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URBAN FORESTS: A GLOBAL PERSPECTIVE



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URBAN FORESTS: A PERSPECTIVE FROM NORTH AMERICA

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"A vision for healthy urban forests and vibrant communities"



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URBAN FORESTS: A PERSPECTIVE FROM NORTH AMERICA

2.1 Introduction

The past five years in North America have been a remarkable period of growth for urban and peri-urban forestry (UPF). This chapter will focus primarily on recent advances in organization, capacity, standards, management and research in the United States of America, Canada and Mexico. As a snapshot in time, we also highlight the threats and opportunities facing the region's urban forests, and the new directions that are taking shape. Our intent is to be comprehensive but not exhaustive for this inaugural report.

The North American region has shown steady growth in awareness and commitment to urban forests since the term was first coined by the Canadian forestry professor Erik Jorgensen in 1965. The emotional and ecological loss of the iconic American elm tree (*Ulmus americana*) in eastern cities of the United States of America and Canada was a significant catalyst for local and federal policies and investment in urban forestry in the 1970s, including the later passage of the

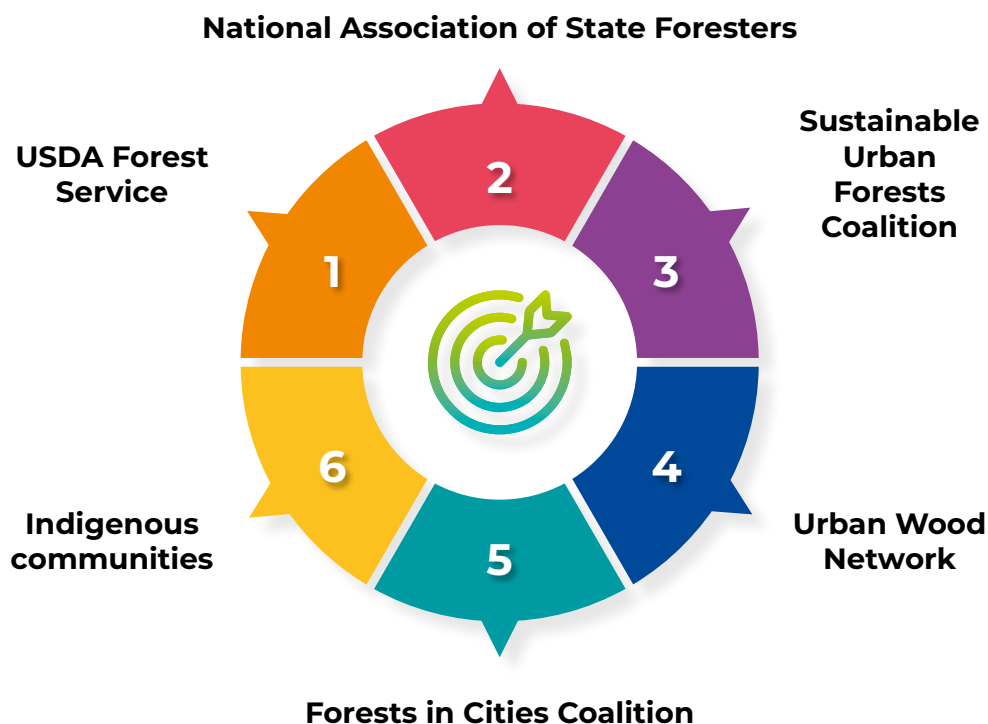
1990 Farm Bill, which established the current Urban and Community Forestry Program in the United States of America. Insects and diseases, now magnified by climate change, continue to drive local, regional and federal actions to restore public safety, beauty and ecological value from declining tree and forest conditions. Today, 50 years later, it is the emerald ash borer (*Agrilus planipennis*) that has galvanized regional and national attention in its impact on nearly all *Fraxinus* species, many of which were planted in cities to replace the lost American elm.



Recent advances in high-resolution imagery (circa 2010) and the many **research findings** (e.g. Endreny, Sica and Nowak, 2020) that tree canopy cover is unevenly distributed across cities – corresponding with disparities in wealth and race, and heat exposure and mortality in vulnerable populations – have overtaken such issues as pests and diseases in the scope and scale of public response. This discovery has led to a cultural awakening, fresh voices, and new priorities for investment in “tree equity” within cities across the world. We prepared this chapter amid a global climate crisis and federal response in the United States of America, Canada and Mexico, where our forests, especially those right outside our front door, are seen as “nature-based solutions” to a host of ills facing cities today.

2.2 Advances in organization and coordination

The key to advances in urban and peri-urban forestry (UPF) within North America has been the response of remarkable organizations and the coordination of programmes that support, monitor, communicate, organize and deliver action through partnerships at all scales.



1

The US Department of Agriculture Forest Service

This response has been facilitated by the **US Department of Agriculture (USDA)** programmes, which have been instrumental in developing innovative management tools and initiatives since 1974. Annual tracking since 1990 has shown that communities receiving federal and state technical assistance tend to advance towards more sustainable and resilient tree care programmes and populations. These communities are now more likely to understand what they have (e.g. tree inventories and canopy assessments), how to accomplish the work (e.g. operations, management and action plans), and which strategies to use in order to grow and sustain tree populations (e.g. planting and maintenance). The USDA Forest Service has also fostered communities of science and practice through its network of regional offices, research stations and urban laboratories (**field stations**) that have supported steady advances in the fields of urban forestry and urban ecology across the North American region and the world.

2

National Association of State Foresters

As regards the national leadership in urban forestry, the **National Association of State Foresters (NASF)**, established in 1920, has played a crucial role in advocating and developing policies and forest action plans to manage and protect state and private forests, including urban forests. As a non-governmental organization composed of the directors of forest agencies in the 50 states, the NASF has fostered collaboration among state foresters to facilitate the development and delivery of USDA Forest Service programmes, and to resolve regional and national policy and funding issues through three regional state forester groups: the **Southern Group of State Foresters**, the **Western Forestry Leadership Coalition** and the **Northeast/Midwest State Foresters Alliance**. State urban forestry coordinators have been frontline personnel in providing technical and financial assistance to local partners in establishing, maintaining and expanding effective urban forest and tree care programmes.

3

The Sustainable Urban Forests Coalition

Since 2004, in addition to the national and state-level efforts, the **Sustainable Urban Forests Coalition** has been instrumental in bringing together a diverse network of non-profit organizations, businesses, associations and charitable foundations dedicated to promoting healthy urban and community forests. Their collective efforts have fostered awareness and increased tangible support for urban forests and the programmes that sustain them. Each stakeholder in the Coalition has a strong independent voice, but altogether the network represents a volunteer force for advancing sound, effective urban forest policy and practices at national to local levels.

4

The Urban Wood Network

Other notable advances in leadership and coordination in the North American region are represented by the Urban Wood Network (UWN) and the Forests in Cities Coalition. Established in 2017 to promote the utilization of urban wood and remove it from the waste stream, the **Urban Wood Network** brings together municipal arborists, tree care companies, sawmills, manufacturers, consultants and other interested partners. The UWN has unified many sectors to establish and support full circle urban forestry management by fostering a robust supply chain and facilitating the best possible use of urban wood resources.

5

The Forests in Cities Coalition

The Forests in Cities Coalition resulted from the efforts of the **Natural Areas Conservancy** in New York City. Through partnerships and research initiatives, the Coalition is enhancing the management of forested natural areas in 17 metropolitan areas across the United States of America. Their efforts include developing a community of practice to enhance the management of 730 000 hectares of forests embedded in urban landscapes, informing on urban forest management best practices, and studying the cooling potential of urban natural areas in order to contribute to the development of climate-resilient strategies.

