URBAN FORESTRY

CURRENT STATE – WITH FOCUS ON CANADA AND BC

CECIL KONIJNENDIJK, PROFESSOR OF URBAN FORESTRY

CECIL.KONIJNENDIJK@UBC.CA
@CECILUFORIA
THE FIGHT
FOR BEAUTY

OUR PATH TO A BETTER FUTURE
A REMARKABLE BOOK: PASSIONATE, PERSUASIVE AND BRAVE

FIONA REYNOLDS
“... Beauty is more than a service to us. It fulfils something in us that other things cannot, and it enriches our lives in all kinds of unexpected and vital ways.”
LEARNING OBJECTIVES

• Present the importance of trees and green spaces in urban areas
• Define the concept of urban forestry and understand its roots and characteristics
• Understand differences in how urban forestry has developed and been defined in different parts of the world
• Discuss the status and perspective of urban forestry in Canada and British Columbia
ABOUT CITIES AND GREEN SPACES
Characterising ‘good’ cities


• Cities: Places Sacred, Safe and Busy (and Ephemeral) – *Joel Kotkin* (2005)

• Biophilic cities – *Timothy Beatley* (2010)
• “Retrofitting our cities for happiness”
• Soft traffic, shared space
• Importance of biological complexity
Provide universal access to safe, inclusive and accessible, green and public spaces

In particular for women and children, older persons and people with disabilities
Source: Schama (1995)
Paulus Constantijn la Fargue 1729-1782
VERWALTUNG
Von Herren und Vorschriften
James Notman, Boston; engraving of image later published in *Century Magazine* (source) - The World's Work, 1903: http://archive.org/stream/worldswork06gard#page/3938/mode/2up
New York’s Central Park

Sources: www.greenswardparks.org; Wikimedia Commons
The City in the Forest

Photo: Jasper Schipperijn
• **Biotic and abiotic conditions**
  • Tree planning under difficult conditions
  • Harsh growing conditions – often man-caused

• **Anthropogenic pressures (‘direct’)**
  • Vandalism and mechanical damage
  • Overuse
  • Pollution
  • Infrastructure/urban development

• **Societal developments**
  • Changing politics, demands, economics
  • Conflicts, wars and crises
‘GREEN SPACE FAILURES’

• High pressures and hunger for urban land
• High maintenance costs vs. falling public budgets
• Ageing parks, vegetation
• Diseases (e.g., Dutch Elm Disease)
• Climate change
• Changes in society, e.g. ’democratisation’
• Political decisions, design, etc.
• Focus on establishment, not maintenance
• ...?
Provide universal access to safe, inclusive and accessible, green and public spaces

In particular for women and children, older persons and people with disabilities
INTRODUCING URBAN FORESTRY
How do you define ‘the urban forest’?
REPORT
OF THE
GENERAL SUPERINTENDENT OF PARKS.

CAMBRIDGE, December 1, 1884.

TO THE BOARD OF PARK COMMISSIONERS OF THE CITY OF CAMBRIDGE:

GENTLEMEN:—I have the honor to present my first annual report as General Superintendent of Parks, covering the period from the date of my appointment, March 1, 1884, to the present date.

SHADE TREES.

For many generations the shade trees upon the streets of Cambridge have been the pride of residence and the admiration of visitors. How much our city is indebted to its trees, not merely in the matter of adornment, but for utilitarian reasons as well, it would be difficult to state. Cambridge territory, in contrast with some of the neighboring cities and towns, has few natural opportunities for fine landscape effects; but in the extent and beauty of its foliage and in its magnificent specimens of native trees, our city, in the past, has offered an attraction to housebuilders which has been a small factor in the city's growth. While we would search in vain upon the assessment lists of public property for an inventory of the shade trees, it would not be a difficult task to show that, collectively, these trees are among the most valuable of the municipal property. Large as the amount has been which has recently appropriated for park development in Cambridge, this sum covers so short a period of representing the value of the city's foliage already established. A discussion at some length upon the present condition and needs of the public shade tree may not, therefore, be deemed out of place, especially when it is considered that no extended official report has ever before been presented upon this subject.

