Urban Forest Management Plan
AUGUST 2024 DRAFT v3.2

Note: Once the plan is finalized, Mi'kmaq People will be involved to give the plan an Mi'kmawi'simk name that is relational, land-based, and connects people with the land.

HALIFAX

Acknowledgements

DIAMOND HEAD

pipikwan pêhtâkwan

PLAN AT A GLANCE

The Halifax Regional Municipality's Urban Forest Management Plan is a strategy for managing the region's trees and forests to 2050. HRM has an estimated 80 thousand street trees in the urban core, which greatly enhance our urban environment. Several modern challenges threaten the region's forests, including urban development, climate change and extreme events such as the 2022 Hurricane Fiona and the 2023 Tantallon wildfire. This plan provides guidance for how the Municipality can protect and enhance the urban forest to increase both forest and community resilience.

TARGETED ENGAGEMENT

Community engagement was a key in developing the Urban Forest Management Plan. During the project engagement process, HRM sought input from the public, engaged organizations, and five typically under-represented communities: Indigenous People, African Nova Scotians/Canadians, francophones and Acadians, people with disabilities, and newcomers. To ensure diverse voices were heard, a variety of engagement approaches were adopted, including online surveys, public open houses, workshops, and interviews.

As part of developing this Plan, HRM referred to the etuaptmumk (two-eyed seeing), an integrative method coined by Elder Albert Marshall of Eskasoni in Unama'ki, Nova Scotia which emphasizes the coexistence and synergy of Indigenous and Western perspectives. This plan seeks to integrate Indigenous ways of knowing as well as those of other communities engaged through the development of this Plan to create a more inclusive plan and vision.

VISION

HRM's urban forest is a vital part of the municipality's urban fabric, maintained through sustainable management and thoughtful balancing of community priorities. Our green network, featuring large, mature trees and diverse native ecosystems, enhances climate resilience and quality of life for all residents. The community's care ensures the urban forest remains a cornerstone of HRM's environmental and cultural landscape.

3 BIG IDEAS

EQUITY

HRM's urban forest management program is both sustainable and equity-centered in its service delivery.

BALANCE

Balance between forest and biodiversity conservation and the continued growth of HRM.

COMMUNITY

Community values, education and stewardship capacities are prioritized- its people are HRM's most influential urban forest management resource.

FRAMEWORK

VISION

3 BIG IDEAS

Monitoring Tools   Core Values

OBJECTIVES
▼
STRATEGIES
▼
ACTIONS

18 Priority actions

5 Quick start actions

5 OBJECTIVES

1. PLANNING + PROTECTION

2. PLANTING

3. MAINTENANCE

4. STEWARDSHIP

5. MANAGEMENT + MONITORING

QUICK START ACTIONS

- City to plant 1,000 new trees per year
- Achieve a seven-year grid pruning cycle
- Establish an inter-departmental working group
- Define levels of service for ornamental trees and forested areas
- Establish community outreach and engagement capacity within Parks Team and Urban Forestry Department

FACTS ABOUT HRM'S TREES IN 2024

- The urban core lost **~11.0%** canopy cover between 2000 and 2022
- **70%** of canopy cover is on private property. In the urban core, **74%** is on private property
- **78%** of Halifax is forested land
- Estimated **80,000** street trees
- One in three street trees inventoried is a **maple**
- **150** street tree species and **85** genera
- **~1,000** street trees planted per year
- HRM's program funding **~$10 per resident**

Contents

Plan Introduction and Overview
Introduction et aperçu du Plan

WHAT WE HEARD

Language is important! Mi'kmaq translations throughout this document honor the language and culture of the original inhabitants of HRM, while French translations reflect HRM's commitment to the ongoing preservation and support of the Municipality's Acadian and Francophone residents.

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1.1. INTRODUCTION TO THE PLAN

HRM residents love their trees. From red spruce, to white ash, basswood, American elm, and both Norway and red maple, HRM is through and through a community of trees. Trees have been woven into the very fabric of our community, character elements of our urban streetscapes and inseparable from native Wabanaki-Acadian ecosystems.

This Plan replaces HRM's 2013 Urban Forest Master Plan as the guiding document to inform the management of trees in HRM. The preceding plan was drafted to inform the management of the urban forest for the period between 2013 and 2023. That period has now passed, and there is now need for an updated plan.

Current Challenges

Much has also changed in HRM over the past decade. Our community has welcomed close to 80,000 new residents- well over ten percent growth in a period of just ten years. This growth has increased demand for housing and infrastructure. Parks and wilderness areas have also seen corresponding growth in use, particularly following the COVID-19 pandemic. This growth is anticipated to continue in the years to come. Our planning approaches need to be revisited now to ensure this surge in development balances the need for housing

availability and preservation of the urban forest and green space.

In some of HRM's older neighbourhoods ornamental trees are ageing along a similar timeline. A coordinated approach to managing the process of replacement is needed in order to ensure periods of significant canopy loss are not experienced as these large older trees are replaced with younger, smaller individuals.

Climate change and extreme weather have also continued to evolve as a central management challenge. Hurricane Fiona had severe impacts on trees across the community. The Upper Tantallon wildfire in 2023 resulted in the temporary displacement of more than 16,000 residents, and destruction of 200 buildings including 150 homes. Both hemlock woolly adelgid and emerald ash borer have also been confirmed in Nova Scotia for the first time over the past decade- both pose a real threat to trees and forests in HRM.

This Plan

This Plan maps a coordinated path forward for the sustainable management of HRM's urban forest over the upcoming decades. A 25-year horizon enables long-term forest planning while a regular 10 year review period supports adaptive management.

Planning for sustainable urban forest management enables cities to:

- Identify and prioritize issues for urban forest management in consultation with the community.
- Enhance equity in access to ecosystem services provided by urban forests and improve public health and well-being by targeting interventions that reduce heat vulnerability and increase access to nature for under-served populations.
- Expand and connect tree canopy and green spaces to provide critical habitat for wildlife, support urban biodiversity and provide opportunities for residents to connect with nature.
- Allocate resources more effectively, ensuring that tree planting and maintenance efforts are directed towards areas with the greatest need and potential impact.
- Guide strategic planning and policy development in urban forestry to create more resilient, biodiverse and inclusive urban environments.