6

Indigenous communities

Advancement in urban forestry through Indigenous communities is gaining momentum. Traditional practices of growing and utilizing plants and trees for sustenance and shelter have been prevalent across North America for centuries. There are many examples of community forestry being practiced as an integral part of local culture. Examples such as the **Menominee Indian Tribe of Wisconsin** (United States of America) showcase the importance of sustainable forest growth for harvesting wood and traditional products. Indeed, their forests have more standing timber today than in the past, and their tribal forestry operations have provided employment through 150 years of **sustainable forestry**. Another example is the Blackfeet Nation in Montana, United States of America, which was the first tribal community to be recognized as a **Tree City of the World**. The cultural and community importance of trees and forests has a long history, and the sharing of **traditional ecological knowledge (TEK)** related to their stewardship continues to grow.



2.3 Advances in capacity

The growth in commitment to UPF at all scales of governance in North America has been driven by local needs and demands for assistance. Community tree management is the responsibility of property owners and local governments across the region. Public commitment is manifest through volunteer engagement and public spending levels to grow capacity and sustain tree planting and maintenance efforts.



Federal investment

The United States of America has had steady growth in local investment catalysed in many ways by national leadership listening to state and local voices. Congress-authorized funding for forest research in urban areas started in 1974, and subsequent legislation consolidated a broad range of forestry assistance to states – fire and forest management, forest health, wood utilization, urban forestry and other assistance – under the USDA Forest Service, State and Private Forestry Division. However, it was not until 1990, with the passage of the Food, Agriculture, Conservation, and Trade Act (commonly called the “Farm Bill”) that specific federal authority and funding for **Urban and Community Forestry** (UCF) was established. The Farm Bill legislation also established additional mechanisms to guide policy, investment and capacity across the country. It created the **National Urban and Community Forestry Advisory Council** (NUCFAC), with representation from all sectors of UPF – a group tasked with writing and updating a **National Ten-Year Urban Forestry Action Plan** including **research and development**. To support the goals set out in the plan, the NUCFAC also implements a **National Urban and Community Forestry Challenge Cost Share Grant Program** through the USDA Forest Service, contributing up to USD 1 million annually to projects that develop programmes or tools (e.g. **i-Tree**) applicable to UPF practitioners nationally in support of the Action Plan.

In recent years, the Forest Service has also distributed funding for projects through the **Landscape Scale Restoration** (LSR) programme, facilitating collaboration across states and interest groups to solve specific land management issues. Project funding supports collaboration among various forestry professionals, including urban foresters, wildland fire professionals, wood utilization experts, nursery managers and researchers to address challenges across the spectrum of people–tree–forest issues.

An example of such collaboration is a cooperative project involving multiple states (New Mexico, Texas, Kansas, Nebraska and Oklahoma) that aims to address the challenge of a limited availability and selection of diverse and climate-adapted trees for urban forestry. The project brings together the expertise of nursery and genetics professionals to establish a partnership model for producing native seed from among a diverse set of tree species for local planting projects. It involves tree seed collection, testing, seed orchard establishment, and planting in partnership with commercial nurseries, arboreta and local governments.

Recently, the United States has received a significant funding boost for the Urban and Community Forestry (UCF) through the **Inflation Reduction Act** (Section 23003). The Congress authorized USD 1.5 billion in federal funds over 10 years to distribute to states, cities, non-profit community groups, universities and tribal nations (See section 6 - *New directions*). At least 40 percent of these funds must be allocated to economically or environmentally disadvantaged neighbourhoods and areas, as defined by the **Council on Environmental Quality's Climate and Economic Justice Screening Tool**. This funding is specifically targeted at capacity-building to address long-term challenges such as climate change, heat abatement in cities, expanding community engagement, and reducing environmental and economic inequities. This generational investment in capacity expands opportunities for the USDA Forest Service to work directly with national partners, cities and community-based organizations.



© Phillip Rodbell/USDA Forest Service

Photo 1. Philadelphia, Pennsylvania
green stormwater infrastructure

In Canada, the federal government has made a significant investment in urban forestry through the **2 Billion Trees (2BT) program** (2020–2030). This CAD 3.3 billion commitment aims to plant two billion trees by 2030 and includes competitive grants for urban capacity building. This programme has enabled **many smaller communities** to enhance their urban forests.

While the **National Forestry Commission** (CONAFOR) in Mexico does not have a specific mission for the management of urban forests, it has developed special guidelines within the **Mexican Forestry Fund** to channel resources for environmental compensation for land use change. This can include financing afforestation projects in urban areas, following the regulations established in the General Law for Environmental Protection in 2023.

State and provincial programmes

Many states choose to distribute their federal fund allocation as grants to community groups and local governments (e.g. cities, towns, villages, townships, counties) to build capacity at the local level. These competitive, matching grant programmes are often designed to provide an incentive for a local entity to expand urban forestry staffing, provide training, conduct tree inventories, draft management plans, establish public education programmes, and support other components of quality urban forestry management. Some states also have state-funded programmes for urban tree distribution and planting to complement the federal funding they distribute.

To support state programmes and foster collaboration, the USDA Forest Service maintains a network of regional urban forestry staff. These staff members provide support to state programmes, monitor grant accomplishments, and foster collaboration among the states in their region: the Northeast and Midwest, the South and the West. With guidance from the NASF and three regional collaboratives of state foresters, the state coordinators meet regularly with their federal counterparts to discuss programme achievements, share success stories, and collaborate on ideas to solve UPF challenges common to their respective geographies. Examples of successful projects through this interagency cooperation include: the **Healthy Trees, Healthy Lives** educational campaign promoting the positive links between trees, forests and human health; the **Urban Forestry Economic Analysis** detailing the contribution of UPF to state economies in the **Northeast and Midwest**; and a 2023 Publication on Resilience in the **Western Urban and Community Forestry** region, featuring stories of building resilient communities.

The province of Manitoba, Canada has a unique forest programme that includes an **Urban Forest Council**. The Council's objective is to promote arboriculture best practices, safe work, professional development, information-sharing and networking in Manitoba.

In Mexico, an example of state-level urban forest management is the **Agencia Metropolitana de Bosques Urbanos del Área Metropolitana de Guadalajara** (AMBU). This is a decentralized public body in the state of Jalisco, designed to conserve, protect and renew 12 forests and urban parks located in the capital. AMBU provides technical, scientific and legal support to conserve and improve forest connectivity, biodiversity, social integration and recreation, environmental education, infrastructure and fundraising. It provides support to nine municipalities where more than five million people live.

National non-governmental organizations

National non-governmental organizations (NGOs) have been critical leaders in educating and organizing constituencies, and raising private funding and corporate resources to support local actions and advocate for the need for state and federal investment. Below are just a few of the NGOs that have played an outsized role building a regional movement to plant and care for urban and peri-urban forests.

➡ **AMERICAN FORESTS (AF)** one of the oldest environmental organizations in the United States, has been a policy leader and advocate for urban forests since its establishment in 1875. AF pioneered the practice of urban tree canopy analysis and benefit quantification with their CityGreen software, and created the **Vibrant Cities Lab**, a resource hub for advancing local UPF programmes. Most recently, AF unveiled its **Tree Equity Score** tool, which highlights areas with the greatest need for tree cover and environmental equity.

