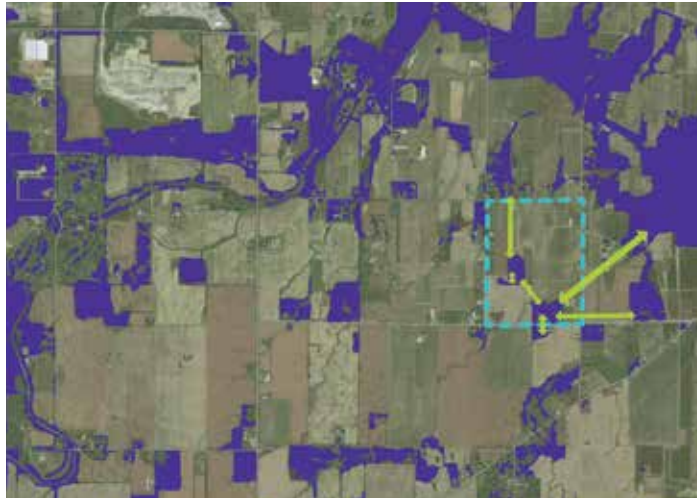


FIGURE 6



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FIGURE 7



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FIGURE 8



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connected by mycorrhiza can share nutrients and energy, influence where water is moving underground, and even warn each other of impending threats.

No seedling left behind! Forest seedlings that were not lucky enough to have germinated in a sunny location are charitably supplied with energy through this same fungal network. Given these scientific discoveries, forest communities have been likened to neural networks; a collective manifestation of intelligence referred to as the “wood-wide web.”

If forests were only facing fragmentation and habitat loss, given time, they would likely recover. Or perhaps if the forest were still wholly connected, just maybe the various forest species could shift quickly enough to avoid extinction from climate change. Shifting in a highly fragmented landscape though likely won't occur fast enough. This is where we humans come in: as landscape architects and planners, we are well positioned to promote species movement through landscape patterns that we include in our designs. Since 2015, I have worked for Dougan & Associates, an ecological consulting and design firm, in Guelph, Ontario. Our office includes ecologists, wildlife biologists, and landscape architects who work on projects grounded in the principles of landscape ecology.

### Landscape Pattern + Function

Landscape ecology is a field of study that emerged in the 1980s when advances in satellite imagery and geographic information systems (GIS) facilitated a deeper understanding of landscape

pattern and function. Three overarching forms; patch, corridor and matrix, are the main categories of landscape pattern. A patch is an area of habitat that differs from its surroundings. In Figures 4 and 5, the remnant forests are patches of habitat. Corridors are linear forms that either facilitate species and genetic flow between patches (i.e., windbreak between forests) or can serve as a barrier when dividing patches (i.e., a road). The surrounding landscape that encompasses these elements is referred to as the matrix, which in Figures 4 and 5 entails the agricultural fields.

Aerial photography, satellite imagery, and GIS datasets are great tools for site analysis. This spatial data can be used to develop base maps, which we then refer to during field inventories. With granted property access, we can verify the acquired desktop information to fill data gaps. This step in familiarizing ourselves with the site is often vital and can entail botanical inventories, species at risk screening and soil sampling, depending on the project.

Prior to developing a concept plan, we identify patches and corridors within the matrix. Figure 6 depicts existing patches (purple) and conceptual connections with green arrows. Once opportunities are identified at the site scale, reviewing the site's context is key to maximizing the possibility for future connections, as seen in Figure 7.

Each design opportunity for improved connectivity is unique. For instance, linking patches can be detrimental: It can result in species predation, fire spread or invasive species infiltration. It is crucial

to familiarize oneself with the site's landscape and its history. The form and size of corridors is very much site specific. Our office designers rely on publications such as Environment Canada's “How Much Habitat is Enough?” to incorporate habitat requirements for wildlife and to identify minimum thresholds needed for functioning ecosystems.

Reconnecting tree assemblages across the landscape improves tree populations' climate change adaptation potential. Reconnecting tree assemblages across the landscape allows for plant and animal mobility. This is important, not only for maintaining biodiversity but also for safeguarding forests' ability to sequester large amounts of carbon from the atmosphere. Reconnecting forest patches expands mycorrhizal networks, facilitates tree species distribution and bolsters genetic diversity.

As an ecologist and arborist, I am privileged to explore some of southern Ontario's most biodiverse remnant habitats. I have come to love this landscape and the diversity it still holds. Through my design practice, I try to promote this diversity by protecting, connecting, and restoring natural habitats. My affinity with trees and biodiversity stems from learning about them, so it is also one of my mandates to promote environmental education through design. I implore you to go for a walk in the woods. Fall in love with it, and then design to promote it.



CONNIE PINTO

# TORONTO'S TREE CANOPY: GROWING STRONG

&gt;FR\_LP+

## LE COUVERT ARBORÉ DE TORONTO : UNE FORTE CROISSANCE

Si Toronto est également la ville qui connaît la croissance la plus rapide en Amérique du Nord, sa forêt urbaine présente d'énormes avantages quantitatifs, comme la séquestration du carbone, l'élimination de la pollution et l'évitement du ruissellement, ainsi que des avantages qualitatifs, comme la fourniture d'un habitat pour la faune, l'amélioration du bien-être physique et mental et la contribution à un paysage de rue plus frais, plus calme et plus sûr.

**TORONTO'S TREES ARE** part of a diverse and complex natural heritage system that contributes to what makes life enjoyable in North America's fourth-largest city. The idea that Toronto is a city within a park is not an outrageous claim when more than 2.9 million people share more than 63,000 hectares of land characterized by major wooded ravine systems, other environmentally significant habitat, and 46 kilometres of Lake Ontario shoreline. While Toronto is also the fastest growing city in North America, its urban forest boasts enormous quantitative benefits such as carbon sequestration, pollution removal and avoided runoff, as well as qualitative benefits that include providing habitat for wildlife, improving physical and mental well-being, and contributing to a cooler, calmer and safer streetscape. A healthy, sustainable urban forest helps make Toronto livable.

**1** AERIAL VIEW OF TORONTO'S WATERFRONT **2** THE DON VALLEY PARKWAY IN AUTUMN **3** RESIDENTIAL TOWERS OVERLOOK THE DON VALLEY **4** NEWLY PLANTED TREES IN THE CITY ROAD ALLOWANCE **5** A TYPICAL TREE-LINED TORONTO STREET  
PHOTOS CITY OF TORONTO

## Encouraging Study Results

In 2018, the City of Toronto conducted its second tree canopy study to examine the current state of its urban forest. Using state-of-the-art technologies and tools to discover changes in the size and character of the urban forest, it highlights findings and trends since the inaugural canopy study was completed 10 years ago. The results of the tree canopy study are encouraging: Toronto's tree population expanded by over one million trees and canopy cover increased from an average of 26.6 to 28% to 28.4 to 31%. This is a tremendous finding given the intense challenges and environmental stress factors experienced by our urban forest over the last decade, including infestations of invasive insect pests, impacts of the 2013 ice storm, city-building and development. Overall, these findings reflect the City's proactive maintenance programs and consistent investment in urban forest expansion through tree protection, tree planting and stewardship.



**More than half of the existing urban forest is on private property. Coincidentally, private property offers the greatest opportunity to expand the urban forest.**



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Many public and private agencies have a role in managing Toronto's urban forest. The results of the canopy study emphasize the importance of tree canopy expansion, not just on public land but on private land as well. It is estimated that more than half of the existing urban forest can be found on private property and much of the opportunity to expand the canopy is on private land. Recognizing that canopy expansion efforts cannot be confined to public lands alone, the City launched a private tree planting initiative to help private landowners contribute to canopy expansion on their property. Delivered through a community grants and incentives program, community-based, not-for-profit organizations are able to support private landowners in tree planting and stewardship. Over 30,000 trees and shrubs have been planted to date.

In addition to increases in the overall tree population and estimated canopy cover, Toronto's street trees are larger

and healthier than they were 10 years ago. Street tree condition improved by 25%, helping to contribute to increased structural value and ecosystem services provided by the urban forest. Careful species selection, good stock quality and proactive tree maintenance have reduced vulnerability to pests and diseases, improved aesthetics and increased ecosystem services. Based on analysis performed using i-Tree software, Toronto's urban forest has a structural value of \$7.04 billion dollars, and its healthy street tree population contributes \$1.63 billion of that total value. Street trees also contribute towards annual ecosystem services such as carbon sequestration, pollution removal and avoided runoff. In 2018, the estimated value of these services was \$55 million, a significant increase from the estimated annual value of \$28.5 million in 2008. Ecosystem services analysis provides valuable information for landscape architects, foresters and urban planners working for the City and in private practice.

### Impermeable Cover Increasing

While some characteristics of Toronto's urban forest have improved over the last 10 years, not all trends are positive. Changes in impermeable cover over the last decade reflect the realities of meeting growth and city building requirements while protecting and enhancing the natural environment. Impermeable cover has increased by 1.4 % over 10 years. Looking back at data from 1999, the 19-year trend shows impermeable cover has increased by 3.6 %. In addition, permeable cover – needed to grow trees unless they are part of a continuous soil trench below paved sidewalks – has decreased by 9.6% of the same period. This change impacts stormwater management, water quality, retention of healthy soil, biodiversity and urban heat island effects. The increase in impermeable cover on single family residential lands is particularly concerning as it has the most potential for canopy expansion. This trend is not unique to Toronto but it does highlight the challenges and opportunities of building a city that provides a quality of life its citizen's deserve.

### Strategies + Solutions

While these findings seem daunting considering the City has a target of increasing its canopy cover to 40%, Toronto has strong policies in its Official Plan that support a healthy urban forest and green streets. Urban Forestry works across City-divisions on innovative cross-divisional solutions to balance the realities of city growth with the care and expansion of the urban forest. One example is the Toronto Green Standard, which is Toronto's sustainable design requirement for new private and city-owned developments.



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Design options were created to meet the requirements of the Toronto Green Standard, with additional details and specifications for these are currently under development.

Efforts are being made to maximize street tree success by investing in technologies and best management practices to improve street tree survivability. Urban Forestry and its partners are evaluating a range of soil cells to gain a better understanding of how the range of products perform in terms of ease of access to subsurface infrastructure/utilities and future restoration of structural integrity. These soil cells are structural support systems that provide un-compacted topsoil for trees to grow when planted within paved surfaces. Results of this project will inform the development of a revised Soil Cell Specification identifying minimum performance criteria for acceptance and will be adopted as a City standard. Further, Urban Forestry is piloting the use of remote sensor technology to improve the efficiency and effectiveness of watering and arboricultural care for trees planted in urban streetscapes.

