

SPECIAL REPORT

TD Economics



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THE VALUE OF URBAN FORESTS IN CITIES ACROSS CANADA

Highlights

- Urban forests are the trees and other plants found on the streets, in our yards, in parks, and surrounding our major cities.
- These forests provide a multitude of benefits, enhancing the landscape, reducing pollution, and helping control heating/cooling costs.
- The greater Halifax, Montreal, and Vancouver areas together contain more than 100 million trees, worth an estimated \$51 billion (Halifax: \$11.5b; Montreal: \$4.5b; Vancouver: \$35b).
- The return on trees is significant: for each dollar spent on maintenance, between \$1.88 and \$12.70 in benefits are realized each year, depending on the city.

In June of this year, TD Economics released the report “Urban Forests: The Value of Trees in the City of Toronto”, available [here](#). It demonstrated the various benefits of trees from a range of dimensions that are often underappreciated. The report found that the urban forest was worth \$7 billion and residents receive from \$1.35 to \$3.20 in benefits for each dollar spent on forest maintenance (Table 1).

The report received strong interest from across the country, which naturally led to requests for similar estimates for other Canadian urban centres.

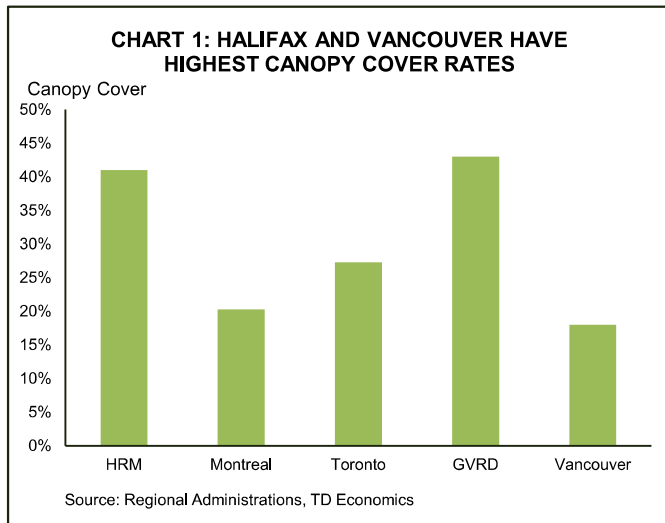
This report examines the economic and environmental benefits of the forests in and around three major Canadian cities: Halifax, Montreal, and Vancouver. We describe the environmental benefits provided by these forests, and then examine the unique characteristics of each city’s urban forest. In contrast to the Toronto report, this report looks at the forests within the greater area surrounding each city. Our analysis thus includes the Halifax Regional Municipality (HRM), Greater Montreal, and the Greater Vancouver Regional District (GVRD).

A high level of variation exists across cities: for instance, as Chart 1 shows, canopy cover (the share of a city area shaded by trees) varies widely. Even within an area, variation can be observed, as the canopy within the City of Vancouver is much lower than for the Greater Vancouver area overall/ in general.¹

Table 1 - Annual benefits provided by Toronto's urban forests

Benefit	\$ value (millions)	\$/tree
Wet-weather flow	\$53.95	\$5.28
Air quality	\$19.09	\$1.87
Energy savings	\$6.42	\$0.63
Carbon sequestration	\$1.24	\$0.12
Energy emission abatement	\$0.58	\$0.06
Total benefit	\$81.29	\$7.95
Cost benefit ratio	-	\$1.35 - \$3.20

* Carbon avoided and sequestered is net of the emissions from the decomposition and maintenance of trees.
Source: Toronto Parks, Forestry & Recreation, TD Economics.



Benefits of Urban Forests

Investing in the development and maintenance of urban forests is in many ways an investment in the health and well-being of the city and its residents. While people may enjoy having trees around for personal reasons, such as the calm of sitting in a park or walking the dog, the benefits of urban forests extend well beyond enjoyment and include numerous economic, environmental and social benefits.

Economic and social benefits that accrue from urban forests include, for example, recreation or tourism, and the associated spending. These may be sizeable, particularly for Montreal (Botanical Gardens), and Vancouver (Stanley Park, Grouse Mountain, others). Trees can also help reduce the frequency of road repairs, and have been shown to improve property values for both residential and commercial buildings.