➡ **THE ARBOR DAY FOUNDATION (ADF)**, established in 1972, is now the largest member-based non-profit environmental organization in the United States, with more than one million members, donors and supporters. The ADF has created a community of practice across local governments and the private sector to support urban and community forests. The Foundation annually hosts the **Partners in Community Forestry** Conference, where professionals from various forestry sectors network and learn about the latest management options, technology and examples of partnership from around the world. In addition, the ADF offers various recognition programmes, including **Tree City USA**, which celebrates cities and towns that meet urban

forestry standards. It also recognizes **colleges and universities**, **health care institutions** and **primary/secondary schools** in order to promote best practices in tree care. Furthermore, the ADF leads the **Tree Cities of the World** recognition programme, which brings together a global network of communities. Taken together, these recognition programmes bring together many of the property owners and managers that impact trees and forests. The ADF also partnered with the USDA Forest Service to develop **Energy Saving Trees**, a utility-to-consumer model for tree distribution that helps homeowners save energy. Local utility companies sponsor free trees for homeowners with i-Tree Design software, which shows the best place to plant trees for energy savings. Since 2011, more than 120 sponsors have distributed 450 000 trees to households nationwide.

Photo 2. Nashville,
Tennessee



© Photo courtesy of Arbor Day Foundation



© Photo courtesy of Arbor Day Foundation

Photo 3. San Francisco, California



Photo 4. Miami, Florida



Photo 5. Greenville, South Carolina

- For more than 25 years, the **ALLIANCE FOR COMMUNITY TREES** (ACT), a programme of the ADF, has served as the national voice for the community-based organizations dedicated to planting and caring for trees in the United States. This network delivers on-the-ground programmes for tree planting, tree care, volunteer action, and learning and sharing among members.
- **THE NATURE CONSERVANCY** (TNC) is a convening partner of Sustainable Urban Forests Coalition (SUFC), which works in partnership across the region to create a world where people and nature can thrive. Their **North America Cities Network** is the newest force of 21 cities committed to supporting the voice and vision of local communities to co-develop innovative conservation solutions. In partnership with the USDA Forest Service and the University of Georgia, TNC developed the **Healthy Trees Healthy Cities** mobile application to educate and engage community residents in monitoring tree health. TNC scientists have played a significant role in identifying **nature-based services** (McDonald *et al.*, 2016) provided by urban forests.
- **TREE CANADA** is the only national non-profit organization dedicated to planting and nurturing trees in rural and urban environments, in every province across the country. Since 1992, Tree Canada has helped to grow Canada's tree canopy through programmes, research and engagement efforts, and by offering grants to communities and schools. Tree Canada's mission is to help grow resilient ecosystems and healthier, greener communities across Canada.



© Photo courtesy of Tree Canada

Photo 6. 2022
Planting of trees
under the Edible
Trees grant

© Photo courtesy of Tree Canada



Photo 7. 2022 Partners in Planting event with UPS in Surrey, BC

Photo 8. 2022 Partners in Planting event sponsored by UPS in Surrey, BC



© Photo courtesy of Tree Canada

© Photo courtesy of Tree Canada



Photo 9. National Tree Day 2022 at the Montreal, QC, event on Mount Royal

Photo 10. National Tree Day 2021 at the Quebec City event; post-planting image



© Photo courtesy of Tree Canada

Established in 2002, **REFORESTAMOS MEXICO** is a civil society organization whose mission is to achieve sustainable development through thriving forests across all 32 states of Mexico. The organization, through the Trees and Cities team, has developed initiatives such as the Urban Tree Index, where cities are ranked in terms of tree condition, and the Tree Regulation Index, which ranks Mexican states in terms of their regulatory protection for urban trees and forests. Furthermore, Reforestamos Mexico promotes **Tree Cities of the World** and hosts a photography contest that seeks to identify the largest trees in the country and heritage trees in urban areas.

© Photo courtesy of Reforestamos Mexico



Photo 11. Mexico City urban reforestation



© Photo courtesy of Reforestamos México

Photo 12. Mexico City urban reforestation

Local government programmes

Most state and provincial governments recognize local governments – cities, towns, villages, boroughs, townships, counties and other political subdivisions – through home rule charters, so that local decision-making on issues, such as water, wastewater, police, fire protection and land use, are made by locally elected representatives rather than state legislatures. This structure enables cities to be at the forefront of UPF development in the region. Long before federal funding was made available, cities were developing their own programmes to plant, tend or remove trees on public property. A [US Conference of Mayors’ report](#) on how they are leading on climate includes several examples focused on trees as a nature-based solution to extreme heat and flooding. An earlier [survey of 135 cities](#) illustrated many local examples, some of which are shown in Table 1.

Table 1. Examples of urban forestry initiatives in North America and Canada

	The city's Forestry Services in the Department of Public Works designs and manages approximately 200 000 street trees and is responsible for many green spaces, as well as beautification projects. Its successful programme for managing the emerald ash borer (EAB), is considered a model for the country.
	NYC Parks manages public trees in the city and implemented the MillionTreesNYC initiative, a public–private partnership that planted one million trees across the city from 2007 to 2015.
	The city has a long history of promoting urban forestry practices, being the oldest and longest-running Tree City USA in Texas. The Parks Department manages public trees, while private property trees are regulated by the Urban Forestry Management Section of the Planning and Zoning Department.

Portland, Oregon	Urban forestry management falls under Parks and Recreation, which aims to manage 218 000 street trees, 1.2 million park trees and 2.9 million private property trees. The city has established ordinances, policies and regulations for private property trees in order to achieve city-wide goals for tree canopy.
Denver, Colorado	The Office of the City Forester oversees public tree management and development regulations to protect private trees. Denver's educational campaign for managing the emerald ash borer, called Be A Smart Ash engages residents in efforts to replace ash trees across the city.
Canada	Various Canadian cities have ongoing initiatives, such as the Million Tree Challenge in London, Mississauga and Winnipeg. Cities such as Oakville have set new standards in urban tree by-laws, promoting advancements and innovation in urban tree by-laws.
District of North Vancouver, British Columbia	The district has a new Urban Tree Canopy Project that supports residents living in apartments to plant trees and shrubs on balconies using funds from an environmental compensation fee.
Mérida, Yucatán, Mexico	The city developed the municipal Green Infrastructure Plan , aligned with the Municipal Development Plan, to promote the generation of information and indicators, the implementation of programmes and projects, promotion of environmental education, and the design of public policies for better governance regarding trees, among other elements that make up their green infrastructure agenda.
Toluca, Mexico	Toluca launched the Citizen Network of Pollinating Gardens to raise awareness on the importance of pollinating species. The city is part of the monarch butterfly migratory corridor, and the gardens contribute to connectivity between forested areas.
San Pedro Garza García, Nuevo León, Mexico	The municipality has an online platform for citizens' adoption of trees in the city, allowing residents to participate in tree planting initiatives and contribute to urban greening efforts.