One of the best outcomes of investing in tree canopy studies of this kind is that they provide reliable data that staff can use to adjust strategic goals and program activities that reflect the changing nature of the urban forest and evolving management

issues including climate change adaptation and resiliency. Study findings have already supported implementation of the Ravine Strategy which was awarded the 2019 National Award for Landscape Management from the CSLA. It's the first comprehensive, intentional and coordinated vision and strategy of its kind for Toronto's 11,000 hectare ravine system.

As Toronto's first tree canopy study informed the development of its first Strategic Forest Management Plan, this second tree canopy study will inform new strategic and management directions for the growth, protection and enhancement of Toronto's urban forest. Current ecosystem services data and land cover analysis will be used to inform the City's TransformTO Net Zero Emissions Strategy with the goal to achieve net zero greenhouse gas emissions by 2050 or sooner. This is part of the Climate Change Emergency declaration approved by City Council in October 2019. Current land cover analysis will also be used by City Planning in the development of area studies and secondary plans. Areas of existing canopy cover and potential planting space for canopy cover expansion provide an additional layer of opportunities to maximize environmental sustainability and local growth objectives.

### Neighbourhood Actions

The city-wide tree canopy study will be used to develop actions at the neighbourhood scale. Based on the 2018 land cover analysis, the City is developing canopy action plans for

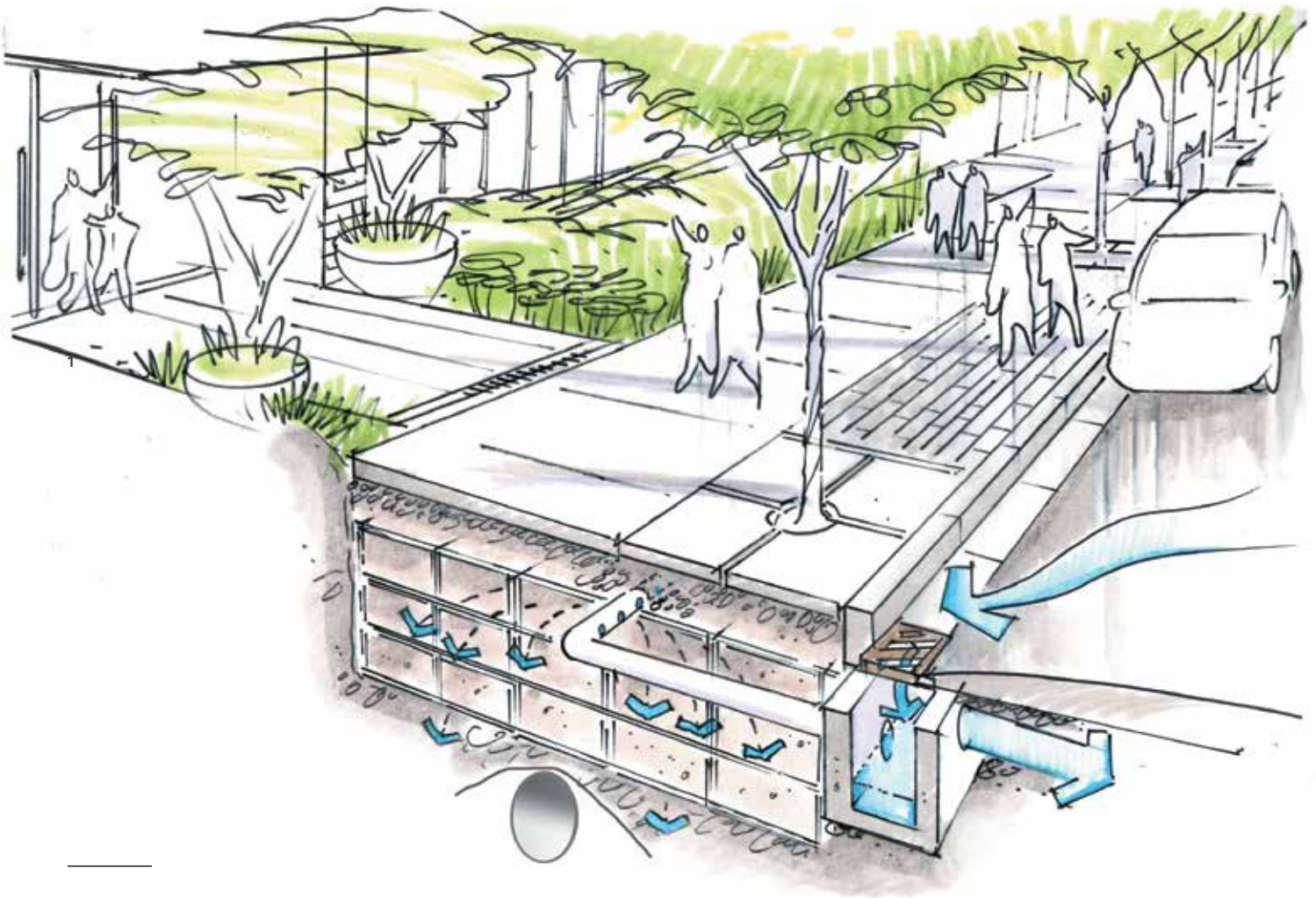
neighbourhoods with low canopy cover. These neighbourhood-specific action plans will focus on opportunities for internal collaboration to expand canopy cover through street tree planting, park tree planting and private tree planting. Support for private tree planting will be achieved through the recently launched incentive program designed to encourage landowners to plant trees on residential, industrial, commercial and institutional lands. This community-based tree planting initiative will be key to the successful implementation of canopy actions plans.

Led by a strong strategic plan and enforced by new and innovative data, Toronto's urban forest management program is advancing in the right direction. The urban forest is recognized as a vital city asset contributing to the quality of life in Canada's largest urban centre. The value of the urban forest is not just recognized by citizens within the city. According to The Global Liveability Index, Toronto was ranked 7th as one of the most livable cities in the world in 2019. Since 2011, Toronto has placed 4th on the Economist's Livability Survey which rates cities across five categories; stability, healthcare, culture and environment, education and infrastructure. Recently, Toronto was one of nine Canadian cities to receive the first international Tree Cities of the World recognition for leadership in urban and community forestry. The program connects cities around the world in a new network dedicated to sharing and adopting the most successful approaches to managing community trees and forests.

It's clear that urban trees help to mitigate negative impacts and social consequences of urbanization making cities more resilient to these changes. Future decisions to grow, protect and enhance Toronto's urban forest require partnerships, robust policies and a commitment to protect the growing space for urban forest expansion. A well-planned and well-managed urban forest is part of the City's response to climate change adaptation, ecosystem conservation, and the realization of health and social outcomes that make Toronto an enjoyable, thriving and sustainable living city.

6, 7 CONTINUOUS SOIL CELLS ALONG FRONT STREET  
PHOTOS CITY OF TORONTO





WENDY DE HOOG + JULIE MCMANUS

# CREATING THE BLUE-GREEN URBAN EXPERIENCE: VANCOUVER'S RAIN CITY STRATEGY

FR\_LP+  
UNE EXPÉRIENCE URBAINE BLEU  
VERT : LA STRATÉGIE RAIN CITY  
DE VANCOUVER

Le fait de ramener les espaces naturels, y compris les arbres, dans le paysage urbain peut aider à rétablir une partie du cycle naturel de l'eau par infiltration et évaporation.

1 RAINWATER TREE TRENCH  
IMAGES CITY OF VANCOUVER

**ACROSS CANADA, URBAN** living is becoming a new normal. Today, more than 80% of the country's population lives in cities, where forests and meadows have given way to high-rise buildings, parking garages and an ever-expanding network of roads. Every year, more people are born, grow up, work and live out their retirement in cities. As these urban areas continue to grow and densify, the natural water cycle is altered dramatically. Making places for nature within these highly impervious landscapes has never been more important. Bringing natural spaces, including urban trees, back into the cityscape can help restore some of the natural water cycle through infiltration and evaporation. It can also protect people and property by providing urban water management and urban cooling. But perhaps more important, green spaces can support the mental and physical health of those who spend time in them.





2, 3, 4

In the City of Vancouver, where growth is rapid, and space is limited, designing the city to interact with the natural water cycle is essential. With few places left to build out, most developments are building up, with high-rise towers that stretch onto or near the property line leaving little area for green spaces that can infiltrate and evaporate rainwater. Density is also creating more impermeable surfaces, producing more urban rainwater runoff in a city that is already contending with aging and undersized sewer and drainage infrastructure. Tack on the challenges of climate change with more frequent and extreme weather conditions such as downpours, droughts and heat waves, means Vancouver needs to think differently about how the city is planned, designed and built to manage its urban water resources.

**2** 63RD AND YUKON, SOUTH VANCOUVER **3, 4** RAINWATER TREE TRENCHES UNDER CONSTRUCTION AT RICHARDS ST. **5** RICHARD STREET PROPOSAL, DOWNTOWN VANCOUVER  
IMAGES CITY OF VANCOUVER

### The Rain City Strategy

In November 2019, Vancouver City Council unanimously endorsed the Rain City Strategy, a 30-year plan to change how rainwater is managed both on public and private property. The strategy is founded on the idea of transforming Vancouver into a Water-Sensitive City where all water resources are recognized for their value to communities and natural ecosystems. A Water Sensitive City considers how human influences impact the environment and seeks to embed urban water management approaches into land-use, infrastructure and urban design decisions. Using a holistic approach, green infrastructure (GI) is an urban water management tool that can be designed into streets, public spaces, parks and private property to treat rainfall where it lands and use it as a resource for communities.

By 2050, Vancouver aims to manage urban rainwater runoff from 40% of its impervious spaces with GI features. This is no small task for a city that experiences 1200 to 1600 mm of rain each year. The city has adopted a GI design standard to capture and clean 48 mm of rainfall per day, equating to 90% of rain events. To meet this ambitious goal, the city has developed three action plans for Streets and Public Spaces, Parks and Beaches, and Buildings and Sites. These action plans outline 46 programs that act as a roadmap, and focus not only on implementation, but also on enabling programs such as research, pilot projects, outreach and training to drive innovation and mainstream GI implementation.