PLAN SCOPE

HRM's 2013 Urban Forest Master Plan used the urban forest definition put forward by the Canadian Urban Forest Strategy.[1] This Plan continues to use that definition:

Trees, forests, green space and related abiotic, biotic and cultural components in and around cities and communities. It includes trees, forest cover and related components in the [HRM's] *rural areas.*

Many classes of tree can therefore be found in the urban forest. This includes publicly owned street and park (i.e., urban) trees, privately owned trees, and trees in forested landscapes under a broad range of ownership structures (**Figure 1-1**).

More than 71 percent of land in HRM is under private ownership. This amount of private ownership makes urban forest management fundamentally a shared responsibility. The Municipality manages trees on Municipal land, such as those growing in parks, forested areas and along Municipal roads. On private land, trees are managed by the relevant property owner or land manager.

WHY THE PLAN WAS UPDATED

The Urban Forest Management Plan update was initiated to:

1. Update the 2013 plan, which called for a ten-year review,
2. Respond to the evolving challenges and pressures facing HRM's urban forest management program,
3. Continue to advance implementation of the 2013 plan, and update the resources needed to meet increasing demand for urban forest services and changing urban forest management context, and
4. Increase diverse perspectives from community members such as Indigenous people, African Nova Scotians/Canadians, francophones and Acadians, people with disabilities, and newcomers.

ETUAPTMUMK

Etuaptmumk, which translates as two-eyed seeing, describes an integrative perspective coined by Elder Albert Marshall of Eskasoni in Unama'ki, Nova Scotia that emphasizes the coexistence and synergy of Indigenous and Western perspectives. Albert Marshall describes etuaptmumk as "learning to see from one eye with the strengths of Indigenous ways of knowing and from the other eye with the strengths of Western ways of knowing and to using both of these eyes together".[2] To practice etuaptmumk, this plan has integrated Indigenous knowledge and values gathered through the engagement undertaken as part of the development of this Plan.

In addition to integrating Indigenous ways of knowing, the Plan also seeks to integrate diverse ways of knowing from other HRM communities such as African Nova Scotians/Canadians, francophones and Acadians, newcomers, and people with disabilities.

wilderness

street trees

forested park

landscape ornamentals

private trees

trees in rural areas

park trees

trees in industrial and commercial areas

Figure 1-1. HRM transect and urban forest typologies.
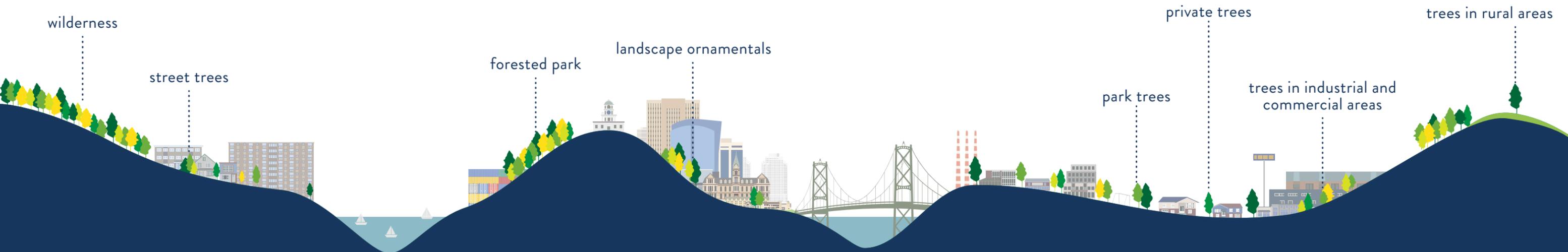
WHAT WE HEARD

Callouts like this one will be used throughout the Plan to highlight ways of knowing and perspectives from Indigenous participants, African Nova Scotians/Canadians, francophones and Acadians, people with disabilities, newcomers, and engaged organizations.

THE BENEFITS OF THE URBAN FOREST

Urban forests are essential for creating healthy and livable urban environments. Trees provide many benefits, often called 'ecosystem services' Research has illuminated many connections about the benefits trees provide in urban areas, including:

Climate resilience

HRM's urban forest helps protect the municipality from climate change impacts. Trees regulate temperatures through shade and evapotranspiration, cool the environment[3], and reduce storm and flood impacts. They are also important carbon sinks, sequestering atmospheric carbon.[4,5]

Clean air and water

Trees purify the air by absorbing pollutants like carbon monoxide, nitrogen dioxide, and particulates[6]. They also filter rainwater and stormwater runoff, improving water quality before it enters lakes and rivers.[7,8]

Habitat and biodiversity

Urban forests support a wide range of plant, animal, fungal, and microbial life.[9] Intact forests with diverse habitats sustain greater biodiversity, benefiting both human and animal residents.[10]

Improving human health

Trees contribute to physical and mental health by providing spaces for exercise and relaxation. Exposure to greenery reduces stress, improves work performance, boosts creativity, and aids recovery in hospitals. [11,12,13] Schools with more trees and shrubs visible from classroom windows have been found to achieve higher test scores and graduation rates.[14] Access to parks or natural areas increases physical activity levels.[15] Canadian doctors increasingly prescribe time outdoors for its health benefits.

WHAT WE HEARD

"When you think about the significance of the tree, it's very powerful. It's very symbolic. Trees connect us. Many cultures believe trees have spirits."

Economic value

Trees stimulate the local economy by attracting people to commercial districts, resulting in increased spending and longer stays.[16] Areas with abundant tree cover tend to have higher property values.[17,18]

Connecting with land and culture

Many Indigenous engagement participants highlighted the importance of connecting with the land and forest to make them feel that they belong. Many newcomers highlighted how they may first connect with the community through connecting with the land, particularly where language might be a barrier to connecting with people. Research also shows that forests and trees enrich communities by providing cultural benefits and a sense of identity and pride.[19] Spending time in local green spaces fosters community connection and strengthens social bonds.[20]

Resources

Trees provide tangible resources for cultural, social, and economic uses. Ornamental trees are often chipped for landscaping, and fruit trees in community gardens or orchards provide locally grown food. Some trees offer medicinal resources and have been used in cultural products for thousands of years (e.g., wisqoq or 'black ash' and Mi'kmaq handwoven baskets).