Local non-governmental action

Community-based tree groups across North America are among local charities that have existed for decades, raising funds to deliver local programmes to benefit urban forests, such as tree planting, educational campaigns, volunteer management and, increasingly, efforts to create green jobs and promote environmental justice. New groups form regularly, while existing groups continue to grow and develop more sophisticated approaches to urban forestry programming. Tables 2, 3 and 4 showcase only a few examples of the different sized NGOs from more than 100 active organizations:

Table 2. Community-based tree groups and NGOs promoting urban forestry in North America

	Founded in 1981, this organization has installed and maintained over 60 000 street trees, accounting for almost half of San Francisco’s street tree canopy. It led a successful public awareness campaign and ballot initiative, which transferred the care of all street trees from fronting property owners to the Department of Public Works and allocated USD 19 million annually for street tree and pavement maintenance.
	Founded in 1989, it led the community planning process to develop the ReLeaf Cedar Rapids’ long-range plan after a destructive storm in 2020. The plan aims to re-establish the lost tree canopy in Cedar Rapids and supports fundraising efforts.

Casey Trees	Washington, DC	Established in 2002, Casey Trees has become a leading non-profit organization focused on trees. It boasts a 40.5-hectare tree nursery, advocates for a 40 percent tree canopy goal for Washington, DC, conducts regular measurements of tree canopy, and monitors changes to inform tree policy through its annual Tree Report Card .
Sacramento Tree Foundation	Sacramento, California	Since 1982, this organization has been engaged with the community to plant and care for over 1.5 million trees throughout California. It has collaborated with the Sacramento Municipal (Electric) Utility District to distribute and plant more than 600 000 free shade trees since 1990 to reduce peak energy demand and lower household energy bills. It has been estimated that the energy savings of these trees is equivalent to building a new power plant for the region.

Table 3. Organizations that engage residents in greening and advancing local tree canopy cover in Canada

ORGANIZATION	LOCATION	DESCRIPTION
Collectif Canopée	Quebec City, Canada	Builds capacity to plant 10 000 trees in the Quebec City area.
Root for Trees	Edmonton, Canada	A volunteer tree-planting initiative in the City of Edmonton.
Sustainable Neighborhood Action Program	Toronto, Canada	Includes urban forests in its climate change solutions efforts.
ReForest London	London, Canada	Aims to enhance environmental and human health in London, known as the 'Forest City', through the benefits of trees. Inspires and empowers residents to plant and care for trees.

Table 4. Civil society organizations that protect trees and green areas in Mexico

	A Civil society organization dedicated to protecting Monterrey's forest heritage through the implementation of good practices. Reforestación Extrema is recognized for its transformation of public spaces.
	A Civil society organization that aims to increase the number of green areas in León. FURA promotes a local advocacy agenda to influence municipal public policies to achieve its goals.
	A civil society association founded in 2008 to improve air quality in Jalisco. Focuses on the production, donation and adoption of endemic and native trees for planting in public pavements, parks, gardens and private spaces.



Continuing education – training and networking

The growth in continuing education, training and networking opportunities has been exponential in the North American region since the seminal **National Urban Forestry Conference (1978)** in Washington DC, the **2023 World Forum on Urban Forests** is suitably hosted in the same location. Between these two dates, hundreds of state, provincial and national events have taken place. As a national model, the annual **Partners in Community Forestry Conference** hosted by the Arbor Day Foundation brings together coordinating organizations and local leaders to network and share model projects and lessons learned in a peer-to-peer framework.



Similarly, the **Canadian Urban Forestry Conference** provides a premier event hosted every two years by Tree Canada. The Conference links practitioners to subject matter experts in order to share innovative strategies, policies, technologies, research and best management practices in urban forestry.

FAO, Reforestamos México, the Instituto de Estudios Superiores de Occidente (ITESO), the Government of Guadalajara, the Metropolitan Agency for Urban Forests (AMBU), Bosque Urbano Extra, and the National Forestry Commission collaborated to organize the **Third Forum for Latin America and the Caribbean on Urban and Peri-urban Forests** in October 2022. A product of this Forum was the Guadalajara Action Plan (see the Latin America and Caribbean section), which established an agenda to promote urban forests in the region.

The ISA **Certified Arborist** and other industry credentials since the early 1990s have created a substantial demand for continuing education units (CEUs). Today, it is relatively easy to gather CEUs through in-person and virtual conferences and webinars associated with ISA state and country chapters. In addition, state and local tree-related educational events are hosted annually in conjunction with **Tree City USA** and state Urban Forest Council meetings.

Regarding continuing education, the Society of Municipal Arborists has been hosting a **Municipal Forestry Institute (MFI)** since 2006. MFI is a weeklong intensive educational programme for practising professionals to strengthen leadership skills in programme administration, coalition building, strategic thinking, programme planning and public relations. The newest edition to advanced learning is the **Green Communities Leadership Institute** which was developed and is delivered by active peers and conservation leaders in the profession. This is a “next level leadership opportunity that prepares community leaders to enact climate action, improve diversity, equity and inclusion and build lasting positive impact on environmental and community health”.

Many university extension programmes, professional associations and the USDA Forest Service offer one-hour webinars that have been recorded and compiled into an extensive collection of current and advanced topics at each institution. These sessions can be viewed on-demand and attract a dedicated following. Important collections can be found at **Pennsylvania State University**, **University of Massachusetts-Amherst**, the non-profit **Urban Ecology Collaborative**, among others.

In Canada, the Kwantlen Polytechnic University in British Columbia is offering an **arborist technician apprenticeship** that combines on-the-job training and classroom learning. Certified arborist technicians work for municipal parks departments, school boards, golf courses and for private arboriculture companies, and are in high demand.

The **École forestière de La Tuque** in Quebec offers a new pruning educational programme, lasting 915 hours. It is given by professional teachers who have worked in the field for several years. At the end of the training, the student will have acquired the skills as a technician in arboriculture, urban forestry, forestry and nursery practice.

Higher education and professional affiliation

Formal educational opportunities in North America have been relatively stable, and primarily offered by state and provincial universities, community colleges and independent institutions. However, recent developments in the workforce include the emergence of arborist and urban forestry apprenticeship programmes. For example, in Canada, there has been a surge of research contending with multiple dialogues in urban forestry, notably around both social and ecological interventions and innovations.

This has led to a range of programmes and studies across colleges and universities. For example, the Canada-wide interuniversity and interdisciplinary graduate training programme in **Urban Forest Management** (Ufor) aims to train highly qualified professionals capable of managing the complex sociocultural and economic make-up of urban forests. The programme is centred on creating a national network of academics and partners who have a stake in urban forest training and professional development, and those who can offer training or internships to students.

Professional affiliations have also been critical to advancing education and practice in urban forestry across the North American region. Some affiliations supporting urban forestry include the **Arboriculture Research and Education Academy**, which facilitates communication and coordination among scientists and educators, and the **Society of Commercial Arboriculture**, which connects professional arborists through networking and educational events.

Another notable case is the **Mexican Association of Arboriculture** (AMA), which is an NGO created in 1999, with the purpose of promoting the practice and study of arboriculture, including certification of arboriculture professionals in Mexico. AMA has established and disseminated standards and practices in tree care.



© Photo courtesy of City of Durango, Mexico

Caption: Tree City of the World celebration in Durango, Mexico

2.4 Advances in standards and metrics

Baselines and changes

The municipal tree management assessments and **formal reports** (Hargrave *et al.*, 2022) tell the story of change and the maturation of urban forestry practices in the United States of America. Initiated in 1974 by James Kielbaso at Michigan State University, the assessments were repeated roughly every 10 years to establish baseline data on local government programmes and inform the delivery of national and state technical and financial assistance. The collected data have been essential in understanding how communities of different sizes approach urban forestry while also highlighting areas for improvement within local programmes. The subsequent updates, with the most recent **completed in 2014** (Hauer and Peterson, 2014), revealed significant advancements in urban forestry practices. First, there has been a notable increase in staff expertise, with 61 percent of people living in communities have at least one staff member holding an **ISA Arborist certification**, a programme developed only 20 years earlier. Moreover, the incorporation of industry standards or credentials for contractor hiring decisions has become commonplace, with 72 percent of communities adopting this practice.