### Designing for Density

By 2041, Vancouver expects to welcome 150,000 new residents to the city. Creating livable spaces that support densification requires sustainable solutions on both public and private spaces. Approximately 60% of Vancouver's impervious spaces are located on private property, and implementing GI solutions on developments across the city is integral to achieving the goals of the Rain City Strategy.

Today, Olympic Village stands as a model and inspiration for a different infrastructure design approach in the City of Vancouver. Olympic Village was built to house athletes during the 2010 Winter Olympic games and converted afterwards into a mixed-used community with 1,100 residential units. Designed with sustainability and livability in mind, GI features are weaved seamlessly into the community to provide multiple uses and benefits. On most buildings, rainwater is collected from the green roofs and podiums into cisterns. This grey water is then used in decorative water features, toilets and for summer garden irrigation, providing a 40% reduction in demand for drinking water from the municipal reservoirs in the process. Many rooftops also feature green roofs that enhance rainwater management. Rainwater tree trenches clean urban rainwater runoff from paved surfaces and grow the urban tree canopy to provide urban cooling and shady streets, while permeable pavers create a classic neighbourhood feel and at the same time allow rainwater to slip through and infiltrate into the ground. A large engineered wetland gives people a place to gather and experience nature just outside their doors while also collecting and managing two thirds of the rainwater that runs off of roadways, plazas and other public lands. Through policy and planning, GI features like those in the Olympic Village are becoming the new normal on development projects, allowing the city to densify in a holistic and integrated way.



### Working together across disciplines to maximize the co-benefits of GI

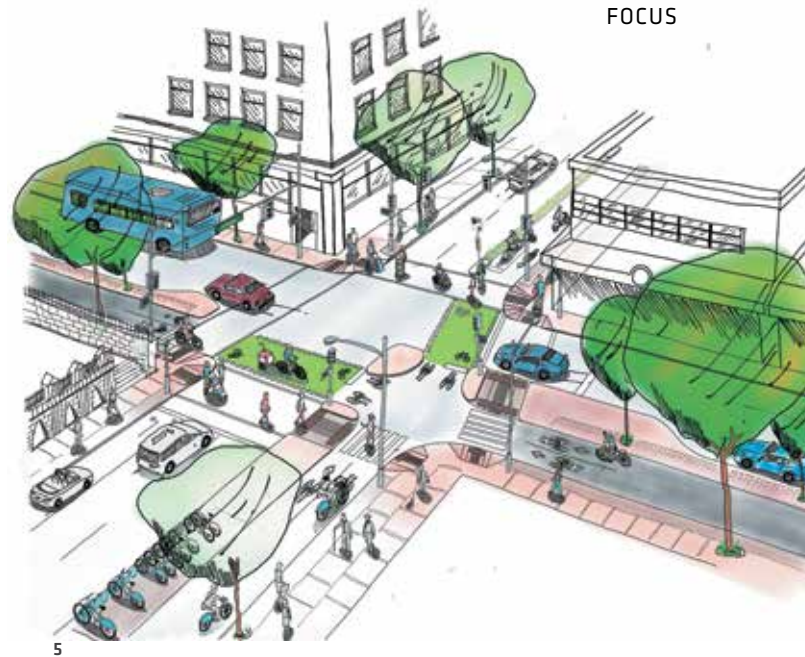
When designed strategically, GI can deliver a range of social, environmental and economic benefits beyond urban rainwater management. It can enhance green space across the city, increase sense of place, reduce urban heat island effect, encourage biodiversity, provide ecosystem services, deliver green job opportunities, and improve equitable access to green spaces and rainwater management services across the city. At the heart of GI is the merging of natural and engineered systems. Landscape architects are well positioned to ensure GI is designed to fit its site context.

Internal collaboration between the various City departments and with other external agencies and professionals is essential when using GI to meet a myriad of co-benefits. To foster this spirit of collaboration, the Rain City Strategy calls for intentional leadership by the city as well as innovative design ideas from practitioners to catalyze action and help Vancouver progress on its path to become a Water-Sensitive City. A great example of this collaboration can be seen in the GI plaza at 63rd and Yukon in South Vancouver, where planners, landscape architects and engineers collaborated to maximize the co-benefits of GI. Located in a lower income neighbourhood with limited green space, this project provided an opportunity to make community improvements that positively impact the health and well-being of the local residents. Some 102 m<sup>2</sup> of greenspace has been added to the community that treats urban rainwater runoff from more than 1,170 m<sup>2</sup> of adjacent streets and sidewalks. Several new trees add to the urban canopy creating a cool shady place in the neighbourhood. Through intentional design, the plant pallet evokes the image of a lost stream, buried underground when the neighbourhood was initially developed. Benches, bike racks and water fountains all help to make this a space where the community can gather and connect. Form, function and the environment all are an essential part of this community hub.

### Making Green Infrastructure Business as Usual

The Rain City Strategy is a pivotal shift in how drainage utilities are planned in Vancouver, moving GI from one-off projects towards wide-scale implementation. Integrated planning and design approaches that consider economic, social and environmental benefits are being used to make strategic and cost-optimized sewer and drainage infrastructure decisions. “Blue-green systems” planning is an example of this. These systems aim to connect people, places and green spaces through multi-functional infrastructure projects, such as the addition of a protected bike lane paired with GI.

Vancouver has recently developed a blue-green systems prioritization tool that helps place GI investments where they provide the largest impact in three categories: water management, co-benefits and feasibility of implementation. The prioritization tool places emphasis on projects that mitigate flood impacts, provide equitable access to greenspace, improve active transportation networks, target high land surface temperatures and urban canopy deficient areas, connect habitat patches and are within biodiversity



hotspots. The tool also looks for synergies and efficiencies with other city priorities, objectives and projects, as well as any conflicts that might reduce viability of the project, including the existence of mature street trees and their root system.

In May 2020, Vancouver broke ground on its first blue-green system, an eight-block network of rainwater tree trenches and permeable pavers that run alongside a protected bike lane on Richards Street in downtown Vancouver. The highly urbanized area lacked sufficient tree canopy and was largely impervious, making it an ideal candidate for a blue-green system approach. Trees will be planted in a combination of structural soil and proprietary tree trench boxes, giving room for roots to spread out underground while maintaining space on the surface for the sidewalk and bike path. Streets and sidewalks have been graded towards the GI practice so they can collect and treat all the urban rainwater run-off on site. When completed, the Richards Street Blue-Green System will add 103 new trees, treating a 15,000 m<sup>2</sup> drainage area and sequestering on average 1,144 lbs of carbon per year, as well as adding 1.5 km of protected, two-way bike lanes.

### Moving towards a Water-Sensitive City

Landscape architects are key to shaping GI projects that maximize their potential as valuable amenities in the community. For years, rainwater management fell under the purview of utility engineers who focused on capture and conveyance only. The Rain City Strategy is an opportunity to change that, and bring rainwater back to the surface of our cities. It is a chance to change both the perception and function of infrastructure as something that can be designed for both human and animal interaction as well as urban water management.

Thirty years from now, Vancouver could look completely different – a livable and resilient city that values water and greenspace in equal measure. Broad canopies will shade cyclists and pedestrians as they travel through any part of the city. Public realm will include spaces that flood during intense rain storms, and serve as places to gather and connect on all other days. Rain gardens and bioswales will replace concrete and asphalt, encouraging urban biodiversity to flourish. This vision can only be achieved by working together, exploring innovative techniques, and adapting design based on lessons learned.



MARC HALLÉ

# A CASE FOR MINI FORESTS

## > FR\_LP+

### PLAIDOYER POUR LES MINIFORÊTS

Cet élan a entraîné une asymptote de développement qui a dépassé les limites de la planète, ce qui a donné lieu aux manifestations sans précédent de l'Anthropocène qui vont des feux de forêt à l'effondrement de la plate-forme glaciaire en passant par l'élévation du niveau de la mer, la mort des récifs et les pandémies. Ayant épuisé nos réserves limitées, nous avons commencé, pour nous tenir au chaud, à brûler les planches de notre propre maison.

1 MONTREAL'S MONT ROYAL 2 BOOMFOREST NGO: USING THE MIYAWAKI METHOD NATIVE SPECIES ARE PLANTED 3 PLANTED AREA AFTER THREE MONTHS  
PHOTOS 1 MARC HALLÉ 2, 3 BOOMFOREST NGO

**WHO COULD HAVE** imagined that the first clearings cut from Canada's great eastern forests in the early 1600s would have accelerated from axes and ploughs to chainsaws and feller bunchers over the ensuing 15 generations to invert the endless matrix of forest into a landscape mosaic dominated by fields and conurbations? This momentum has resulted in an asymptote of development that has transgressed the planet's finite boundaries, resulting in unprecedented manifestations of the Anthropocene that range from forest infernos and ice shelf collapse, to sea-level rise, reef death, and a global pandemic. Having exhausted our limited supplies, we have started burning the boards of our own house to stay warm.

Where is this momentum heading? A 2019 installation of a forest patch in an Austrian soccer stadium called "The Unending

Attraction of Nature" posits a future where dwindling forests take on the status of zoo pandas, an inversion of the medieval walled garden where the forest is now imagined as the one in need of a protective enclosure against the human.

Our understanding of *forest* has been shaped by a linear logic that has worked very well for us until now. The tidy notion of the *arboretum* informs an idea of trees as *individuals*, elevated through a belle-époque aesthetic of street tree allées and monocultures, heroic specimens derived from a limited palette made up of only the hardiest and noblest trees. We make them succeed through life-support investments in soil, air and water, surviving like soldiers in urban trenches. And for those that don't make it, a lot of money and effort is spent to gurney them away, to be replaced when maintenance budgets permit.





### See the Forests, not just the Trees

Forests, on the other hand, can be considered not necessarily as an agglomeration of individuals, but rather as a body where trees make up the living tissue and organs, continually renewing themselves to enable the forest to endure for tens of thousands of years. Trees, along with their affiliated forest symbiotes, have evolved to possess a self-sustaining biology of foreverness. If the forest is a body, at what point does accelerating removals of trees produce the same consequences as removing too many organs, undoing the self-sustaining and life-giving complex of relationships that are the essence of a forest?

The law of the forest is competition, and designers who treat trees as individuals work hard to reduce this competition. Like doting parents with high expectations, a hopeful upbringing of individual trees is a conscious effort against others that might take up too much space, cast too much shade, or use up too much soil. There is a place for the cultivation of these, and designers are getting better and better at optimizing a tree's performance in non-natural contexts. But there is also a place for forests, which follow a different set of rules. The forest's law is not a competition of winners and losers, but rather a synchronicity of cooperation, where trees communicate below ground through fungal networks that can optimize the well-being of the entire forest.