Assigning a financial value to the urban forest's benefits helps highlight some of these values. A 2017 report from Dalhousie's School for Resource and Environmental Studies[21] estimated the structural replacement value — the theoretical cost to fully replace all trees and forest as they exist now — of trees located in the *2013 plan study area* to be over $1.6 billion. That same study estimated a carbon storage value of more than $68.9 million in today's (2024) dollars, and annual sequestration value exceeding $3.7 million using the social cost of carbon developed by the US Environmental Protection Agency. Trees in the study area also attenuated stormwater runoff valued at over $2 million annually.

With trees, bigger *is* often better

Generally, larger, more mature trees yield more community benefits than smaller. For example larger trees providing more shade, cool larger areas, filtering more pollutants from air and water, or offering enhanced habitat value.

WHAT WE HEARD

Trees are one of our oldest relatives. We learn wisdom from the large canopy trees that have been here for a long time. They provide us with many teachings that Mi'kmaq People still use today.

Evapo-transpiration

Rainfall interception

Wildlife habitat

Beautification + sense of pride

$240,000/yr Pollutants removed

$1.8M/yr Energy savings

$3.7M/yr Carbon sequestration

$1.6 Billion Structural value

Health + healing

Food production

Shade

Concentration + learning

Connection to nature

Social strengthening + recreation

Healthy soil

Improved infiltration

$68.9M Carbon storage

Nutrient cycling

$2M/yr Avoided runoff

Land Surface Temperature

Legend

☐ Urban Core

Land Surface Temperature

41°C

16°C
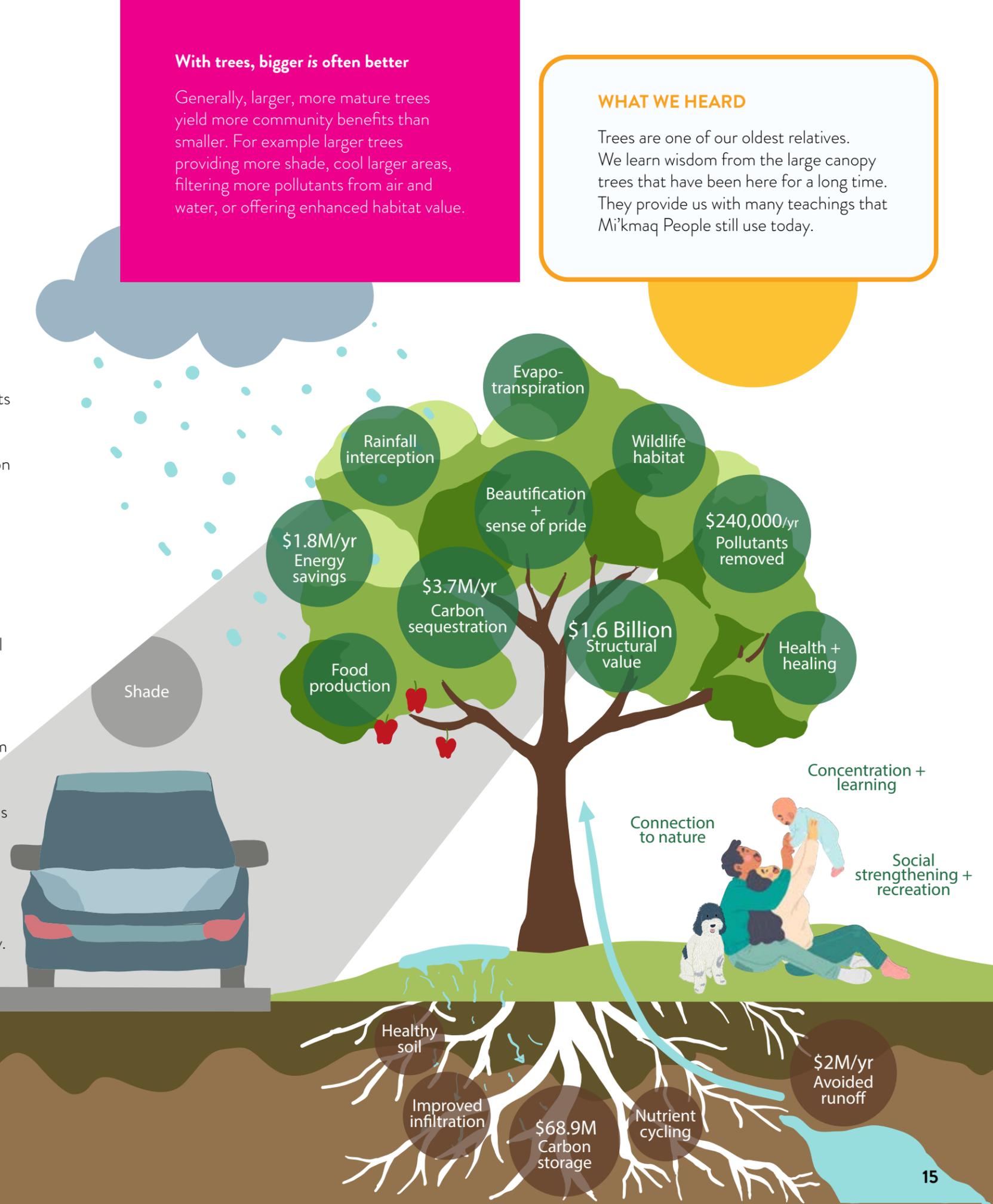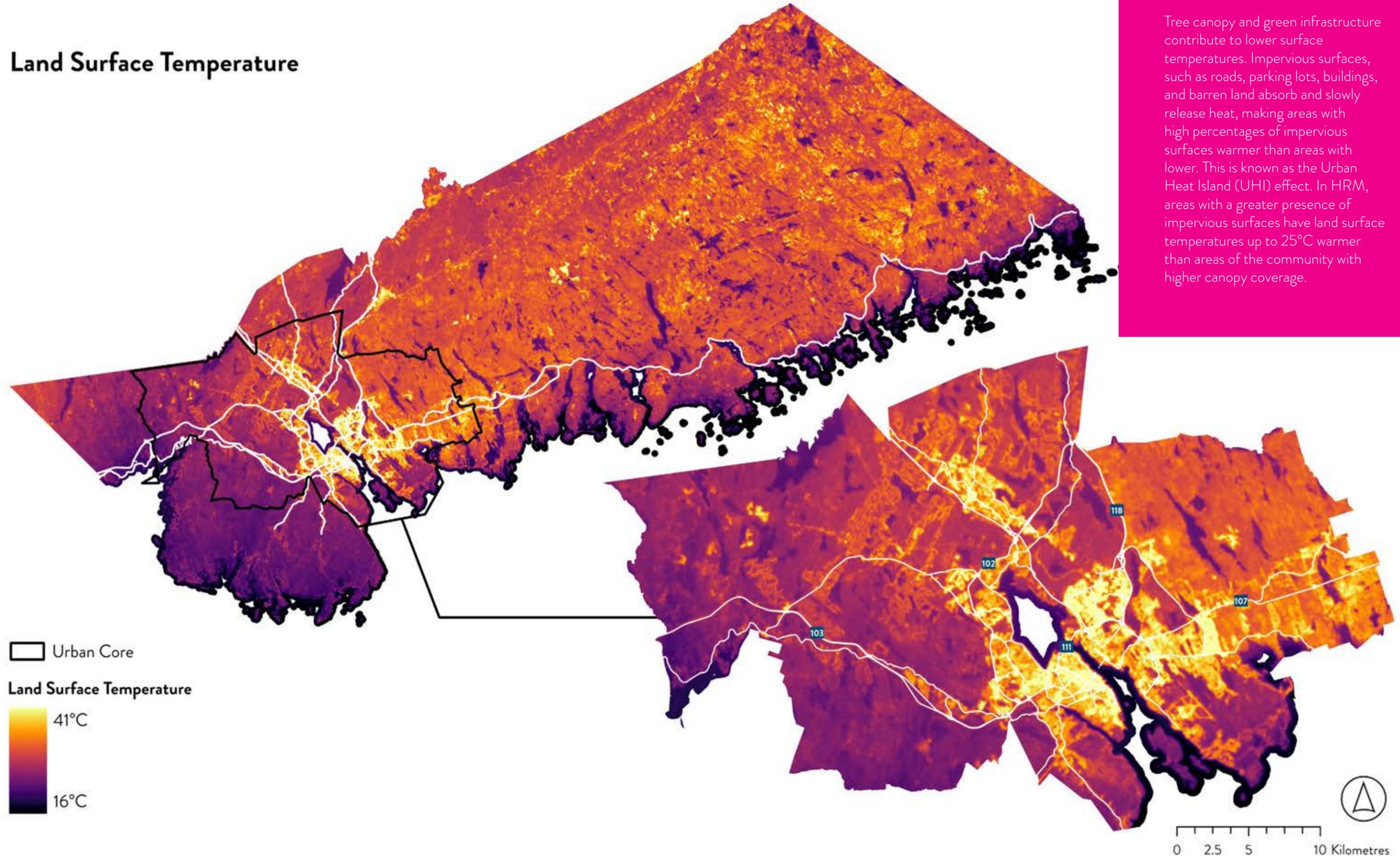
HRM's Urban Heat Island