Regarding workforce compensation, the pay for field arborists has aligned with the national average for all occupations in the United States. However, city foresters earn 50 percent more, indicating the significance placed on their role in urban forestry management. The growth in tree care ordinances has been remarkable, increasing from 67 percent in 1974 to 90 percent in 2023. Especially noteworthy is the substantial rise in trees and development ordinances, with 54 percent of communities having some form of tree protection today, compared to a mere 11 percent in 1974. Assessing the tree population has become common, with 67 percent of the communities now possessing some knowledge about their tree populations through inventories – an increase from 21 percent in 1980. Furthermore, the adoption of management plans has increased from 11 percent to 50 percent between 1974 and 2023. Community engagement, although not

tracked in the past, has become common today. Approximately 65 percent of respondent communities now involve volunteers in urban forestry activities, resulting in an estimated annual contribution of 1.5 million volunteer hours.

Despite the progress made over the past 50 years, certain challenges persist. One such challenge is the lack of tree diversity, with an average of 60 percent of the public tree population consisting of only six tree species. This situation highlights the need for further efforts to enhance and promote diversity in urban tree populations. Indeed, diverse urban tree species have the potential to enhance the resilience and overall health and sustainability of urban ecosystems by offering varied resistance and tolerance to pests, diseases and environmental stressors.

An important update to this work will be carried out in 2024 to continue the 50-year legacy. The work will incorporate new ways to assess urban forests and green spaces, the current status of tree diversity, and many more appropriate solutions to build upon a 50-year longitudinal assessment¹ of municipal forestry programmes.

Local programme management

Across North America, urban forest management ranges from proactive to reactive approaches. Many communities have transitioned from pencil and paper inventories to advanced systems like interactive geographic information systems (GIS), and machine learning for urban tree canopy analysis. The City of Los Angeles in partnership with **City Plants** exemplifies the successful combination of urban forest information and community needs. The Vibrant Cities Lab **Urban Forestry Toolkit** provides an interactive tool for developing and benchmarking local programmes. Additionally, the Arbor Day Foundation's **Tree Cities of the World** programme extends recognition and incentives to local and tribal stakeholders to develop UPF management programmes beyond the United States.

i-Tree Tools

A steady series of assessments, applications, models and peer-reviewed papers co-developed with partner organizations and university institutions led to the development of the **i-Tree suite** of freely available tools. The suite of tools enables individual trees and their benefits and values to be assessed, priority planting areas to be identified, and tree canopy and land cover to be estimated. The

¹ A longitudinal study is a research design that involves repeated observations of the same variables over long periods of time. It is often a type of observational study, although it can also be structured as a longitudinal randomized experiment.

integration of i-Tree with the USDA Forest Service nationwide continuous **Forest Inventory and Analysis** (FIA) Program allows to evaluate the environmental services provided by urban trees such as public health enhancement, carbon sequestration, air quality improvement and energy savings.

A remarkable six-year study in Louisville, Kentucky was carried out using the i-Tree model and direct assessments in partnership with The Nature Conservancy. This was the first controlled experiment of its kind to test urban greening in the same way that a new pharmaceutical intervention would be tested (Yeager *et al.*, 2023). The **Greenheart Project** research team first assessed the risk of diabetes and heart disease, stress levels and the strength of social ties among 636 participants from targeted Louisville neighbourhoods. The team also took baseline measurements of air pollution levels at the same time to measure the power of greenery as a public health strategy in Louisville neighbourhoods.

Recognizing the value of the i-Tree suite, a version called **i-Tree Eco** was adapted for Mexico with the collaboration of the **National Institute of Forestry, Agriculture and Livestock Research (INIFAP)**. For the adaptation of the suite, the project incorporated climate and pollution data from climatic stations, integrated new tree species, and collected data from 33 urban centres covering 83 percent of Mexico's urban population. In addition, the translation of manuals and software into Spanish ensured accessibility and usability in the country.

The use of high-resolution digital imagery has revolutionized the understanding of tree canopy dynamics across urban areas. By overlaying this information with property ownership maps, the concept of “**tree equity**” has emerged, leading to a shift from a public street tree focus to a parcel-based, all-lands approach² for planning and management. Many communities have assessed their canopy cover distribution, set goals and implemented initiatives to achieve those goals. Individual tree or sample-based inventories, such as **i-Tree Eco**, contribute to a comprehensive understanding of the urban forest's structure, function, resilience, biodiversity, and ecosystem services over time.

The Tree Equity Score

In an effort to address disparities in access to green spaces, the American Forests organization developed the **Tree Equity Score** tool. This tool highlights the inequities between different areas in terms of tree cover and green spaces, which

² A parcel-based all-lands approach is a method that allows city land parcels with favourable land use conditions to build more green infrastructures than required, and trade their extra capacity as monetary credit to land parcels that have building difficulties.

are often influenced by historic injustices such as federal grading (or **redlining**³) of neighbourhoods (Nowak, Ellis and Greenfield, 2022). This has led to the awareness that more affluent areas often have more trees, tree cover and green spaces. Therefore, this situation clearly demonstrates that these newly marshalled spatial tools help visualize the problems and challenges while enabling us to know where we should focus our efforts. Climate change and particularly **extreme heat** events highlight the importance of not only recognizing these issues, but also actively working to find the solutions for alleviating these inequities through increased tree cover and more green spaces for all.

2.5 Advances in management and science

Forests under pressure

Our urban forests are under pressure as never before. Natural disasters like hurricanes leave dead and damaged trees in their wake, and many communities lack the capacity and resources for restoration. Moreover, wildfires ravage our forested natural areas, leaving them so damaged that they are challenged to regrow on their own (Davis *et al.*, 2023). In addition, land developers convert and fragment forested landscapes for new housing, often destroying valuable habitat and contributing to declining biodiversity. Furthermore, climate change alters the growing conditions, making some places hotter and drier while flooding root systems in others. And finally, adding to the vulnerability of urban forests, invasive insects and diseases leave broad swaths of hazardous dead trees across our cities and invasive plants crowd out our native trees.

The emerald ash borer (EAB; *Agrilus planipennis*) gives one poignant example of the devastation that invasive insects can have on our urban forests and of the impact on the people who rely on them. EAB most likely entered North America in the early- to mid-1990s, carried over from its native Asia

³ Redlining is a discriminatory practice in which services are withheld from potential customers who reside in neighbourhoods classified as “hazardous” to investment; these neighbourhoods have significant numbers of racial and ethnic minorities, and low-income residents.



in shipping containers. It was not observed in forests of the United States until 2002, when scientists found it on Detroit's ash trees. It was **observed in Windsor, Ontario** that same year. Since then, **EAB has continued to spread rapidly** across the United States of America, and is now found in the Midwest, the northeast, the south, and as far west as Oregon and in five Canadian provinces. Hundreds of millions of ash trees across the continent have fallen to the pest. EAB continues to impact the economy across the rural to urban gradient, costing forest managers, nursery owners, governmental organizations, and private landowners hundreds of millions of dollars.