Every city has spaces that could be wilded with forests. And there are examples where forests have a privileged place in the urban realm. Forest parks in European cities (often remnants of royal hunting grounds), Central Park in New York, Parc du Mont-Royal in Montreal, Stanley Park in Vancouver, and newer designed forests like Corktown Common in Toronto, are cherished as a fundamental experience of the cultural landscape.

Could the same rigor in growing individual trees in cities be directed to integrating forests within urban areas as well? How can we design these precarious juxtapositions where the tug-of-war between the needs of living systems and urban infrastructure are made mutually compatible, so that they can both flourish side-by-side? Strategic design moves that promote soil and mycorrhizal interconnectivity, while keeping out compaction forces from vehicles, buildings and utilities, pedestrians and even dogs, provide interesting design opportunities towards a robust forest infrastructure. One example of how this could be done is Parc Hydro-Québec in Montreal, where the park's hardware for a high-compaction public gathering space is provided through a permeable surface suspended over an unencumbered forest floor below.



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Like bodies both large and small, forests can be created across a range of sizes. A small forest infill patch in the city may not be enough to solve big problems, such as creating habitat for large mammals. But the outcome of investing in spaces for non-human species to exist in parallel is a step that could enrich the diversity of urban ecology. Even a mini-forest the size of a single parking space can bring myriad benefits that expand the makeup of living systems in a city.

### Miyawaki Method

There is a quote in Richard Powers' novel *The Overstory* that reminds: "The best and easiest way to get a forest to return to any plot of cleared land is to do nothing – nothing at all, and do it for less time than you might think."

You may have viewed the famous TED Talk by Shubhendu Sharma in 2014 ([bit.ly/3mVvK2KX](https://bit.ly/3mVvK2KX)), who launched what has become a kind of movement for mini-forests worldwide. The most remarkable takeaway from Sharma's presentation is the simplicity of creating a forest. Sharma – an industrial engineer by training and practice – had his epiphany while working at a Toyota automobile plant in India, where the famous Japanese botanist Akira Miyawaki had been hired to construct a forest. Inspired by the success and straightforwardness of the Miyawaki Method ([boomforest.org](http://boomforest.org)), Sharma created an afforestation enterprise that has established a procedure to fast forward a mature forest in about 20 to 40 years, instead of the 100 to 150 years typical of conventional succession. The results are impressive, with forests that

produce a combined leaf surface area about 30% greater than conventional planting, increasing photosynthesis and an accumulation of other environmental benefits.

Miyawaki has planted over 40 million trees in 15 countries across his long career. His method can restore forests on degraded soils based on seedlings established from native trees. His insight came through observing ancient remnant trees around Shinto shrines in Japan, which he concluded were more resilient to local conditions, including tsunami, than other imported species planted over centuries at other established reforestations throughout the country.

Generally, the Miyawaki method comprises five steps:

**Step 1** – Collect seeds from a local indigenous forest near the site of the proposed forest.

**Step 2** – Prepare the terrain, assess the soil, amend as needed with compost, and grade the surface.

**Step 3** – Germinate the seeds in a propagation bed, transplanting them to small pots when they start to bud into 2 to 3 leaves.

**Step 4** – Gradually acclimatize these young potted seedlings from several weeks to a few months to the conditions of their proposed planting site.

**Step 5** – Plant the seedlings at a spacing of about 50cm to maximize a multi-layered forest density. The seedlings need maintenance over the first three years, with a layer of straw mulch to keep

moisture and suppress weeds, regular watering, some staking to help establish straight trunks, and often a temporary fence to keep out disturbances from people and pets. After this initial establishment period, no additional maintenance is required.

The simplicity of this is almost child's play. In fact, children have been surprisingly good helpers at large planting events and ceremonies, where their random deployment of seedlings can mimic seed dispersal in nature.

Miyawaki forests of any size can be easily created in leftover spaces in cities: linear beds of reduced street widths and road allowances, vacant lots, easements and alleyways, as well as residential and pocket spaces. They could even be established as a network of forest nodes to create a critical patchwork in urban rewilding. Integrated in parallel with cultural landscapes and urban systems, these initiatives could create an enduring infrastructure to boost resilience in the ongoing evolution of cities.

Humans are far up the food chain, often forgetting that all food and oxygen are produced from photosynthesis, and all nourishment that sustains life ultimately comes from plants. The restoration of complex vegetation communities provides more than merely a parallel world for birds, bugs, and rodents. Anyone who enjoys eating and breathing should care about them, too.

**4** PLANTED AREA AFTER 12 MONTHS **5** THE MIYAWAKI METHOD FOREST AFTER 26 MONTHS  
**PHOTOS 4, 5** BOOMFOREST NGO





1

AMELIA NEEDOBA + ERIKA MASHIG

# LAYING DOWN ROOTS FOR RESILIENT CITIES

## > FR\_LP+

### ENRACINER LA VILLE POUR PLUS DE RÉSILIENCE

Par rapport à d'autres infrastructures municipales, les forêts urbaines ont eu tendance à être moins prioritaires en matière de financement, les programmes étant davantage destinés à gérer les risques qu'à fournir des services écosystémiques à la communauté.

**IF YOU WORK** in urban forestry or landscape architecture, "I love trees but..." is a familiar refrain. Trees can be a polarizing topic in cities, revered and held sacred by some, accused and condemned by others. Compared to other municipal infrastructure, urban forests have tended to rank lower in funding priority, with programs funded more to manage risk than to deliver ecosystem services to the community. The University of Wisconsin's 2014 *Urban & Community Forestry Census of Tree Activities* (Hauer *et al.*) found urban forestry budgets in US cities represented only 0.5% of total municipal budgets and an expenditure of \$8.76 per capita on average. And yet, the profound importance of urban trees and nature to human health, mental function and general well-being is supported by nearly 40 years of research, by the tree and forest legacies of 19th-century urban greening movements in industrialized and colonial cities, and by our own experiences with nature – particularly in this time of COVID-19.

**1** LOCATED IN THE LOWER MAINLAND, TOTAL LAND AREA IS 15.3 SQUARE KILOMETRES (5.9 SQ MI)  
**PHOTO** JON BENJAMIN PHOTOGRAPHY



Cities and nations, now grappling with how to respond to climate emergencies, are looking to tree planting (2 billion of them in Canada!) and resilient urban forests as part of the solution. However, the research shows that our urban trees live fast and die young. The average life expectancy of street trees is 19 to 28 years, yet most species can live for 50 to 150 years minimum. Data also shows that urban tree canopy cover is declining, and impervious cover is increasing in urban areas across the U.S.

Amelia Needoba is an urban forestry consultant with a foundation in forest science. Erika Mashig is a parks manager in local government with a foundation in landscape architecture. Approaching the topic from their differing, but converging, viewpoints, offers valuable insights into developing urban forest strategies.

### What is an urban forester?

**Amelia:** My role, as an urban forester, is to manage urban trees and forests to maximize the benefits they produce while also minimizing risk and costs. However, I cannot fulfill my role without the active participation and support of professionals in disciplines including engineering, planning, landscape architecture, community engagement and arboriculture. Urban forests are an incredibly complex resource to manage because of the many competing interests and values, diverse stakeholders, and the physical and political constraints of urban areas.

**Erika:** Part of my role at the City of New Westminster is to manage a team leading the implementation of the City's Urban Forest Management Strategy (2016). As a landscape architect and parks planner, trees are inherent to our work. I naively expected that all departments valued trees and wouldn't think twice about prioritizing their preservation. It became evident early in the strategy development process that we needed to build consensus around the urban forest as critical infrastructure and that the important environmental, social

and economic benefits provided by trees outweighs many associated negatives including risk and maintenance.

### Why are cities developing urban forest strategies?

History suggests that the broad drivers of change leading to increased demand for urban forests in cities have been somewhat repetitive in the sense that, a perceived reduction in the quality of life in cities (e.g., disease, pollution, over-crowding etc.) leads to public and political pressure to improve quality of life using trees and public greenspace. Since the field of urban forestry emerged some 50 years ago, cities have been increasingly subject to rapid growth, growing social inequities, impacts of globalization and the hazards of climate change. These concerns are driving an increase in demand for ecosystem services and therefore urban forest planning and management, with urban forest strategies often being a first step cities take.

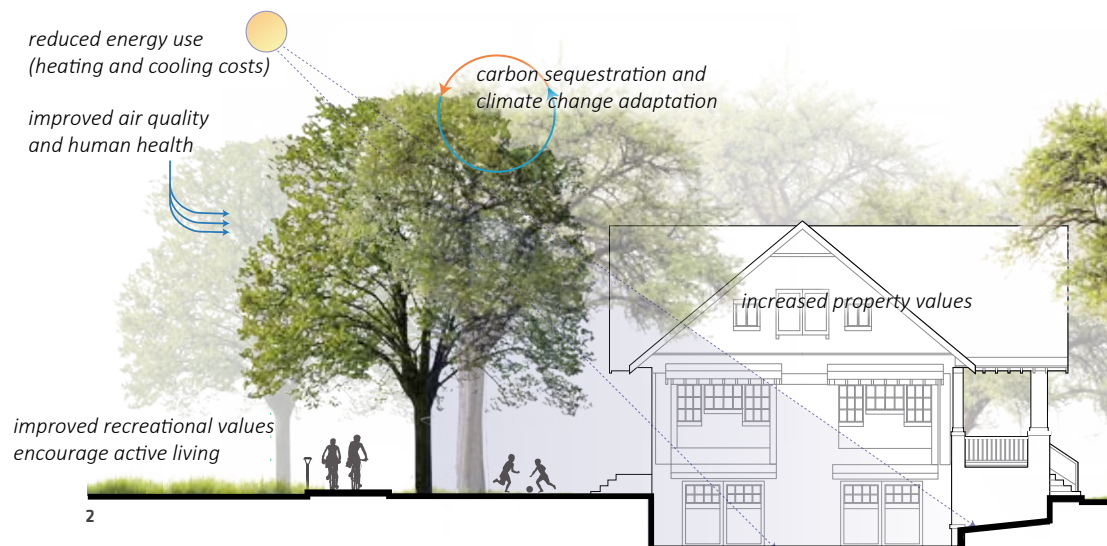
An urban forest strategy is a planning process that defines and benchmarks the current state of a community's urban forest by establishing the goals, targets and actions necessary for meeting that community's long-term urban forest vision. New Westminster is a widely/ highly developed, dense, compact city (approx. 15.6 km<sup>2</sup> or 6 mi<sup>2</sup>) in the Lower Mainland region of British Columbia with a population of ~71,000. Our urban forest is beloved for its environmental quality, beauty and naturalness, and the social and recreational opportunities it provides.