Tree canopy and green infrastructure contribute to lower surface temperatures. Impervious surfaces, such as roads, parking lots, buildings, and barren land absorb and slowly release heat, making areas with high percentages of impervious surfaces warmer than areas with lower. This is known as the Urban Heat Island (UHI) effect. In HRM, areas with a greater presence of impervious surfaces have land surface temperatures up to 25°C warmer than areas of the community with higher canopy coverage.

0   2.5   5   10 Kilometres

HRM's Forest
La forêt de la municipalité

2 ta'pu

settlement have permanently changed the landscape. Forest management practices, such as clear-cutting and high-grading, have contributed to the rise of balsam fir as a significant species. The Wabanaki-Acadian Forest is likely younger today than it ever has been. Before the arrival of Europeans, old growth was thought to cover as much as 50% of the land.[25] Today some estimates put that number as low as one percent.[26] The forest has also become more fragmented over time, broken up by roads, infrastructure, and urban communities.

In the last century forest stressors have continued to intensify. Humans have disconnected from the natural world, introducing new, alien pests including beech bark disease, emerald ash borer, hemlock woolly adelgid, and Dutch elm disease. Some of these threats have already taken their toll on both native and introduced tree species, others pose a current and significant threat. Climate change also poses an unprecedented challenge, with trees, people and property increasingly at risk from events such as severe weather and wildfire.

2.1. THE WABANAKI-ACADIAN FOREST

A BRIEF HISTORY

HRM is located within the Wabanaki-Acadian Forest, a transitional landscape between the Northern Hardwood Forests of New England, the Boreal Forest of Quebec and the Newfoundland/Labrador. This transitional position results in a mix of coniferous and broadleaf tree species - more than 40 in all. Undisturbed by colonial land management practices, the Wabanaki-Acadian Forest is considered one of the most diverse temperate forest regions in the world.

Red spruce and hemlock are often considered to be the defining tree of the Wabanaki-Acadian Forest and a major component of its old-growth stands. In this forest, red spruce is commonly found alongside sugar maple, yellow birch, beech, hemlock (one of the Wabanaki-Acadian's longest-lived species), white pine, balsam fir, and larch. Other common Wabanaki-Acadian species include red maple, white ash, white birch, trembling and large-tooth aspen, and black spruce.