Sadly, the RSB is only one of many **pests and diseases threatening North American forests** today. For example, the spongy moth (*Lymantria dispar*) continues to threaten oak forests in 19 states, the District of Columbia, and neighbouring parts of eastern Canada. **Sudden oak death**, caused by a mold pathogen called *Phytophthora ramorum*, is killing oak trees in California and Oregon, and impacts an additional 75 species. In addition, the hemlock woolly adelgid (*Adelges tsugae*), an insect native to East Asia, remains unchecked by native predators, weakens hemlock and spruce trees, and is devastating populations of Eastern hemlock in suburban and rural communities.

In Mexico, urban forests face similar challenges with **multiple pests and diseases** that put trees at risk. In addition, urban forests are often threatened by changes in land use for urban development or by informal appropriation of land by vulnerable groups. The lack of planning and regulations for housing construction and tree care, as well as of municipal budgets and staff to monitor permits and compliance with the laws in place are challenges that threaten the future of urban forests in Mexico.

New methods and best practices

Today, forest managers work to detect stressors early in order to protect the resilience and sustainability of our urban forests. To this end, they combine collaborative techniques with emerging technologies. For example, tools such as **Healthy Trees, Healthy Cities**, developed in partnership with The Nature Conservancy, the USDA Forest Service and Georgia Tech University, enable staff and community volunteers to gather observational, early detection data on urban trees. The tool can be downloaded onto a smartphone, removing the barrier of requiring expensive specialized equipment.

In addition, researchers at the USDA Forest Service, the New Jersey Institute of Technology, and the College of Saint Rose developed a model for **early detection of ash trees infested by EAB**. The model combines a map of a city's ash trees

with multiple health categories that allow for a more accurate forecast of ash health when compared with previous models. When combined with community surveillance for early signs of infestation, like looking for increased woodpecker activity as the birds hunt for EAB grubs, models like this can help a city prepare in advance for an EAB infestation and treat trees with insecticide in time to prolong their lives.

In the eastern United States of America, **Urban Forest Strike Teams**, composed of ISA Certified Arborists from state forestry agencies across the region, are deployed to assess tree risk and damage in order to help mitigate the effects of disasters to a community's tree canopy. Team members gather information on mobile devices and equip municipalities with the information they need for the Federal Emergency Management Agency's (FEMA) **public assistance applications for debris removal**.

On-the-ground monitoring is time-intensive, and communities often lack the resources to monitor trees as frequently as necessary. The USDA Forest Service has developed protocols to support **long-term monitoring of tree growth** (Roman *et al.*, 2019). The agency has also developed methods with community members **to collect and study moss samples in trees** (Kirkland, Jovan and Derrien, 2023) in order to map air quality in heavily polluted neighbourhoods. These more intensive methods can now be supplemented with **remote sensing technologies**, such as light detection and ranging (LiDAR) collected by unmanned aerial vehicles (drones), to detect early signs of stress in urban forests.

Since 2021, Reforestamos Mexico has promoted the **Environmental Detectives** initiative, through which company personnel, students and neighbourhood groups are trained to become "citizen scientists". Through the training they receive on the **iNaturalist** platform, they collect and input information on biodiversity and the condition of urban trees to inform decision-making.

Community co-design for resilient forests

Pressures on people and forests today are compounded by a long **history of systemic racism and disinvestment in communities of colour and poverty** (Locke *et al.*, 2021). For example, in the 1930s, the federal Home Owner's Loan Corporation in the United States created maps that colour-coded neighbourhoods in 149 cities. These maps assigned grades to neighbourhoods to represent risk factors for residential mortgage lenders, and are often referred to as "redlining maps" because the highest risk areas were designated in red. These redlining maps effectively blocked people of colour from participation in the housing

market and building generational wealth. As a consequence, this set the stage for the inequality we see in many cities in the United States today, including in tree canopy. An analysis of 37 metropolitan areas (Locke *et al.*, 2021) showed that neighbourhoods given an 'A' rating in these redlining maps have almost double (43 percent) the tree canopy of neighbourhoods given a 'D' rating (23 percent).

Urban forestry practitioners and related professions together research scientists are working in partnership with communities to **rectify past inequities and ensure equal access** (Carmichael and McDonough, 2018) to the benefits that our urban forests provide. To this end, they are **co-design urban forestry projects with impacted communities** (Johnson, Campbell and Svendsen, 2020), including planting and management activities. Practitioners are learning a great deal about **community co-design from tribal communities** and other disciplines in real time, including environmental justice, and diversity, equity and inclusion principles.

Examples of co-design strategies include those documented in the **Johnston Square neighbourhood of Baltimore**. The process consisted of the following:

- ✓
- ✓ **cultivating** meaningful engagement opportunities for all stakeholders and recognizing that everyone is an expert based on their own lived experiences;
- ✓ **engaging** the practitioners as facilitators and capacity builders; sharing knowledge and tools with stakeholders; focusing on and elevating the voices of those directly impacted and building upon the strengths and resources within the community;
- ✓ **sustaining, healing and empowering** communities by addressing the cumulative impacts of disinvestment in **environmental justice communities**;
- ✓ **facilitating** collaborative partnerships and power sharing at all phases of the project;
- ✓ **working** towards sustainable, community-led and controlled outcomes through a cyclical and iterative process;
- ✓ **disseminating** knowledge and sharing results with all participants using diverse communication channels.

These types of co-design processes share power with communities, putting them in the driver seat, and ultimately help them to become more resilient to climate change, pests, disease and poverty. For example, in rural communities in Mexico, *Plant With Purpose* has used a community-led model to plan and execute reforestation projects, simultaneously addressing environmental degradation and extreme poverty. After years of persistent droughts, heavy rains and flash floods in many areas of Oaxaca, Mexico, which reduced crop yields and increased rural poverty, *Plant With Purpose*, with funding from the Arbor Day Foundation, is working with communities to plant drought-resistant trees and restore the soil, the water and the forests that people depend upon for their livelihoods. Community members are planting fruit trees on their individual plots in addition to organizing larger-scale efforts to plant native pine on surrounding communally managed hillsides. These efforts are helping farmers heal their degraded land and creating a better future for their families.

The City of Philadelphia developed its first-ever **urban forest strategic plan (Philly Tree Plan)**, proudly engaging more than 9 000 of its residents in a community-led process. Between 2008 and 2018, Philadelphia's urban forest shrunk by 6 percent, i.e. equivalent to 1.000 American football fields worth of tree canopy. However, the remaining tree canopy is not fairly distributed across the city, with some neighbourhoods having under 5 percent tree canopy, while others have 45 percent or more. The Philly Tree Plan is a response to these challenges; it is a 10-year strategic plan for the growth and care of the urban forest that puts people first, with three key values guiding the Plan: environmental justice, community engagement and sustainability. Therefore, the Philly Tree Plan aims to bring the benefits of trees to those communities that need them the most, and in the ways that support them the best. The plan describes many ways for residents to get involved, but sets no tree planting or canopy cover goals. Its focus is on the public health and job-related benefits of public investment.



New initiatives and research findings

Cities are **complex social-ecological systems** where elements are self-organized and interconnected, and have leverage points that can improve the system. To address the complex issues facing our forests today, cities are developing systems-based solutions that attract resources for sustaining green infrastructure, including trees, that deliver multiple positive outcomes.