By the ordinance established March 15, 1884 (Sec. 11), it is ordained that "the Park Commissioners shall have the care of the trees in the public streets." Prior to this date, as far as the public records show, the same department has been the custodian of the public trees. Why this arrangement was made in the beginning, and why it was for so many years continued, is not apparent. But that the art of urban forestry—i.e., requiring special knowledge, cultivated taste, and a nature sympathy with plant life—should have been made an adjunct of the city's municipal government is a business of recent building, showing that the governing powers in the past have been largely indifferent in the matter of shade tree cultivation. Indeed the city corporation has done but little to foster our shade trees, and that little has been done without system. We must look to quite a different source to account for the care bestowed upon Cambridge trees in the past. Judgments of this may be seen in the literature of Lowell and Longfellow and others, and the service which those eminent Cambridge citizens have rendered in creating and maintaining a discriminating sentiment for tree culture in their historic city, is beyond calculation. As long as the Cambridge elm was reared, Cambridge trees would be favorably regarded. And to this high work must be added the valiant services rendered in the past by the numerous citizens who, although without the power to own, yet, by listening, have given individual effort to tend the trees along our public streets, and have never failed in voice or act, to come to the defense of our lofty inheritance whenever it was assailed by men of more heedless methods.

But however valuable individual effort has been in the past, it is evident that the time has come when the matter of tree culture upon our public streets and reservations must be made a municipal enterprise. The high conditions of our improved urban life are calling upon us. Gradually the surface of Cambridge is being accentuated with houses and blocks; the lawns which separated the buildings from the sidewalks are disappearing in the yawning cellars of modern structures; apartment houses rise above the tree tops; electric-light wires are strung and fill the foliage above, while escaping gases suffocate the roots beneath. In the earth, on the surface, and above, the situation of shade trees increases at an alarming rate, with the increase of city conditions. Thoughtful owners of horse abloom, who allow the apprentices of a fifty-dollar animal to destroy a thousand-dollar tree. The axe of
https://treecanada.ca/en/programs/urban-forests/history-urban-forestry-canada/
Urban forestry

The art, science, and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic, and aesthetic benefits trees provide society

(Helms 1998, based on Miller 1997)
KEY CHARACTERISTICS OF URBAN FORESTRY

- **Integrative:** all tree resources; urban and peri-urban; planning & management
- **Strategic:** long-term vision, multiple use
- **Inter-/multidisciplinary:** wide range of disciplines/fields
- **Participatory:** stakeholder involvement
- **Urban:** urban conditions; meeting urban demands
## “Playing Field” of Urban Forestry

<table>
<thead>
<tr>
<th>The Urban Forest</th>
<th>Individual trees</th>
<th>Tree groups and small woods (e.g. in parks)</th>
<th>Urban &amp; peri-urban woodlands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functions, policies, planning, and design</strong></td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>Technical activities, including selection and establishment</strong></td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
</tr>
</tbody>
</table>

WHAT URBAN FORESTS DO FOR US
URBAN FORESTRY INFOGRAPHIC

54% of the world's population lives in urban areas. It is expected to increase to 66 per cent by 2050.

TREE COVERAGE BY CITY

1997
2017

10% Increase in tree canopy was associated with 12% decrease in crime. The magnitude was 43% greater for public than for private lands.

5’ GREEN EXERCISE
Just 5 minutes of walking close to green spaces during lunchbrek is enough to improve worker's mental health and mood.

23% LESS SICK DAYS
Desk workers who can see nature from their desks during lunchbrek experience 23% less sick time off than those who can not see any nature.
Optimised urban tree benefits rotation length

This is a simplistic diagrammatic representation prepared for the Sheffield Trees Action Group seminar held on 21/01/17 showing one approach to estimating the optimum rotation length for urban trees based on the financial benefits they provide. It is a conceptualization based on estimated figures to demonstrate the principle, and the reality of individual circumstances may vary considerably from this simplistic view. For these reasons, it should be referenced with caution and applied intelligently, taking full account of the individual circumstances of each situation.