Historical accounts describe the Wabanaki-Acadian as a mixedwood forest of grandeur - a landscape characterized by towering white pines over 45 metres tall and vast stands of beech and other hardwoods.[22] Studies in the broader Wabanaki-Acadian region have estimated that red spruce once made up one-third

of the forest, with balsam fir as a common associate species. Some red spruce in the Acadian Forest were thought to have commonly been 150 to 250 years old.[23,24]

Over the thousands of years since the last ice age, the Wabanaki-Acadian Forest and its resident species have adapted to its specific part of North America. Natural processes of disturbance like windstorms, and insect outbreaks, and wildfire have shaped its development through a process called succession. These disturbances create 'gaps' that release understory trees and allow for new growth, promoting forest renewal.

Relations have long inhabited this place. For time immemorial, Indigenous Peoples, the Mi'kmaq, have lived in and cared for the old growth stands of red spruce, white pine, hemlock and ash that have played a strong part in cultural connections to the land. Long before the arrival of Settlers, Indigenous Peoples learned with and from these forest landscapes.

Much has changed in the more than 500 years since the arrival of the first Europeans to the Atlantic coast. More than 400 years of timber harvest, agricultural clearing, shipbuilding, timber-fuelled conflict, and human
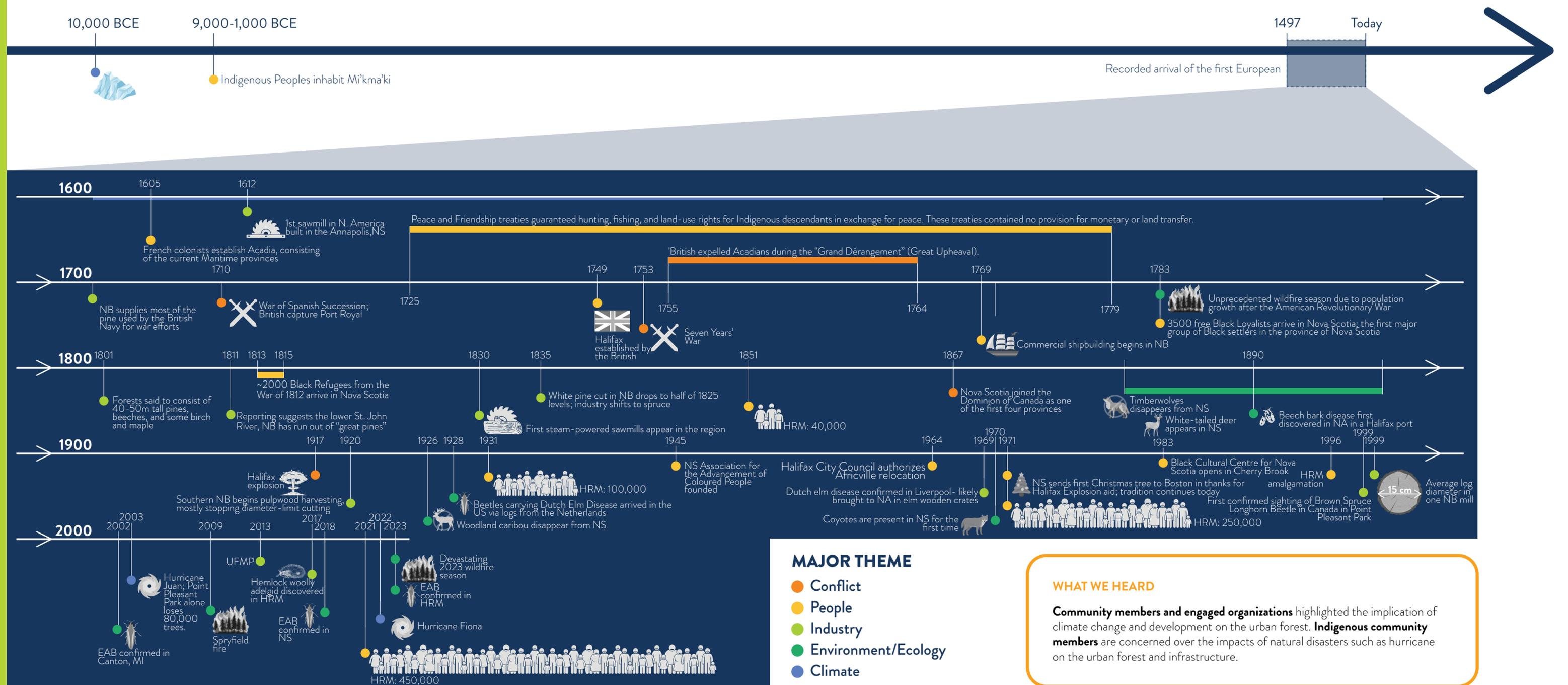
A Timeline

The Wabanaki-Acadian Forest has existed since the retreat of the glaciers following the last ice age. Mi'kmaq Peoples arrived on these lands and cared for the native ecosystems for thousands of years before the arrival of Europeans. In the 500 years since European arrival, the landscape has changed, dramatically.

The timeline on the right is meant to communicate the degree of change that has occurred over a relatively short period of time relative to the Holocene (i.e., the current interglacial period). Technology, population growth and globalization have reshaped tree and forest management.

Major social, political, industrial, and environmental events over the past 500 years are illustrated. Most of these events relate either directly to human influence over the Wabanaki-Acadian Forest, or to HRM's history (and therefore to the urban forest's history). This timeline is not all-encompassing. It is a sampling of historic events that tell the story of change in the Wabanaki-Acadian Forest, as well as change in HRM as a community.

The events detailed are assembled from a compilation of sources, however special credit is given to the work of Simpson, J. (2015).[37]

10,000 BCE

9,000-1,000 BCE
Indigenous Peoples inhabit Mi'kma'ki

1497
Recorded arrival of the first European

Today

1600

1605
French colonists establish Acadia, consisting of the current Maritime provinces

1612
1st sawmill in N. America built in the Annapolis, NS

Peace and Friendship treaties guaranteed hunting, fishing, and land-use rights for Indigenous descendants in exchange for peace. These treaties contained no provision for monetary or land transfer.