The USDA Forest Service is working collaboratively with communities to model systems-based approaches to urban forestry and conservation. For example, the **New York City Urban Field Station** developed the **Stewardship Mapping and Assessment Project** (STEW-MAP), which is both a methodology and community organizing tool that helps collaborators understand who is engaging in urban stewardship across their community. This kind of understanding has helped to shed light on opportunities for novel collaboration. The tool has been piloted and is being applied in more than a dozen cities and mosaic landscapes around the world, including in Mexico. Recently, Tree Canada partnered with the Canadian Forest Service and the University of Toronto to lead a **pilot study** in the City of Toronto, Canada.



..... **Caption:** Guadalajara Nursery, Mexico

In another example, the **Baltimore Urban Field Station** collaborated with city leaders and non-profit groups to develop a framework for utilizing urban wood, known as the **Baltimore Wood Project**. The framework mapped the necessary components of a functioning urban wood economy and included workforce development for under-employed people and opportunities to enhance tree planting and maintenance budgets through partnerships with producers and consumers of urban wood products. In support of this framework, the USDA Forest Service funded business case studies to examine the economic value of wood and other benefits from the deconstruction of terraced houses, and from urban forestry activities more generally. Findings from these reports catalysed a USD 15 million programme from the State of Maryland to dismantle vacant row homes in Baltimore, and a nearly USD 1 million innovation loan from the city to support utilizing wood from urban forestry activities. This model is now being replicated and expanded in other metropolitan areas through a new national **Urban Wood Network** including transdisciplinary efforts focused on sustaining green spaces in cities.

Our shared concept of the role of forests in cities is also shifting. To many practitioners, urban forests have been synonymous with street trees, but today this definition has expanded to include trees on private lands and our forested natural areas as well. **Scientists at the USDA Forest Service** and the **Natural Areas Conservancy** are collaborating to identify and disseminate best practices for managing urban forest patches of wooded natural areas within cities, **adapting traditional silviculture to the assessment and management techniques in urban settings** (Piana, Pregitzer and Hallett, 2021). The Natural Areas Conservancy is disseminating the best practices via their **Forests in Cities** Resource Library, a collection of 17 cities across the United States of America that is expected to grow in the years ahead.

Forests are also being further integrated into buildings, creating opportunities to blur the lines between indoors and outdoors via biophilic designs. Biophilic design is an approach to architecture that seeks to connect building occupants more closely to nature. Biophilic designed buildings incorporate natural lighting and ventilation, natural landscape features and other elements for creating a more productive and healthier built environment for people.

Mass timber⁴ continues to gain popularity around the world as a construction material, and often includes exposed wood elements in buildings. This type of construction that includes wood sourced in urban areas can also enhance the health of our overstocked, fire-prone rural forests through sustainable harvesting of smaller diameter wood. **Including plants and exposed wood in the built environment** can reduce stress and improve well-being for people (Fell, 2010). Therefore, combining exposed wood in buildings with robust urban forests and healing landscapes has the potential to enhance these mental health benefits in a sustainable way (USDA Forest Service, 2018).

Adaptation management of urban forests for climate change is an active area of science and practice. Collaborative efforts with local governments and non-profit groups are taking place for **tree improvement** in seed orchards and for **assisted migration** of tree species from the South to test plots in the North. Also, the new **Long-Term Ecological Research Program** has begun in the Minneapolis-St. Paul Metropolitan Area, bringing together more than a dozen research institutions to study how urban stressors affect the ecological structure and function of urban nature.

Recent advances in **urban forestry research** at the USDA Forest Service include the following:

- ✓ Well-managed trees and green infrastructure can buffer the negative impacts of a **changing climate and expanding urban footprint**.
- ✓ Trees, forests and green infrastructure can also improve **community health and well-being** and provide jobs that support economic growth.
- ✓ Understanding the status and trends in urban forest health and tree cover can inform and improve **management and protection** efforts.
- ✓ Stewardship of urban forests **strengthens civic capacity**, builds social cohesion, and supports the foundations of a thriving civil society.

In Canada, there are organizations and research institutions that are collaborating to conduct innovative research to improve urban forest management and practices by considering broader dialogues in social integration such as equity and creative interventions. Tree Canada's next **Canadian Urban Forest Conference** (October 2024) will focus on equity themes such as governance and community connectivity, environmental and social justice, and the various values and viewpoints of urban green spaces that impact and influence urban forest management, planning and practice.

⁴ Mass timber uses state-of-the-art technology to glue, nail or dowel wood products together in layers. The results are large structural panels, posts and beams.

2.6 New directions

A moment for accelerated growth

Working together with local communities, the region's UPF community of science and practice has the opportunity to realize the goals of planting the right trees in the right places, maintain the existing urban tree canopy, and grow more equitable, diverse and resilient urban forests for the future.

The **Inflation Reduction Act**, passed in 2022, includes billions of dollars to support equitable urban forests through federal agencies in the United States, including the **Federal Highway Administration**, the **Environmental Protection Agency** and the **USDA Forest Service**. These unprecedented funding levels offer the opportunity to leverage emerging technologies, systems-based solutions and best practices to address past inequity and current threats.

Many other federal government agencies and programmes have received climate mitigation funds through the Inflation Reduction Act and signed a **seminal agreement to collaborate** on leveraging each other's work to increase public access to nature in communities. This cross-government collaboration has the potential to transform the connectivity that residents have with natural infrastructure by cutting across lines of income and race in the United States.

The **Fourth National Climate Assessment** (NCA 2018) acknowledged that urban forests, open spaces and waterways provide multiple benefits, but many are under stress because of land-use change, invasive species and pollution. A new NCA initiative focused on **Natural Capital Accounting** (Baghdad *et al.*, 2021) will focus on the economic benefits of urban green space as a contributor to gross domestic product.

In the context of climate change, and recognizing the high mobility of people in the North American region, there is potential for regional cooperation to prevent or slow the spread of pests and diseases that threaten urban forests. New tools and technological advances that will be available online can generate community science strategies to detect pests and pathogens more rapidly.

Potential alliances

Discussions have been proposed to expand the successful **Alliance for Community Trees** across North America and use it to increase the number of Tree Cities of the world. This would include translating English materials into Spanish to

promote the culture of urban forests in Mexico. In this way, the successes in the United States might be replicated at scale.

Through the **Commission for Environmental Cooperation**, there are opportunities for North American countries to collaborate in strategies to strengthen urban forests. An example could be to support Mexico, based on the lessons learned from the United States and Canada, to integrate a national policy on UPF with state/provincial and municipal governments, as well as promote multisectoral collaborations to protect and equitably expand urban and peri-urban forests.

© Photo courtesy of Phillip Rodbell, USDA Forest Service



Caption: New York City, New York – Planting the first tree of a million tree initiative.

New dialogues and networks

Over the past decade, there have been new dialogues emerging in urban and peri-urban forestry that advance ideas of social and ecological equity. One such dialogue is gender equity and women's leadership and the emergence of multiple networks, initiatives and research focusing on women in urban forestry. It is hoped that these dialogues result in greater coordination and more equitable actions and investments across sectors.