Key benefits provided by urban forests include:

- **Wet weather control:** The canopy and root systems of urban trees help to reduce strain on city infrastructure by absorbing precipitation, reducing the pollutants entering city water systems, and reducing erosion.
- **Air quality:** By their very nature, urban trees improve the atmosphere around them by removing carbon, ozone, sulphur dioxide and other pollutants from the air, while producing oxygen. They also reduce small particulate matter (PM10 and PM2.5) that can affect human respiratory systems.
- **Energy savings:** Trees that are located near homes and other structures help to reduce energy bills. Tree canopies provide shade to buildings in the summer,

reducing cooling costs; while in the winter, their structures reduce the cooling effect of winds, helping to lower heating bills. In addition to the direct cost savings, depending on the energy source mix in a given city, emissions of pollutants are also reduced as demands on power plants fall.

- **Carbon sequestration:** In addition to removing air pollution, trees also capture and store carbon as they grow, keeping it out of the atmosphere; helping to mitigate potential climate effects.

The value of these benefits is the focus of our analysis. By examining the annual costs of water purification, or energy costs, we can calculate the money saved by the presence of trees. Similarly, the costs associated with air pollution provide a value for the pollutants that trees remove. The money that is saved by the presence of trees is the economic benefit of these trees. Because we focus only on these benefits of urban forests, the dollar value we calculate will under-estimate the complete annual benefits of urban forests, which would include tourism, recreation and other social benefits that one cannot put a dollar value on.

Urban Forests in Halifax

Halifax, the most populous city in Eastern Canada with a metro area population of around 415 thousand, is surrounded by forest in nearly all directions. As a result, canopy coverage across the Halifax Regional Municipality (HRM) is fairly high, at 41 per cent. In addition to the trees surrounding the city, Halifax also features a number of large urban parks, including Point Pleasant Park, Sir Sandford Fleming Park, and Shubie Park. Halifax has had a long history of forestry, both in support of shipbuilding and for export. Consequently, the forests around Halifax are relatively young, with lower

Benefit	\$ value (millions)	\$/tree
Wet-weather flow	\$2.10	\$0.04
Air quality	\$12.59	\$0.22
Energy savings	\$12.40	\$0.21
Carbon sequestration	\$4.28	\$0.07
Total benefits	\$31.37	\$0.54
Cost benefit ratio	-	\$12.70

Source: Halifax Regional Municipality, TD Economics.

value fast-growing species such as red maple, white and gray birch, poplars, and serviceberry dominant. Younger trees provide less environmental benefits, resulting in lower per-tree benefit values.

Data from the HRM’s Urban Forestry Management Plan show that nearly 58 million trees grow in Halifax. That is over 130 trees per resident, by far the highest tree-to-population ratio of the cities in our sample. The replacement value of these trees is approximately \$11.5bn, or about \$200 per tree, reflecting the young age of the trees.

Beyond the replacement value of Halifax’s urban forests, they also provide benefits of more than \$30 million per year, as shown in Table 2. The greatest benefits result from improvements in air quality, and the energy savings associated with having trees near homes and other buildings.

Trees in Halifax remove nearly 120 thousand tonnes of carbon from the atmosphere each year – equivalent to the annual emissions of 80 thousand motor vehicles.

There are costs associated with maintaining urban forests, as trees must be planted each year, dead and dying trees removed, trees pruned around power lines, and root damage to sidewalks repaired. Many of the trees are in wild and semi-wild areas, and so require relatively little maintenance – this allows Halifax to maintain a relatively modest forestry budget – as a result, it has the largest cost-benefit ratio of the cities in our sample, with almost \$13 in annual benefits received for each dollar spent on forestry.

Urban Forests in Montreal

The financial capital of Quebec, and with over 3 million residents, Montreal is the second most populous Canadian city. Montreal has significantly less urban forest than the other cities examined in this report, with an estimated urban forest of about six million trees and a canopy cover of 20 per cent, based on a city tree policy report. This represents a ratio of just 2 trees per resident within the Montreal area. Nonetheless, Montreal has a number of sizeable urban parks, including Parc du Mont-Royal, Parc Nature Bois-de-Liesse, and Parc Maisonneuve, which includes the Montreal Botanical Gardens. A wide variety of trees grow in and around Montreal. The most common species are maples (Norwegian and Silver), honey locust, ash, and elm trees.