In 2014, in response to a request from City Council to enact tree protection measures, and under the leadership of the Director of Parks & Recreation, we began development of a city-wide Urban Forest Strategy. A detailed inventory and analysis (inclusive of publicly and privately-owned trees in natural areas, parks, backyards, on streets and in commercial and industrial zones) revealed that the city's urban forest canopy had been in steady decline (from 1994 to 2014). Further analysis showed that the overall canopy cover decrease from 22% to 18%, and was directly correlated to increased development over this 20-year period. Compared to the average canopy cover for North American cities (27%), and in consideration of the added impacts of climate change, the numbers underscored a need for the city to take a first critical step in reversing the trend in canopy cover decline.

### What can be achieved with an urban forest strategy?

Urban forest management is no longer siloed as a parks department concern driven by risk management, but has become a city-wide, and even national, infrastructure priority for climate adaptation. Some of the most significant barriers that municipalities face today in reversing the loss of urban tree cover and growing resilient urban forests relate to land use regulation, design and development practices, climate hazards and adequately resourcing urban forestry departments.

**2** TREES IN URBAN LANDSCAPES PROVIDE BENEFITS TO ALL (PRIVATE AND PUBLIC LANDS). **3** THESE GOOGLE STREETVIEW IMAGES SHOW WHAT DIFFERENT CANOPY COVER PERCENTAGES LOOK LIKE AT STREET LEVEL  
IMAGES 2,3 DIAMOND HEAD CONSULTING





**Urban forest management is no longer siloed as a parks department concern driven by risk management, but has become a city-wide, and even national, infrastructure priority for climate adaptation.**

As exemplified in New Westminster, a multi-disciplinary approach to developing a strategy can enable important interdepartmental coordination on tree-related issues that lead to both policy changes (for example, policy to improve the soil volume and space provided for trees in new developments, or to improve on tree preservation or replacement requirements) and operational changes (such as prioritizing diversity in the tree population, enhancing tree and forest health, and transitioning to programs of proactive pruning and risk management) that increase the resiliency of the urban forest. Like many other Canadian cities, New Westminster is working to shift the profile of trees from amenity to infrastructure assets as an effective way to justify urban forest budgets and create a framework that ensures urban forest assets are valued, akin to their grey infrastructure counterparts.

While the changes coming out of urban forest strategy planning processes are beneficial to urban forests, trees (and their growing spaces) remain wedged uncomfortably between planning and engineering policy and regulations.



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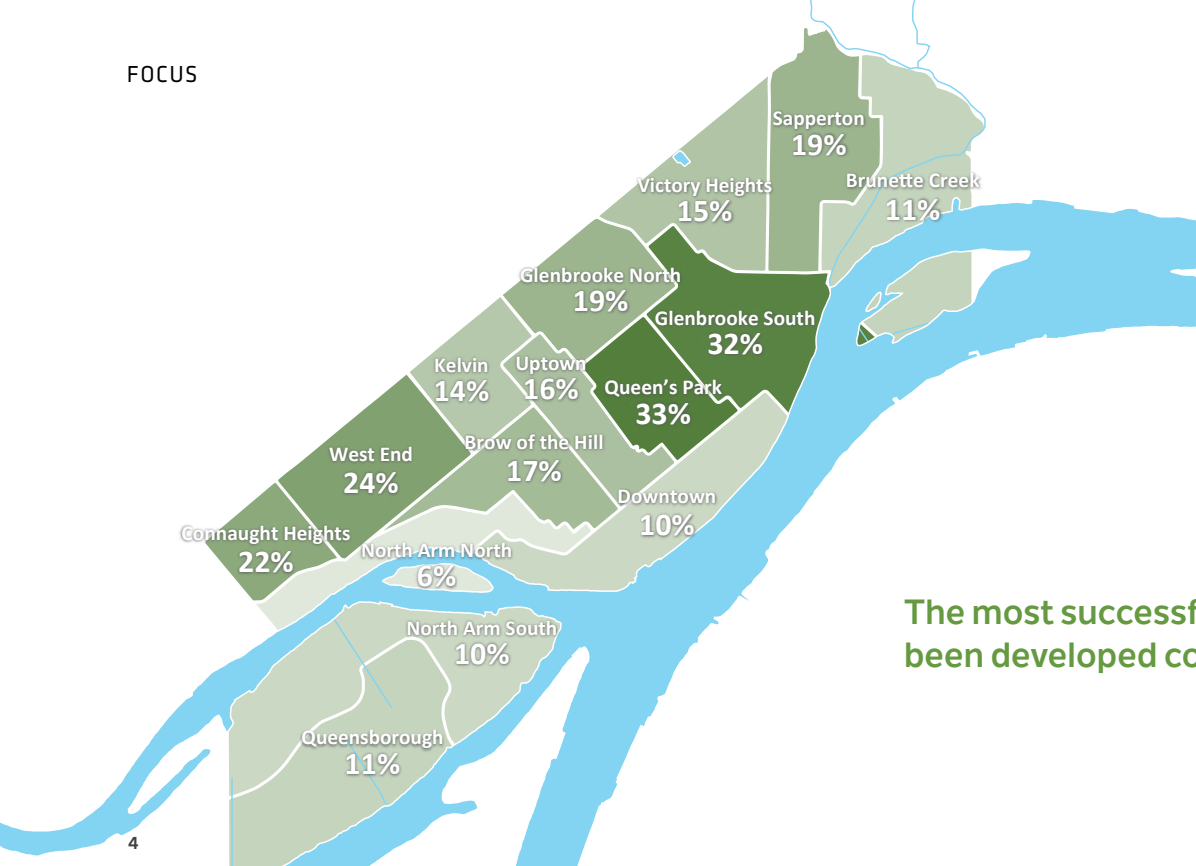
Creating truly resilient urban forests for the long-term will require further systemic change in our approach to integrating trees and nature into urban planning, design, and construction.

The strategy development process included exploration of four future canopy cover scenarios and opportunities modelled specific to New Westminster's context. From these scenarios, the city and the community were better able to understand the costs and feasibility (related to available land base for accommodating additional trees) to set an achievable planting target of 27%. The model informed what has proven to be both an achievable and ambitious canopy cover target within the context of New Westminster, an emerging method that is now being applied to urban forest plans beyond New Westminster.

The strategy's success is largely attributed to the iterative phases of extensive engagement, planning, continued interdepartmental coordination, and immediate implementation following adoption in 2016. The city partnered early in the process with a consultant team to facilitate a series of public open houses and participatory workshops with City Council, the Parks & Recreation Committee, the Environmental Advisory Committee, Youth Advisory Committee, Residents' Associations and city staff from all departments.







**The most successful strategies have been developed collaboratively...**

The engagement process served to create awareness on the status of the urban forest, educate about the benefits of urban trees and provide an opportunity to craft a community vision for the city's ideal urban forest, 20 years into the future. This long-term vision to plant 11,800 trees (8,500 on public land and 3,300 on private land) over the next 20 years recognizes that the urban trees we plant today make up the urban forest of the future. Simultaneous to engaging the public, critical workshops were conducted with City Council and staff to build support for the extensive inter-departmental operational and policy changes, as well as the budget coordination, required to implement to vision over time.

As a result of an "all hands on deck" approach, the City of New Westminster's Urban Forest Management Strategy provides a detailed road map for shared stewardship and sustainable management of the urban forest by all city departments, working towards giving trees parity with other infrastructure components within the urban fabric.

### Reflections on urban forest strategies and their implementation

In reflecting on the experience of building an urban forest strategy in New

Westminster and elsewhere, the three main phases of work typically include:

1. Understanding what you have and how it is doing,
2. Communicating and engaging to increase urban forest literacy and support, and
3. Preparing a strategy document that shares a compelling narrative and vision, and that elevates and integrates the urban forest across broader city operations, policy, and regulations.

The most successful strategies have been developed collaboratively with the staff who are charged with implementing them. Once strategies are in place, implementation usually leads to a wide variety of outcomes from policy and regulatory updates to changes in urban forestry programs, operations, and resourcing.

For New Westminster, the strategy has changed the way we manage our urban forest, from planning and operations, to how we engage the community. Since adoption, a tree protection and regulation bylaw has been introduced with incentives to encourage tree retention. As a result, the arboriculture staff has increased and interdepartmental workshops have continued to foster better understanding and communication on working around trees. Specifically, engineering operations and planning divisions now have increased

staff awareness of the urban forest and the need for public leadership on Best Management Practices for trees. Policy tools and resources are in place to better integrate tree protection and replacement requirements into the tree bylaw. Technical guidelines for soil volume and quality requirements have been established as well as on going work to resolve competing priorities that impact trees within City Right of Ways. City Council has adopted a 10 Year Tree Planting Masterplan to build resilience in our tree population and guide the City's tree planting program on streets, boulevards, parks and natural areas. Adopt-a-Street-Tree Program, Community Tree Sales and Tree Rebates have been initiated to engage residents in the stewardship of trees. More recently, achieving the 27% canopy cover target has been elevated and expedited to 2030 in response to the Climate Emergency and City's commitment to the 2020 Declaration for Resilience in Canadian Cities.

The demand for urban forests is likely to continue growing given the need for climate mitigation and adaptation services, ongoing growth of urban populations and the expansion of cities into wildland. A well-made strategy is an excellent tool for advancing municipal urban forestry towards growing healthy and resilient urban forests. While a strategy may not solve all of our urban forest management challenges, it is a great place to start.



SARA BARRON

# MICRO-DOSES OF NATURE FOR HEALTH AND CLIMATE

&gt; FR\_LP+

## DES MICRODOSES DE NATURE POUR LA SANTÉ ET LE CLIMAT

Selon nous, les microdoses de nature dans une communauté peuvent s'additionner pour créer une riche expérience de verdure au quotidien.