'British expelled Acadians during the "Grand Dérangement" (Great Upheaval).

1700

1710
War of Spanish Succession; British capture Port Royal

NB supplies most of the pine used by the British Navy for war efforts

1725

1749
Halifax established by the British

1753

1755
Seven Years' War

1769

1764

1779

1783
Unprecedented wildfire season due to population growth after the American Revolutionary War

3500 free Black Loyalists arrive in Nova Scotia; the first major group of Black settlers in the province of Nova Scotia

Commercial shipbuilding begins in NB

1800

1801
Forests said to consist of 40-50m tall pines, beeches, and some birch and maple

1811

1813
~2000 Black Refugees from the War of 1812 arrive in Nova Scotia

1815
Reporting suggests the lower St. John River, NB has run out of "great pines"

1830

1835
White pine cut in NB drops to half of 1825 levels; industry shifts to spruce

First steam-powered sawmills appear in the region

1851
HRM: 40,000

1867
Nova Scotia joined the Dominion of Canada as one of the first four provinces

Timberwolves disappears from NS

White-tailed deer appears in NS

1890
Beech bark disease first discovered in NA in a Halifax port

1900

1917
Halifax explosion

1920
Southern NB begins pulpwood harvesting, mostly stopping diameter-limit cutting

1926

1928

1931
HRM: 100,000

Beetles carrying Dutch Elm Disease arrived in the US via logs from the Netherlands

Woodland caribou disappear from NS

1945
NS Association for the Advancement of Coloured People founded

Halifax City Council authorizes Africville relocation

Dutch elm disease confirmed in Liverpool- likely brought to NA in elm wooden crates

Coyotes are present in NS for the first time

1964

1969

1970

1971
NS sends first Christmas tree to Boston in thanks for Halifax Explosion aid; tradition continues today

1983
Black Cultural Centre for Nova Scotia opens in Cherry Brook

First confirmed sighting of Brown Spruce Longhorn Beetle in Canada in Point Pleasant Park

1996

1999
First confirmed sighting of Brown Spruce Longhorn Beetle in Canada in Point Pleasant Park

HRM amalgamation
HRM: 250,000

Average log diameter in one NB mill

15 cm

2000

2002

2003
Hurricane Juan; Point Pleasant Park alone loses 80,000 trees.

EAB confirmed in Canton, MI

2009
UFMP

2013
Hemlock woolly adelgid discovered in HRM

Spryfield fire

2017

2018
EAB confirmed in NS

2021

2022

2023
Devastating 2023 wildfire season

EAB confirmed in HRM

Hurricane Fiona

HRM: 450,000

MAJOR THEME
- 🟠 Conflict
- 🟡 People
- 🟢 Industry
- 🟢 Environment/Ecology
- 🔵 Climate

WHAT WE HEARD

Community members and engaged organizations highlighted the implication of climate change and development on the urban forest. **Indigenous community members** are concerned over the impacts of natural disasters such as hurricane on the urban forest and infrastructure.

Old Growth

Once a hallmark of the Wabanaki-Acadian Forest, old growth forest has become rare. Some estimates put true Old Growth Wabanaki-Acadian forest at as little as one percent of its pre-European range. Through its Old Growth Policy the Province has protected more than 30,000 hectares of Old Growth Wabanaki-Acadian Forest outside of any old growth already subject to protections in Provincial parks and conservation areas. In HRM, 500 hectares of confirmed old growth crown forest are protected under the Province's Old Growth Policy. Another 43,000 hectares of forested land has been flagged as either prospective old growth (awaiting confirmation) or as a candidate old growth restoration site- some of these stands may be subject to protections under the Province's old growth policy in the future. Read more about the Province's Old Growth Policy here.

HRM'S FOREST COMMUNITIES

Climate

The Wabanaki-Acadian Forest Region has a climate characterized by warm, humid summers and relatively mild winters. Ample precipitation during the growing season provides excellent conditions for supporting tree growth. Climate change threatens warmer, wetter, wilder conditions. While some impacts may benefit tree growth, others may influence the range of species that grow in the region, particularly in forested areas.[27] Changes in abiotic and biotic cycles, as well as freeze-thaw cycles may also threaten and damage trees.

Landcover

HRM's municipal area is nearly 5,500 km², making it one of the largest Canadian communities by area. Its large size supports a significant diversity of land uses and land cover types. Figure 2-1 maps the ecological land classifications in HRM. More than 4,300 km² of HRM is forested land, which represents nearly three quarters of the Municipality's land base.[28]

Provincial datasets identify that nearly 85% of HRM's forested lands are "natural", meaning in this case that they are not managed for timber. Managed forests constitute another 11%, with clear cuts and plantations as the largest classes of managed forest. Smaller elements of managed forest include stands with silvicultural treatments, selective cuts, and Christmas tree farms.

FUTURE CLIMATE WILL BE...

WARMER
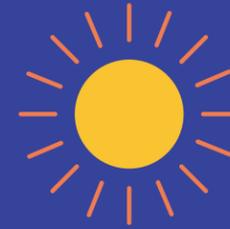
- warmer average temperatures
- more hot days above 25°
- milder winters
- more frequent and longer heat waves
- longer, warmer growing seasons

WETTER

- increased quantity and frequency of precipitation, especially in the fall

WILDER

- Potential changes in frequency and intensity of extreme weather events
- More freezing rain, hail
- More high wind gusts

BY 2050, HRM MAY SEE...

4X the days with temperature above 30°C

2X the number of summer days

More days with heavy precipitation (>20mm)

10% more rain on during rainfall events

WHICH IS LIKELY TO LEAD TO...

EARLIER SPRING

Warmer temperature will contribute to earlier snow melt and buds to burst sooner.

LONGER GROWING SEASON

Earlier spring and a later fall will elongate HRM's growing season.

HEAT WAVES

Possible increases in the frequency and duration of heatwaves may challenge species not well adapted for such conditions, and can also impact fuels and fire behaviour.