Examples include:

Policy and action planning: **Gender Equity in the Forest Sector**; Fem4Forests

Conferences/congresses: **Forests in Women's Hands**; **Women's Forest Congress**; and **Women in Natural Resource Sciences**

Events and activities: **Women in Arboriculture**; **Where Women Choose to Walk: Paths to Improving Cities and Nature** (international panel discussions); **Women Branching Out: A diversity of careers in arboriculture and urban forestry** (film)

Networks: **Beyond Trees Network: Women, Urban, Natural Resources**; **Women in Wood**

Industry training workshops (e.g. **Her City Toolbox** – United Nations)



Research includes:

Women in urban forestry and arboriculture: Experiences, barriers and strategies for leadership (Bardekjian *et al.*, 2019)

Healing experiences of middle-aged women through an urban forest therapy program (Lee *et al.*, 2019)

Arboriculture – a female perspective (Currell, 2016)

Addressing gender inequities in forest science and research (Macinnis-Ng and Zhao, 2022)

Conclusions

The journey to create more healthy, green communities in the North American region had humble beginnings. Through visionary and persistent leadership at universities and federal, state and local levels in government and non-profit organizations, and with private sector support, a vision for healthy urban forests and vibrant communities has taken hold and is thriving. New capacity and the next generation of leaders are developing rapidly at all scales, which promise to result in the protection and expansion of trees, forests and green spaces that are climate resilient and equitably distributed for the benefit of all residents.



References

Bagstad, K.J., Ingram, J.C., Shapiro, C.D., La Notte, A., Maes, J., Vallecillo, S., Casey, C.F. *et al.*, 2021. Lessons learned from development of natural capital accounts in the United States and European Union. *Ecosystem Services*, 52, p.101359. <https://www.sciencedirect.com/science/article/pii/S2212041621001170>

Bardekjian, A.C., Nesbitt, L., Konijnendijk, C.C. & Lötter, B.T. 2019. Women in urban forestry and arboriculture: Experiences, barriers and strategies for leadership. *Urban Forestry & Urban Greening*, 46: p.126442. <https://www.sciencedirect.com/science/article/abs/pii/S1618866719304297>

Carmichael, C.E. & McDonough, M.H. 2018. The trouble with trees? Social and political dynamics of street tree-planting efforts in Detroit, Michigan, USA. *Urban Forestry & Urban Greening*, 31: 221–229. <https://www.sciencedirect.com/science/article/abs/pii/S1618866717305071>

Currell, A. 2016. Arboriculture – a female perspective. *Arboricultural Journal*, 38(2): 83–95. <https://www.tandfonline.com/doi/abs/10.1080/03071375.2016.1163107>

Davis, K.T., Robles, M.D., Kemp, K.B., Higuera, P.E., Chapman, T., Metlen, K.L., Peeler, J.L., Rodman, K.C., Woolley, T., Addington, R.N. & Buma, B.J. 2023. Reduced fire severity offers near-term buffer to climate-driven declines in conifer resilience across the western United States. *Proceedings of the National Academy of Sciences*, 120(11): p.e2208120120. <https://www.pnas.org/doi/full/10.1073/pnas.2208120120>

Endreny, T., Sica, F. & Nowak, D. 2020. Tree cover is unevenly distributed across cities globally, with lowest levels near highway pollution sources. *Frontiers in Sustainable Cities*, 2: 00016. <https://www.frontiersin.org/articles/10.3389/frsc.2020.00016/full>

Fell, D.R. 2010. *Wood in the human environment: restorative properties of wood in the built indoor environment* (Doctoral dissertation, University of British Columbia). <https://open.library.ubc.ca/soa/cIRcle/collections/ubctheses/24/items/1.0071305>

Hargrave, J.R., Harper, R.W., Butler, B.J. & Mullins, J.T. 2022. Municipal Forest Program Management in the United States of America: A Systematic Review. *Forests*, 14(1): 35. <https://www.mdpi.com/1999-4907/14/1/35>

Hauer R.J. & Peterson W.D. 2016. *Municipal Tree Care and Management in the United States: A 2014 Urban & Community Forestry Census of Tree Activities*. Special Publication 16-1, College of Natural Resources, University of Wisconsin – Stevens Point. 71 pp. <https://www3.uwsp.edu/cnr/Documents/MTCUS%20-%20Forestry/Municipal%202014%20Final%20Report.pdf>

Johnson, M.L., Campbell, L.K. & Svendsen, E.S. 2020. Conceptualizing, analyzing, and supporting stewardship: examining the role of civil society in environmental governance. *Ecology and Society*, 25(4): 14. https://www.fs.usda.gov/nrs/pubs/jrnl/2020/nrs_2020_johnson-m_001.pdf

Kirkland, J., Jovan, S. & Derrien, M. 2023. *The more the mossier: Using community science to map air quality in environmental justice investigations*. Science Findings 255. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 pp. <https://www.fs.usda.gov/research/treesearch/65953>

Lee, H.J., Son, Y.H., Kim, S. & Lee, D.K. 2019. Healing experiences of middle-aged women through an urban forest therapy program. *Urban Forestry & Urban Greening*, 38: 383–391. <https://www.sciencedirect.com/science/article/abs/pii/S1618866718305594>

Locke, D.H., Hall, B., Grove, J.M., Pickett, S.T., Ogden, L.A., Aoki, C., Boone, C.G. & O’Neil-Dunne, J.P. 2021. Residential housing segregation and urban tree canopy in 37 US Cities. *npj Urban Sustainability*, 1(1): p.15. <https://www.nature.com/articles/s42949-021-00022-0#citeas>

Macinnis-Ng, C. & Zhao, X. 2022. Addressing gender inequities in forest science and research. *Forests*, 13(3): 400. <https://www.mdpi.com/1999-4907/13/3/400/htm>

McDonald, R., Kroeger, T., Boucher, T., Longzhu, W., Salem, R., Bassett, S., Edgecombe, M., Adams, J. & Garg, S. 2016. *Planting Healthy Air – A global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat*. The Nature Conservancy. USA. 128 pp. https://www.nature.org/content/dam/tnc/nature/en/documents/20160825_PHA_Report_Final.pdf

National Urban Forestry Conference. 1978. *Proceedings of the National Urban Forestry Conference, 13–16 November, Washington, DC*;

Nowak, D.J., Ellis, A. & Greenfield, E.J. 2022. The disparity in tree cover and ecosystem service values among redlining classes in the United States. *Landscape and Urban Planning*, 221: 104370. <https://www.sciencedirect.com/science/article/abs/pii/S0169204622000196?via%3Dihub>

Piana, M.R., Pregitzer, C.C. & Hallett, R.A. 2021. Advancing management of urban forested natural areas: toward an urban silviculture? *Frontiers in Ecology and the Environment*, 19(9): 526–535. https://www.fs.usda.gov/nrs/pubs/jrnl/2021/nrs_2021_piana_002.pdf

Roman, L.A., van Doorn, N.S., McPherson, E.G., Scharenbroch, B.C., Henning, J.G., Östberg, J.P.A., Mueller, L.S. et al., 2020. *Urban tree monitoring: A field guide*. Gen. Tech. Rep. NRS-194. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station. 48 pp. <https://doi.org/10.2737/NRS-GTR-194>.

USDA Forest Service. 2018. *Urban nature for human health and well-being: a research summary for communicating the health benefits of urban trees and green space*. FS-1096. Washington, DC. 24 pp. https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/urbannatureforhumanhealthandwellbeing_508_01_30_18.pdf

Yeager, R., Browning, M.H., Breyer, E., Ossola, A., Larson, L.R., Riggs, D.W., Rigolon, A., Chandler, C., Fleischer, D., Keith, R. & Walker, K. 2023. Greenness and equity: Complex connections between intra-neighborhood contexts and residential tree planting implementation. *Environment International*, 176: 107955. <https://www.sciencedirect.com/science/article/pii/S0160412023002283>

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