**A CHANCE MEETING** at a climate change symposium between a facilities manager and a landscape architect started a conversation about how health facilities and similar institutions need an expanded network of expertise and tools to build climate resilience across departments and disciplines. From this conversation, a new collaboration was born. The collaborative team grew to include important voices: urban foresters, social scientists, local government practitioners, and population health researchers. Though with different disciplinary backgrounds, our team had a shared motivation of contributing to the facilitation of communities that were healthy to live in and ready for new climate realities. Our team believed that urban greening solutions could facilitate both human wellbeing and facilitate climate resilience co-benefits. We also argue that urban greening solutions did not all need to be large in scale. Micro-doses of nature throughout a community can add up to create a rich experience of daily green.

Urban greening is emerging as a key part of the solution to some of our major health and environmental challenges. New technologies are allowing researchers to unravel the myriad ways nature exposure benefits human health. This research is growing exponentially and adding nuance and substance to an intuitive understanding that being outdoors and near plants is good for wellbeing. Landscape architects understand the complexities surrounding how and why nature exposure is beneficial, though it can be easy to get lost and overwhelmed in the data. Landscape architects want to make evidence-based decisions on projects. Designers also have multiple stakeholders and multiple issues to juggle when designing. Human society is facing multiple challenges: climate change, population health, ecological decline, systemic racism, economic inequality. All impacted, and are impacted by, our work in landscape transformation.

To explore how interdisciplinary collaboration could lead to solutions, our team began by shaping accessible, tangible and actionable strategies. The strategies aimed to increase urban greening in ways that would target co-benefits for human health and climate resilience. Our project aimed to develop both practical tools and a compelling narrative to help realize health

and climate adaptation co-benefits. The co-benefits work across multiple scales from individual to collective, indoors to outdoors, campus to community. Our initial work proposes strategies that provide green space retrofits at the neighbourhood and block scale. The collection is a hierarchy of functional design concepts to enhance experiential qualities and physical/psychological dimensions of health and also enhance climate resilience. The strategies are not proposing large scale interventions, but rather suggest the myriad ways that micro-doses of green can be incorporated throughout a landscape for maximum effect. These design strategies, outlined below, can be used by anyone interested in improving quality of life at the community and neighbourhood scale.

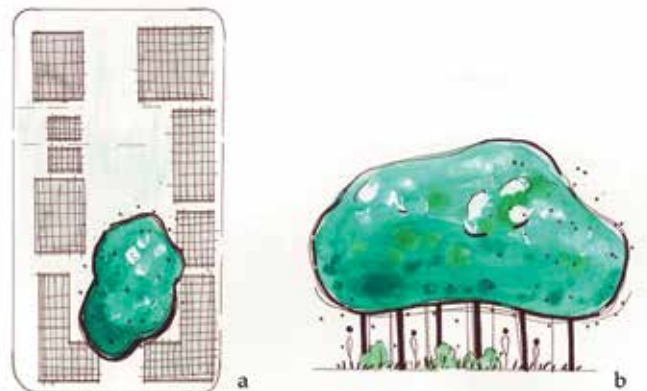
We present a typology of eight tangible green space strategies that integrate climate resilience and public health co-benefits into urban green space design and planning.

*Strategy 1. View from Within* – Consider the view from *within* a building when implementing urban greening.

*Strategy 2. Plant Entrances* – Green entrances allow visitors to experience some nature in their day.

*Strategy 3. Bring Nature Nearby* – Nearby greenspaces provide opportunities for those with limited mobility or time to take a break near nature.

*Strategy 4. Retain the Mature* – When designing a landscape, it is important to keep older trees that provide aesthetic and emotional benefits.



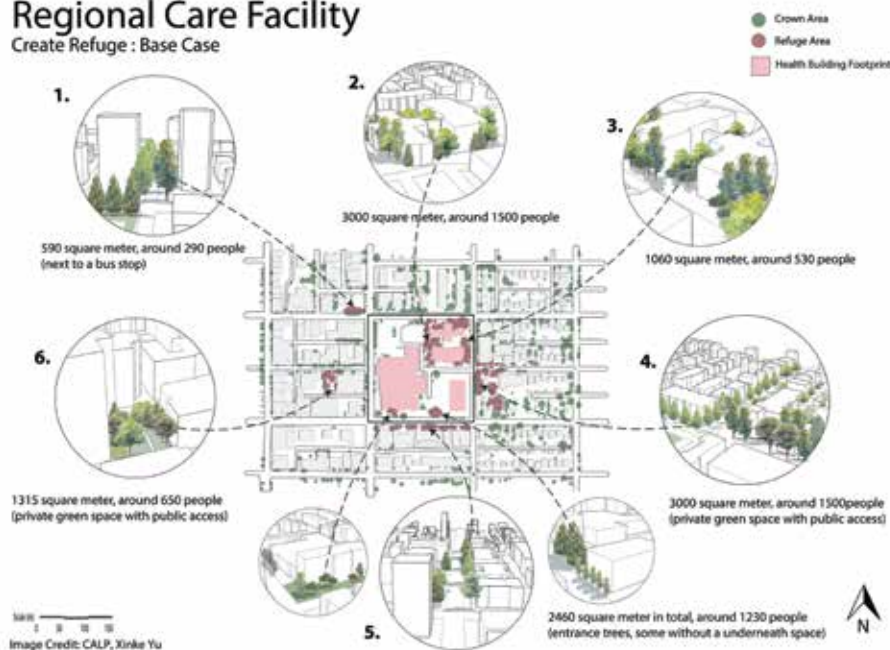
DESIGN SCHEME TO INCORPORATE A SHADED REFUGE, PROVIDING ENOUGH GREEN SHADE TO PROTECT PEOPLE DURING AN EXTREME HEAT EVENT.

IMAGE SARA BARRON



## Regional Care Facility

Create Refuge : Base Case



The metric used for refuge space was the number of people that can be accommodated under tree canopy. Our team defined refuge space as any area with a canopy greater than 30m in diameter and would allow people to stand under it. LIDAR data can be used to identify such refuge areas. Using LIDAR data, trees can be singled out and categorized based on their height. Spots with the tree heights greater than 10m with no tree/bush less than 10m under the canopy are chosen (See Figure Two).

Our team assumed that a person would use up to 1.5m x 1.5m of space under a tree (this was before the COVID-19 pandemic). This would allow for activities such as lying down, sitting, standing under the canopy, be able to accommodate wheelchairs, and provide

enough personal space from other individuals under the tree.

The number of people under refuge space = canopy cover of the space ( $m^2$ ) / (1.5m x 1.5m). Under extreme disaster events such as a heat wave and loss of electricity to buildings in summer, more people could potentially be accommodated by reducing the personal space used by one person. It can be changed to 1m x 1m to allow for enough people to sit down under the canopy. The results can be checked against the daytime population of a given area to understand how many people could potentially find shaded refuge during a heatwave.

The *Create Refuge* strategy has taken on additional significance during the COVID-19 lockdown. The lockdown demonstrated the importance of nearby greenspaces and highlighted the uneven distribution of those greenspaces throughout our cities and towns. By measuring refuge space, more than one benefit can be achieved.

The design interventions should be particularly useful to designers and planners focused on health and climate issues. When conceiving an urban greening plan for a neighbourhood, a landscape architect might want to consider how many buildings have green entrances, or how many mature trees are retained, or perhaps how many greenspaces are connected. This set of simple, quantifiable, evidence-based strategies connects research with design. The strategies suggest a relatively low-cost mechanism for incorporating and measuring urban greening to achieve multiple benefits. Finding space for these necessary micro-doses of nature and dedicating areas to grow healthy trees benefits everyone.

**Team:** Sara Barron, Kanchi Dave, Xinke Yu, Stephen Sheppard, Angie Woo, Kathy Wolf, Erin Desautels, Sophie Nitoslawski, and Doris Sun. Funding provided by: The Real Estate Foundation of British Columbia and Cascadia Urban Analytics Cooperative.

For more information, our first report can be found here: [bcgreencare.ca/resource/climate-resilience-and-well-being-through-neighbourhood-scale-green-design-better-practice](https://bcgreencare.ca/resource/climate-resilience-and-well-being-through-neighbourhood-scale-green-design-better-practice)

*Strategy 5. Generate Diversity* – Diverse plantings are more resilient to changes in climate and to new pests and diseases.

*Strategy 6. Create Refuge* – It is important to ensure there is enough green shade to protect everyone during an extreme heat event.

*Strategy 7. Connect Experiences* – Having a continuous pleasant walking area can increase physical activity and green routes can be inviting and encourage recovery from disease.

*Strategy 8. Optimize Green Infrastructure* – Our changing climate means there is increasing need for adequate green and permeable spaces to allow stormwater runoff to escape.

### Testing the Strategies – Refuge

Each of these strategies is supported by evidence. As a group, the strategies are intended to work together to create robust and healthy communities. To test how they would apply in real world situations, our team applied these strategies to case study sites. Each case quantified and visualized the existing green elements for each strategy. To demonstrate how this works, let us examine the *Create Refuge* strategy (Strategy Six). Figure Two shows the amount of potential refuge space provided by the urban tree canopy. This was a novel strategy introduced by the team during discussions about climate emergencies. The team wondered how many people in a given area could find shade during a heat wave if air conditioning was somehow shut off. The goal would be to maximize the number of people that can be accommodate by increasing number of quality refuge spots. The strategy implies that larger refuge spaces are needed for higher density developments.

MAP OF POTENTIAL REFUGE SPACES (DARK PINK) WITH VISUALIZATIONS SHOWING THE QUALITY OF EACH SPACE.  
IMAGE XINKE YU





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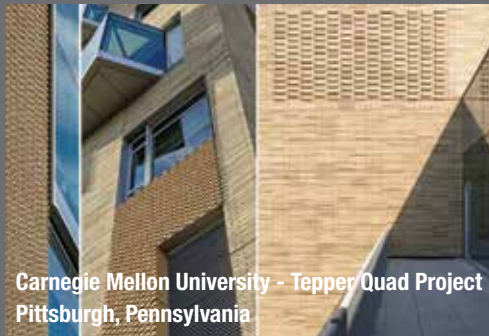
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## THE GOVERNOR GENERAL'S MEDAL IN LANDSCAPE ARCHITECTURE 2020 PETER JACOBS

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GÉNÉRAL EN ARCHITECTURE DE PAYSAGE  
2020 : PETER JACOBS

ON OCTOBER 1, 2020, the CSLA announced that Peter Jacobs will receive the highest honour bestowed on a Canadian landscape architect, the Governor General's Medal in Landscape Architecture. The medal is intended to honour "exceptional landscape architects whose lifetime achievements and contributions to the profession have had a unique and lasting impact on Canadian society." Through the remarkable breadth of his outstanding five-decade career as a professor and director of the School of Landscape Architecture at the Université de Montréal, a key spokesperson for enlightened environmental and social development in the North, and one of the modern pioneers of the profession in Canada, Peter Jacobs has met these demanding criteria in convincing fashion.