Although Montreal has a relatively small urban forest, it is of high quality, with many mature trees. Consequently, individual trees are, on average, quite valuable, with an estimated replacement value of about \$750/tree for an overall

Benefit	\$ value (millions)	\$/tree
Wet-weather flow	\$15.95	\$2.66
Air quality	\$6.19	\$1.03
Energy savings	\$1.72	\$0.29
Carbon sequestration	\$0.58	\$0.10
Total benefit	\$24.44	\$4.07
Cost benefit ratio	-	\$1.88

Source: City of Montreal, TD Economics.

replacement value of approximately \$4.5 billion.

Due to its high population density and fairly even distribution of trees, the largest benefit provided by the Montreal forest is via the reduction in wet-weather flow and its associated strain on infrastructure. At \$16 million per year, trees help to reduce the city’s water treatment bill by over four per cent per year. The energy savings provided by Montreal’s urban forest is enough to pay for more than 1000 households’ annual energy bills. Overall, Montreal’s urban forests provide nearly \$25 million in annual benefits, or more than \$4 per tree.

Per dollar spent, Montreal receives among the lowest benefits of the cities in our study. That said, nearly \$2 in benefits are received for each dollar spent on urban forestry, which is still an excellent return on investment. Additionally, plans have been announced to further increase the urban forest, with the goal of increasing the urban canopy cover to 25 per cent by 2025, in part by planting 300 thousand trees.

Urban Forests in Greater Vancouver

Nearly 2.5 million people call Greater Vancouver home. Stretching from the British Columbia/Washington State border in the south, across to Langley in the east, into Cypress provincial park in the north, and Bowen island in the west (see map), Greater Vancouver includes more than 10 cities within its boundaries.

Because it covers such a large and diverse area, Vancouver contains a wide variety of landscapes, from the dense vertical development of central Vancouver, to the verdant forests of the university endowment lands and the multiple provincial parks contained within its boundaries. For this reason, Vancouver presents a set of unique challenges related to its urban forest. For instance, while the overall canopy cover is estimated at 43%, there is large variation across



the region: in the city of Vancouver canopy cover is only 18% - the lowest of the major cities we have examined. In contrast, Surrey, a suburb, has canopy cover of 32%.

Vancouver’s urban forests vary quite substantially. Famous for its cherry blossoms, cherry and plum trees make up the majority of Vancouver’s street trees, followed closely by maple. When we consider the greater Vancouver area, including the provincial parks within its boundary, evergreen trees become the dominant species, due to their dense cover in less developed areas.

The unique characteristics of the Greater Vancouver region result in extremely high annual benefits related to air quality and wet-weather flow reduction. Trees remove more than 10 per cent of the carbon monoxide released each year by major industries in the region, and close to 90 per cent of nitrogen dioxide emissions. Together with wet-weather water flow benefits, the urban forest provides over \$210 million in benefits annually. In contrast, due to

the relatively low canopy cover in urban areas, and local weather patterns, the annual energy savings are relatively low – on a per-tree basis, Greater Vancouver sees the lowest benefit of the cities under consideration.

Overall, Greater Vancouver receives the largest annual benefit from its urban forests, of nearly \$225 million per year. Although the urban forestry budget (including all cities/municipalities in the region) is relatively high, a significant payoff to this budget is seen. For each dollar spent on forestry, residents receive at least \$4.59 in benefits each year. Several cities within the area, including Vancouver, have committed to growing their canopy cover, which will further increase the value of the urban forest.

Bottom Line

Urban forests - the trees that line our streets, and grow in our yards and parks - do much more than beautify our surroundings. As this report has shown, they are valuable environmental resources. Urban forests within Halifax, Montreal and Vancouver have a combined replacement value of \$51 billion. In addition they provide environmental benefits of over \$250 million per year, or more than \$330 million per year when Toronto is included. It also bears repeating that these are lower bound estimates which don’t include the value of tourism, recreation, or increased property values. What this means is that urban forests don’t just green our neighborhoods, they also help keep the green in our pocketbooks.

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Benefit	\$ value (millions)	\$/tree
Wet-weather flow	\$96.43	\$1.34
Air quality	\$115.86	\$1.61
Energy savings	\$4.64	\$0.16
Carbon sequestration	\$7.21	\$0.10
Total benefit	\$224.15	\$3.21
Cost benefit ratio	-	\$4.59

Source: i-Tree Canopy, City of Vancouver, City of North Vancouver, City of Surrey, Metro Vancouver, Manitoba Hydro, TD Economics.

ENDNOTES

- 1 It should be noted that the city of Vancouver excludes the University Endowment Lands (and thus Pacific Spirit park), while this area is included in the Greater Vancouver area.

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