From conventional forest management theory for optimising timber volume production, the most efficient point to fell and replant is where the current annual increment and mean annual increment curves cross (both in grey). This is called the biological rotation and is at about 51 years in this example. Extrapolating this principle to urban trees, and considering the delivery of tree benefits rather than timber volume, the current annual tree benefits curve (green dots) crosses the mean annual tree benefits curve (red dashes) around 270 years of age (blue arrow). Felling at around 80 years of age delivers only 25% of the potential benefits (green shading) that leaving the trees to their full optimised benefits rotation could deliver. Put another way, up to 75% of the potential benefits those trees could deliver (red shading) are sacrificed through premature removal.

© Jeremy Barcell 2017
The Hidden Life of TREES
What They Feel, How They Communicate
Discoveries from a Secret World

http://blog.ted.com/forest-for-the-trees-suzanne-simard-at-tedsummit/
SURVIVOR TREE

WITNESS TO TRAGEDY, SYMBOL OF STRENGTH

It is more than 90 years old. An American Elm Tree in the heart of downtown Oklahoma City, it survived the bomb’s blast and witnessed one of the worst terrorist attacks on American soil. Today, we call it the Survivor Tree.

Before the bombing, the tree was important because it provided the only shade in the downtown parking lot. People would arrive early to work just to be able to park under the shade of the tree’s branches.

On April 19, 1995, the tree was almost chopped down to recover pieces of evidences that hung from its branches.
A food forest is an urban approach to food production that involves the creation of a perennial garden that mimics a woodland ecosystem. These communities of plants are intentionally placed together to optimize space, nutrient exchange, pollination, productivity, and biodiversity.

**Benefits:**
- Promotes community food production and security
- Creates habitat for wildlife and insects, including pollinators
- Increases public awareness about seasonal fruits, vegetables and nuts
- Provides an accessible space for foraging, gleaning and harvesting
- Supports biodiversity in an urban setting

**Ingredients:**
1. Canopy (large fruit trees)
2. Low Tree Layer (dwarf fruit trees)
3. Shrubs (currants & berries)
4. Herbaceous (herbs)
5. Rhizosphere (root vegetables)
6. Soil Surface (ground cover)
7. Vertical Layer (vines and climbers)
China is building a smog-eating 'forest city' filled with tree-covered skyscrapers

The smog levels in the southern Chinese city of Liuzhou are not yet dire, but if the city fails to deal with its pollution, it will only get worse over time.

Italian design firm Stefano Boeri Architetti believes that building a
London’s trees provide at least £133M of benefits every year in terms of air pollution removal, carbon sequestration and reducing the amount of water going into drains.

- 60% of London’s trees are in private ownership, but they remove 80% of nitrous oxide and 40% of the air pollution we breathe.
- 40% of London’s trees are in public ownership, and they remove 70% of carbon dioxide and 4% of NOx, emitted by road transport.

Trees prevent 10x the volume of water in the Serpentine from entering London’s drainage system. This helps reduce the risk of localized flooding.

2,367,000 tonnes of carbon is stored in London’s trees, worth £147M.
• Urban trees and other nature **reduce heat**
  - And this has been found to impact all-cause mortality, cardiovascular mortality, mental health, children’s birthweight

• Urban trees and other nature **enhance affect**\(^1\)
  - And this has been found to impact cardiovascular mortality, all-cause mortality, mental health and wellbeing

\(^1\) Affect is the experience of feeling or emotion
Better cognitive development among children who go to schools in green areas
Falling tree kills 13 on Portuguese island of Madeira

15 August 2017  Europe

The moment parts of a tree fell on a crowd was caught on camera during a Facebook live.

A falling tree has killed at least 13 people and injured 49 at a religious ceremony on the Portuguese island of Madeira.

A video shows the tree crashing down on a crowded square in a suburb of the main town, Funchal, spreading panic among people enjoying the festivities.