### Studies and early academic career

A Montreal native, Peter Jacobs studied architecture at MIT and Harvard and, after working on the Theme Buildings at Expo 67, returned to Harvard and graduated with a master's degree in Landscape Architecture, reflecting his growing concern for the twin

social and environmental crises of that turbulent era.

In 1971, after two years as a professor of architecture at Nova Scotia Technical College in Halifax, Peter returned to Montreal. He soon took charge of the nascent Landscape Architecture program at the Faculté d'aménagement of the Université de Montréal, leading it to departmental status within a few years. Peter initiated a program of research in landscape architecture at this same time and served as the faculty's first Vice-Dean for Research. Focusing his teaching at the graduate level for many years, he single-handedly assured the presence of a successful Master's program in Landscape Architecture, while serving as faculty advisor and guide to the majority of doctoral students in our field, many of whom became professors in North American, Australian, and Israeli universities, including the Université de Montréal.

### Environmental concerns in Northern Canada and at the international level

In the late 1970s, Peter began his life-long fascination with the Canadian North. As the chair of the Kativik Environmental Quality Commission in Northern Quebec for 36 years, he coordinated public hearings in many threatened milieux, including the

shipment of oil through Lancaster Sound and the hydro-electric development of the Great Whale River project near James Bay.

Peter served as President of the Canadian Society of Landscape Architects from 1978 to 1980 and, for the following decade, as the CSLA representative to the International Federation of Landscape Architects (IFLA). His environmental concerns led to his appointment as chair of the Commission on Environmental Planning of the International Union for the Conservation of Nature (IUCN); he also served as visiting professor and program evaluator for many universities abroad, and as an advisor on international development and conservation projects. Peter became a leading voice in the movement for Sustainable Development, initiating Canadian landscape architects of several generations to this concept.

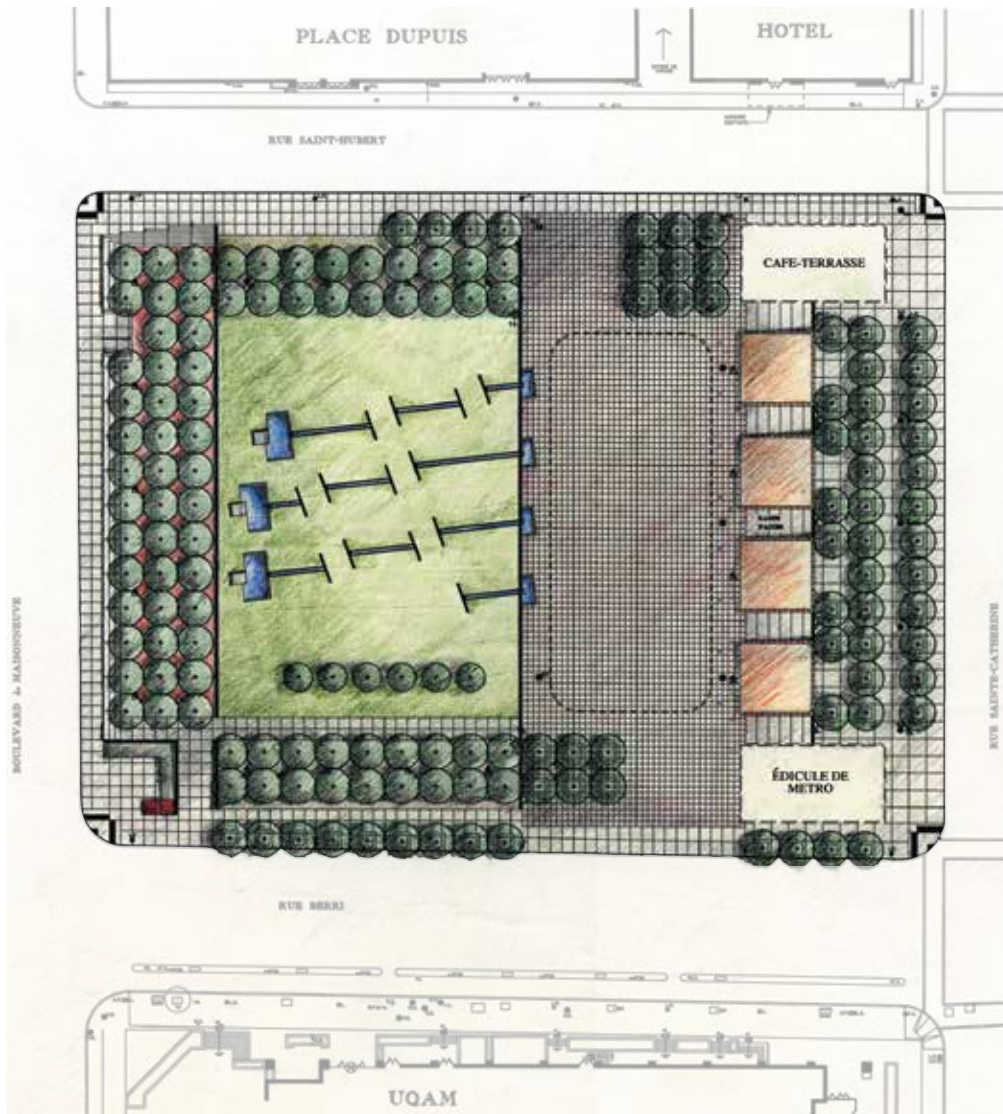
### Scholarship

Somehow, despite all these preoccupations, Peter remained at the forefront of scholarship in landscape architecture, publishing an apparently infinite number of articles in such magazines as *Landscapes / Paysages* (Canada), *Landscape Architecture* (U.S.A.), and *Studies in the History of*

1 PORTRAIT OF PETER 2 PLAN OF  
PLACE ÉMILIE-GAMELIN

PHOTO 1 COURTESY OF PETER JACOBS 2 VILLE  
DE MONTRÉAL : SERVICE DES LOISIRS ET DU  
DÉVELOPPEMENT COMMUNAUTAIRE / MODULE DES  
PARCS, DE L'HORTICULTURE ET DES SCIENCES, 1990





2

*Gardens & Designed Landscapes* (U.K.). From 1998 to 2004, he was a member and chair of the College of Senior Fellows at the famous Dumbarton Oaks Library and Research Center in Washington, DC, where he was named the first “Beatrix Farrand Distinguished Fellow.”

### Impacts on Montreal and Quebec

Peter did not neglect his home ground; for years, he has played an influential role in the long-term development of Montreal and Quebec, as a member (and often chair) of such public bodies as the *Bureau d'audiences publiques sur l'environnement du Québec* and the *Office de consultation publique de Montréal*. And despite pretending to retire in 2015, he has served for the past four years as President of the *Conseil du patrimoine de Montréal*, a vital watchdog over Montreal's architectural and landscape heritage. He has also been involved in the design of a number of important projects in Montreal, including

the concept planning for the Université de Montréal's business school (1995), and Place Berri / Émilie-Gamelin, a centrally-located downtown square (1993); and was the *eminence grise* behind the 1990s renewal of Montreal's venerable Mount Royal Park, in conjunction with the landscape architectural team of the City of Montreal.

### Unsung contributions

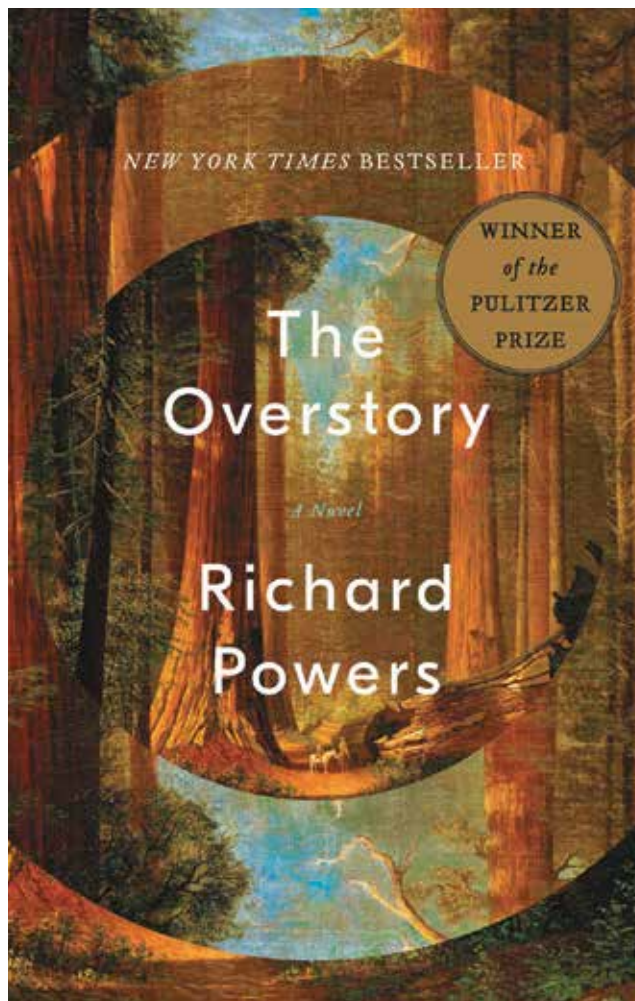
Peter's recent achievements have somehow obscured many of his early seminal contributions to the profession. At Harvard in the 1960s, he was a member of Carl Steinitz's original team that developed the computer-aided landscape mapping and decision-making techniques that led to today's GIS (Geographical Information Systems), while also establishing, with colleague Douglas Way, the basic methodology of Visual Impact Analysis that is still used today. His early research, seminars and editorial work on Canadian landscape architectural history – including

the first studies of pioneers Frederick Todd, Angus Hills and Rickson Outhet – laid the ground-work for all subsequent work in a field that had been virtually ignored up to that time.

Peter's great popularity as a speaker once saw him make simultaneous engagements in Montreal and in Quebec City. With great aplomb, he presented this conundrum as a “once-in-a-lifetime opportunity” to two fellow professors, one of whom wrote a speech on the agreed subject, while the other delivered it. But perhaps Peter's most influential unknown achievement was his site plan (with colleague Douglas Way) for the 1969 Woodstock Music Festival in up-state New York. Unfortunately, attendance was underestimated by a factor of 10, and little remained of their original layout.

Peter's contributions to landscape architecture and environmental sustainability in Canada and abroad have brought him recognition as Professor Emeritus in the School of Urbanism and Landscape Architecture at the Université de Montréal, *Membre honoraire* of the Association des architectes paysagistes du Québec (2018), Fellow of both the CSLA and the ASLA, and member of the Royal Canadian Academy of the Arts. He has received numerous awards including the AAPQ's Prix Frederick Todd (2013) and the CSLA's Lifetime Achievement Award (2018). His unique contributions have now been recognized by the award of the Canadian Landscape Architecture profession's most significant honour, the Governor General's Medal, to our distinguished colleague Peter Jacobs. Bravo!





Richard Powers  
2018, W.W. Norton and Co.

# THE OVERSTORY, A NOVEL

REVIEWED BY DOUG CARLYLE

**AS YOU WADE** through the first sections of Richard Powers' novel *The Overstory*, you might wonder what all the hype's about. Powers' 2018 "tour de force" is a Pulitzer Prize winner, a *New York Times* bestseller, and was shortlisted for the Man Booker Prize. And yet, as you read the first eight chapters, each of which focuses on one (or two in Chapter 5) characters, the novel seems more like a short story anthology – that is if you didn't pay attention to the very first chapter – *Roots* – where we're told, "Listen. There's something you need to hear."

The novel's messages build from exploring the lives, passions, experiences and families of the principal characters, who come from diverse cultures and places. Each of the individuals is bound up with their own unique relationship and passions to trees and the land around them, predominantly in the lower 48 U.S. states. As the novel unfolds, the reader discovers that the lives of the characters are entwined through themes of truth, science, belief, contradiction and conviction. In turn, the stories of tree species are interwoven around the human stories, each with their own character and science.

Through the lives of the novel's characters – human and tree – the overstory unfolds:

- Trees and their forest homes have so much to offer us if only we are willing listen and learn from them. We might then reconsider our relationship to them and to one another.
- New information and discoveries from which arises new knowledge and wisdom, demands that we challenge long-held beliefs and ways of life. There may be challenges addressing change in world that favours the status quo.
- We are of this place, this world, but are not its ruler. We continue the destruction of the natural world at our peril.

The writing style of the novel makes these themes personal and even poignant verging at times on poetic and magic realism.



## “Listen. There’s something you need to hear.”

The research and information underpinning this novel is rich and significant. We may know these facts, but are reminded of how they are illuminating and at times stunning. Among them:

- Trees and people share a quarter of their genes;
- There were six trillion trees at the dawn of *homo sapiens*, now there are three trillion;
- *Populus tremuloides* (Trembling Aspen) sprouts from a rhizome mass too old to date as “one of the largest living things on earth”;
- Douglas-Firs host more than 100,000 species of invertebrates and;
- Every variety of apple comes from a single tree.

Powers floats through other conversations’ provocative thoughts in poetic terms such as, “Photosynthesis...the inscrutable generosity of green things,” “a tree is passage between earth and sky”, “Trees are social creatures. Nature knows few loner trees” and “The dead keep the living alive.” It’s hard not to be struck by such statements; imagining we must pay more attention the next time we are walking down a tree lined boulevard or through the woods.

At times, *The Overstory* leaves the reader feeling terribly sad and hopeless; for example, one conversation notes that British Columbia allows cutting of the equivalent of two million log trucks per year that would take four or five centuries to replace. In other sections, we are there as the American Chestnuts virtually die out, and when the giant redwoods fall to the lumbermen’s machines and axes. And yet, we are also there when a new American Chestnut is discovered in a most unlikely place. Another one of the novel’s human characters reminds us “a Callery pear that survived half burned and with roots snapped, has just returned in good health to Ground Zero.” Sometimes, as another character notes, doing nothing is the better way. Maybe, the novel seems to suggest, trees will survive and thrive if humans just get out of their way.

The novel’s characters raise issues that are difficult to ignore. Should trees and living things have legal standing? Is the well-wooded land succumbing to the prosperity of a few? Is the wilderness gone? Have forests succumbed to chemically sustained silviculture (the tree nurseries we rely on for our projects)?

Powers reminds us through much of the novel that we are in peril because of our treatment and unrelenting destruction of the trees and their world, let alone how we treat one another. A couple of the novel’s characters question the law that sees corporations as people but denies the same status to rivers and trees. Should trees and forests have legal standing? His challenge to us is to transform our relation to trees and the natural world to being that of one among equals.

Why is this book important for people who care about our communities and the world around us? The call for action appears to be in numerous issues all around us that we cannot ignore and that demand unprecedented and immediate action. They are bubbling all around: unprecedented climatic events (fires in Australia and California, melting ice caps, river towns in Alberta about to run dry without their glacial water sources); global and local community social disparity; inequality and the ongoing pandemic of COVID-19. Reading the stories and themes of this novel only reinforces the urgency of these issues.

Why is this book important for landscape architects? Can we speak for the land and its trees? How can we be effective in transforming our communities to greater equity and carbon neutrality? What is our philosophical approach? It speaks to the need for information, knowledge and expertise in a broad range of earth and natural sciences, the teachings of traditional cultures, legal and contractual positions to help find our way as designers and planners. Maybe Powers’ most singular message for us as landscape architects is how we can be more empathic to other species when he proposes that what we make from a tree should be at least as miraculous as what we cut down.

*The Overstory* is a weighty novel, so take your time to take it all in. It’s worth it. As we move forward, imagine our world and communities in the post-pandemic times, knowing that we as landscape architects have a major role to play in shaping conversations and places. We are certainly on the way with initiatives from the 2021 Congress theme of “Nature-Based Solutions: The Green Recovery that Ensures a Great Recovery,” and our numerous advocacy issues.



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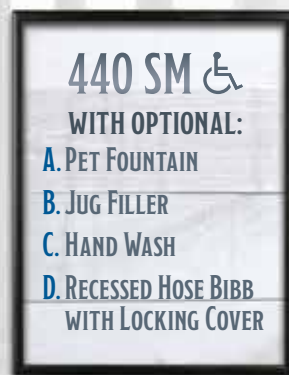
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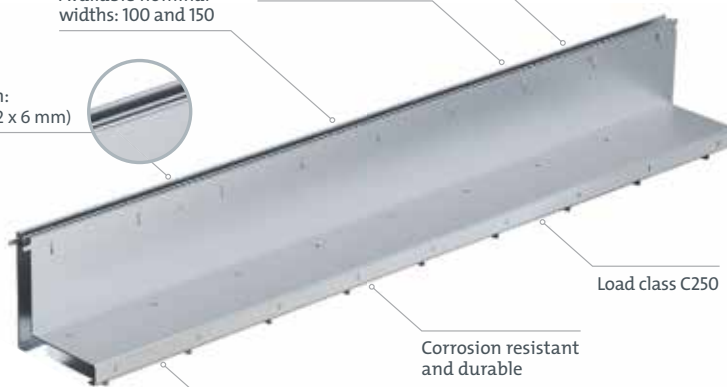
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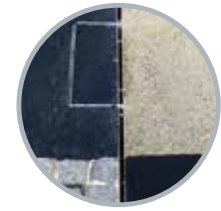
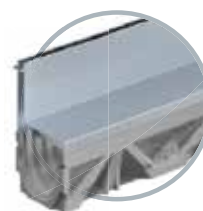
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# FOR THE LOVE OF TREES

VIRGINIA BURT

Around me the trees stir in their leaves  
and call out, "Stay awhile."

The light flows from their branches.

And they call again, "It's simple," they say,  
"and you too have come

Into the world to do this, to go easy, to be filled  
with light, and to shine."

*Excerpt from "When I Am Among the Trees"*  
by Mary Oliver

**AS A WAY** of celebration or perhaps making a mark, the act of planting a tree has been with humans for eons. Planted trees can mark a special time, a reminder, or perhaps a powerful symbol of new potential. When trees are given as a gift, it's wondrous to watch them grow and change.

Cornelia Hahn Oberlander gave me a beautiful native Black Gum (*Nyssa sylvatica*) to mark the year of my induction to both the CSLA College of Fellows and the ASLA Council of Fellows. Some five years later, my love of this tree has deepened. Cornelia has nicknamed the black gum "Mr. Nyssa" as "he" had a bit of a rocky start. Today, Mr. Nyssa thrives and features regularly in Cornelia's and my weekly conversation – the robin's nest that appeared this spring; ice hanging from his dark berries; the depth of sparkling light on his supremely glossy leaves; and his spectacular scarlet fall colour.

Planting a tree is hopeful and delightful. It is beyond our understanding, and yet, there is a deeply felt sense of wonder when we look upon trees. In this wonder, we don't casually dream of the future, we see the tree as the future. As landscape architects we make circles on a plan, write a specification, tag them at a nursery and stand observing the plant as it's muscled into place. A new day – and how lucky we are to affect the future so splendidly – a day well spent.

What research now demonstrates, what we intuitively knew all along, is that trees help us feel richer, help reduce crime in urban spaces, help children learn more quickly and humans heal faster. *Shin rin yoku*, or "forest bathing," is a prescription for mental health in densely populated areas of Japan and now in North America. Our heart beats more richly with the sights and smells of trees – be it immersed in the forest receiving vitamin "C", or pausing in the urban shade on a hot summer day, we appreciate and come into the present for a brief moment, a breath well taken by these oxygen-producing wonders.

Trees symbolize both the microcosm and macrocosm. One of the answers to climate change, one of our biggest challenges on earth – plant more trees. A goal for landscape architects, not difficult to achieve! Meanwhile at home, within my microcosm, I continue to admire Mr. Nyssa. Watching him evolve through the seasons, musing on progress both great and small – an emotional and spiritual connection to our planet. What I know of myself, this tree is special and considered a dear friend.

*Since founding Virginia Burt Designs (VBD) in 1996, Virginia Burt, FCSLA, FASLA, has designed and directed healing landscapes for private residential, educational and public clients. VBD has established a reputation for creating gardens and landscapes of meaning. Virginia's work has achieved international recognition for master planning, private gardens and health care projects, receiving multiple national awards from the ASLA, CSLA, Palladio and others. Clients appreciate and value her deep respect for place and for the human dimensions of each project.*

"MR NYSSA"  
PHOTO VIRGINIA BURT





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