Two children are reported to have been killed, and some of the injured are said to be foreign nationals.

Reports suggest the tree which fell was an oak that was about 200 years old.
URBAN FORESTRY IN CANADA AND BRITISH COLUMBIA
5 themes:

• National urban forestry infrastructure
• Communications and public education
• Research
• Techniques and technologies for urban forest planning and management
• Professional development
The Social and Economic Values of Canada’s Urban Forests: A National Synthesis
April 16, 2015

SPECIAL REPORT
TD Economics
June 9, 2014

URBAN FORESTS: THE VALUE OF TREES IN THE CITY OF TORONTO

Highlights
• Urban forests are made up of the trees, shrubs and other flora and fauna that line the streets, parks and ravines of our cities.
• Urban forests do more than beautify the scenery. They represent an important investment in environmental condition, human health and the overall quality of life.
• The trees in the City of Toronto’s urban forest are worth an estimated $7 billion, or about $700 per tree.
• Toronto’s urban forest provides residents with over $80 million, or about $8 per tree, worth of environmental benefits and cost savings each year. For the average single family household, this works out to $125 of savings per annum.
• For every dollar spent on annual maintenance, Toronto’s urban forest returns anywhere from $1.35...
Living in a greener neighbourhood could lower risk of early death: study

Not just parks but also streetside trees and lawns could have health benefits, study suggests


A national study found that greener surroundings, like the Vancouver neighborhood pictured here, are linked to a lower risk of death among those living in Canada's 30 biggest cities. (Lyne Stafford/Reuters)

1219 shares

Trees stretching their canopies over city streets and grass tickling the sidewalk near your home are more than just pretty; they could actually be helping you live longer, a new study suggests.

Researchers at the University of New Brunswick used census and tax data to track 1.3 million non-immigrant Canadian adults living in the 30 largest urban centers. They compared death rates in neighborhoods with high tree density to those with low tree density.

The study, published in the journal Nature Geoscience, found that residents of neighborhoods with more trees had a lower risk of death from all causes and from cardiovascular disease compared to those living in areas with fewer trees.

The findings suggest that greener environments could improve public health and reduce healthcare costs. While more research is needed to determine the exact mechanisms by which trees provide health benefits, the study highlights the potential of urban green infrastructure as a public health intervention.
WHAT DO WE KNOW ABOUT OUR FORESTS?

Acadian Forest Region

The Acadian Forest Region covers the Maritimes of Canada and parts of New England in the United States. It is a transitional forest, composed of a distinctive and diverse mix of trees, with a combination of northerly boreal species, such as black spruce, white spruce, and southerly temperate species, such as sugar maple. Dominant conifers include red spruce, eastern hemlock, balsam fir, and white pine, with scattered stands of black spruce and tamarack in poorly drained lowlands. Dominant broadleaved species include sugar maple, yellow birch, American beech, and red oak.

The Acadian Forest Region, and especially Nova Scotia, has one of the longest histories of forest exploitation in North America. Because of forest conversion to agriculture, urban development, and unsustainable historical forest practices, the forests around Halifax are unnaturally young and dominated by early-successional species such as red maple, white and gray birch, poplars, pin cherry, and serviceberry. While many of HRM's forest ecosystems are degraded, the Acadian Forest Region has a moist climate with ample precipitation that provides great conditions for restoration through natural regeneration.

Figure 2.1 Forested region, Lake Bemook

HRM Urban Forest Facts

- HRM has an impressive overall urban canopy cover of 43%.
- There are 709,000 publicly-owned trees lining the urban streets of our city:
  - 157,000 directly planted & managed
  - 552,000 naturally regenerated along HRM roadways
- Despite this abundance, there are 94,000 vacant & plantable spots for trees on HRM-controlled rights of way.
- About 1,478 metric tons (Mt) of pollutants are removed annually by urban trees and shrubs in the serviced area of HRM.
- This equates to $9.6 million each year in air pollution mitigation benefits.
- Street trees save $12.4 million in energy costs each year. The shade provided by urban trees can reduce the total energy required to cool a building. This cooling effect not only reduces energy costs, it also translates into reduced air emissions associated with air conditioning.
- Street trees also play an essential role in mitigating stormwater and flood damage, water quality, erosion, and stormwater treatment costs.
- Our street trees provide about $2.1 million in stormwater reduction services annually.
Guiding principles:

1. Adaptive management
2. Precaution
3. Public participation
4. Sustainable development
What are Operational Principles?

The preceding guiding principles directed the overall approach to plan development and aligned the UFMP with HRM’s Regional Municipal Planning Strategy. The following operational principles are more specific, and provide an operating framework for the UFMP.

Operational Principle 1 – Climate Change
Accepting that the climate of HRM will change considerably during the twenty-first century, and in concert with the long-term view of urban-forest development, building resilience to climate change into the future urban forest is vital to its sustainability.

Operational Principle 2 – Comprehensive Approach
Success in sustaining a healthy urban forest depends on implementing a comprehensive and coordinated suite of actions related to tree and forest protection, maintenance, and enhancement.

Operational Principle 3 – Cooperation and Partnerships
HRM needs the active participation of citizens, businesses, other levels of government, and non-governmental organizations in advancing the sustainability of the urban forest.

Figure 4.4 Planting new trees

Figure 4.5 Volunteers measuring and categorizing trees

Operational principles:

1. Climate change
2. Comprehensive approach
3. Cooperation and partnerships
4. Equity
5. Green infrastructure
6. Integrated planning
7. Invasive species
8. Naturalness
9. Priority-setting
10. Public identity
11. Sense of identity
12. Space and location
13. Stewardship
14. Time and timing
15. Urban forest values
City of Surrey Tree Protection Bylaw, 2008 No. 20089
This bulletin is only a summary of the Tree Protection Bylaw. The bylaw is available in its entirety at the City of Surrey website at www.surrey.ca/treeprotection.

Purpose of the Bylaw:
- The Tree Bylaw reduces the number of trees removed, killed, cut or damaged, by improved protection and replanting requirements. With these requirements, the City’s goal is to provide a balance of saving the right tree in the right place while removing trees and replanting trees. This will ensure a sustainable healthy, viable urban forest for the City of Surrey and its residents.

Tree Permits:
A tree removal permit is required:
- to cut or remove any protected tree on private land or ESA.
- to prune any significant tree.

DBH (diameter at breast height): the diameter of a tree measured 1.4m (4 ft) above the natural ground. Each stem of a multi-stemmed tree is measured in the same fashion and the diameters of the 3 largest stems added together to calculate DBH.
Urban Forest Management Strategy
The City in the Forest
Seaside Greenway Completion and York Bikeway
Phase 1 of Point Grey-Cornwall Active Transportation Corridor
HELP ME!

Save me from Gregor's axe
He is cutting me down
Join the Rally June 26th 11am Kits Beach
@ foot of Yew & Cornwall
kitsresidents.com
The City of Vancouver's organizational structure supports the community. Click or tap a shape in the chart to view links to more departments, services, and groups in the City.
We now know canopy cover by neighbourhood.

However, our canopy cover has been declining over the past two decades. Why is this of concern?

Over the last two decades 23,490 healthy, mature trees were removed on private property (including residential, institutional, commercial and industrial land).
Exploring the Green Canopy in cities around the world
Protesters resist Johnston Road tree-cutting

Last-ditch effort seeks to halt removal of mature liquidambars by White Rock

ALEX BROWNE / Thu Sep 7th, 2017 4:10pm / LOCAL NEWS NEWS
MASTER of URBAN FORESTRY LEADERSHIP
LEARNING OBJECTIVES

• Present the importance of trees and green spaces in urban areas
• Define the concept of urban forestry and understand its roots and characteristics
• Understand differences in how urban forestry has developed and been defined in different parts of the world
• Discuss the status and perspective of urban forestry in Canada and British Columbia