MORE FAVOURABLE CLIMATE FOR TEMPERATE SPECIES

Warmer temperatures may challenge the Wabanaki-Acadian's cold-adapted boreal species while at the same time better supporting more southerly, temperate plants.

MORE PESTS AND INVASIVE SPECIES

Climate change may contribute to changes in the life-cycles, abundance and range of forest pests and pathogens. Trees stressed from climatic changes are more susceptible to infestation or outbreak.
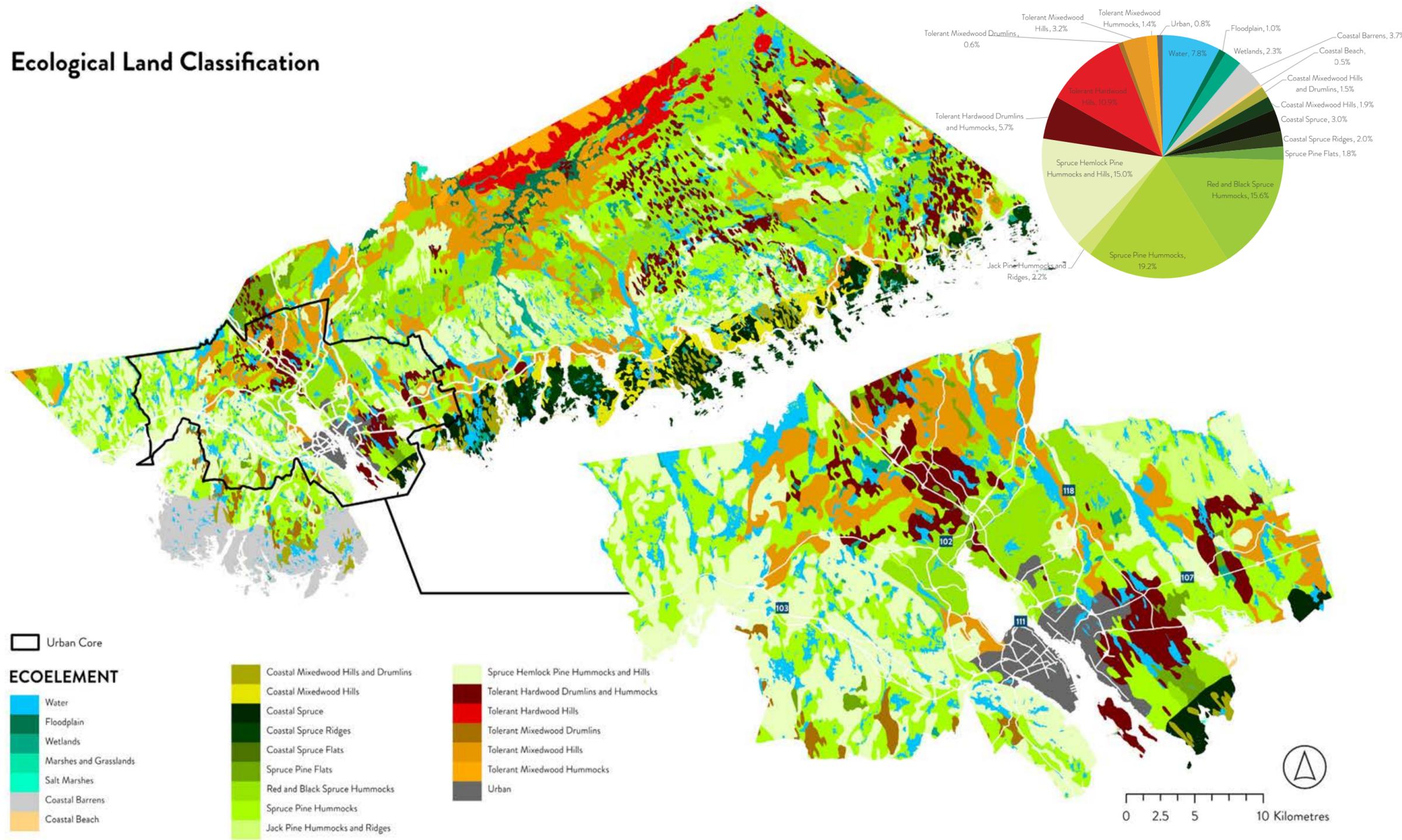
Ecological Land Classification

Figure 2-1. Ecological Land Classification mapping within HRM (ecoelements).
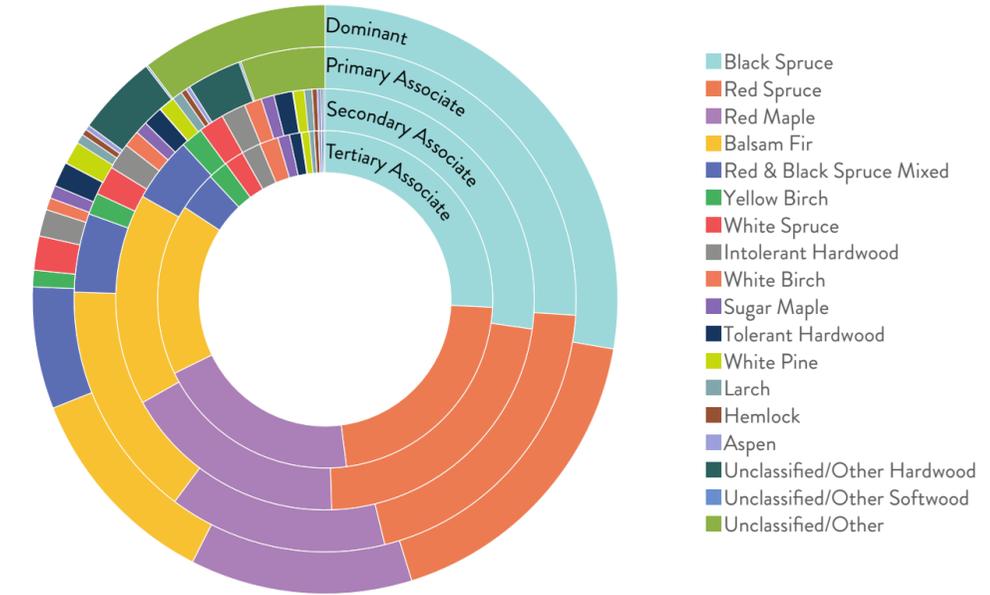
Legend:

Urban Core

ECOELEMENT

- Water
- Floodplain
- Wetlands
- Marshes and Grasslands
- Salt Marshes
- Coastal Barrens
- Coastal Beach
- Coastal Mixedwood Hills and Drumlins
- Coastal Mixedwood Hills
- Coastal Spruce
- Coastal Spruce Ridges
- Coastal Spruce Flats
- Spruce Pine Flats
- Red and Black Spruce Hummocks
- Spruce Pine Hummocks
- Jack Pine Hummocks and Ridges
- Spruce Hemlock Pine Hummocks and Hills
- Tolerant Hardwood Drumlins and Hummocks
- Tolerant Hardwood Hills
- Tolerant Mixedwood Drumlins
- Tolerant Mixedwood Hills
- Tolerant Mixedwood Hummocks
- Urban

0   2.5   5   10 Kilometres

Pie chart labels:

Tolerant Mixedwood Hills, 3.2%
Tolerant Mixedwood Hummocks, 1.4%
Tolerant Mixedwood Drumlins, 0.6%
Urban, 0.8%
Floodplain, 1.0%
Water, 7.8%
Wetlands, 2.3%
Coastal Barrens, 3.7%
Coastal Beach, 0.5%
Coastal Mixedwood Hills and Drumlins, 1.5%
Coastal Mixedwood Hills, 1.9%
Coastal Spruce, 3.0%
Coastal Spruce Ridges, 2.0%
Spruce Pine Flats, 1.8%
Tolerant Hardwood Hills, 10.5%
Tolerant Hardwood Drumlins and Hummocks, 5.7%
Spruce Hemlock Pine Hummocks and Hills, 15.0%
Red and Black Spruce Hummocks, 15.6%
Jack Pine Hummocks and Ridges, 2.2%
Spruce Pine Hummocks, 19.2%

Figure 2-2. Dominant species and associates in HRM's forested areas.

Sunburst legend:

Dominant
Primary Associate
Secondary Associate
Tertiary Associate

- Black Spruce
- Red Spruce
- Red Maple
- Balsam Fir
- Red & Black Spruce Mixed
- Yellow Birch
- White Spruce
- Intolerant Hardwood
- White Birch
- Sugar Maple
- Tolerant Hardwood
- White Pine
- Larch
- Hemlock
- Aspen
- Unclassified/Other Hardwood
- Unclassified/Other Softwood
- Unclassified/Other

Forest Types

Coniferous communities dominate HRM's forested areas (Figure 2-1). Provincial datasets identify that more than 60% of HRM's forests feature black and/or red spruce or balsam fir as dominant species (Figure 2-2). Spruce and spruce-pine hummocks are particularly abundant communities within the municipality. Red maple is the most dominant broadleaf species. Red maple is commonly found in rich, moist soils, often along the banks of streams and swamps.

Character old growth Acadian species including red spruce, eastern hemlock, American beech, yellow birch, and sugar maple can each be found as lead species in isolated instances. However, these species collectively dominate in less than five percent of the forested land base.

Spruce and fir are also common associates in stands dominated by other conifers. Larch is a common associate of black spruce, occurring in eight percent of spruce-dominated stands (Figure 2-2). Larch tends to grow as an associate to black spruce on wet sites and in boggy areas. Balsam fir is a more common associate in stands dominated by spruce.

HRM's native ecosystems are diverse (Figure 2-1) because of the varied site conditions that occur within the Municipality's large land base. Along HRM's eastern shore, globally rare broom crowberry coastal heathland - a community dominated by huckleberries, blueberry, lambkill, cinnamon fern, alders, and black crowberry - may be found. Elsewhere, towards Elderbank, forests of hemlock, white pine, red oak, and other hardwoods occur, situated atop calcareous bedrock. Outside the reaches of fields, pasture and croplands, remnant floodplain forests of white ash, sugar maple and elm sometimes occur although centuries of land conversion have made these communities particularly rare. On the rolling hills of Musquodoboit late successional (i.e., old) mixed-wood forests might consist of sugar maple, yellow birch and beech on upper slopes and red spruce, balsam fir and hemlock on middle and lower slopes.

This rich diversity of ecosystems supports an abundance of animal life. While much has changed in the centuries since European arrival, the Wabanaki-Acadian remains resilient, and sustains refuge for a broad range of plant and animal species.

Disturbance

Disturbance is a natural process in the Wabanaki-Acadian Forest. While in some stands historically infrequent, disturbance plays an essential in renewal and maintaining a healthy ecosystem. Various types of disturbances, such as windthrow, fire, and biotic

agents, shape and influence this landscape, supporting biodiversity.

Provincial datasets identify that roughly two percent of HRM's forested lands have recently experienced a disturbance event, with windthrow and crown dieback being the most significant. Crown dieback is more a symptom than a form of disturbance itself, however the root causes of crown dieback are often difficult to confirm through remote sensing alone. Smaller areas of burn and secondary forests over abandoned fields are also present. The burn area following the 2023 Upper Tantallon wildfire is however not reflected in **Figure 2-1** (the dataset predates the 2023 fire season).

Despite the longstanding role of disturbance within the Wabanaki-Acadian Forest, our relationship with forest disturbance is changing. Long-term changes in precipitation and the frequency and intensity of extreme weather creates new challenges in managing HRM's more than 4,300 km² of forested lands. A patchwork of ownership structures and interests within our forested areas now more than ever demands a collaborative and integrated approach to supporting the forest through the trials ahead.

Fire

On May 28, 2023, the Upper Tantallon wildfire began, damaging an estimated 200 properties and forcing the temporary evacuation of over 16,000 people from HRM's urban core. Schools were closed, 150 homes were lost, and a local state of emergency was declared. This fire was one of many in 2023, with 220 wildfires burning more than 25,000 hectares across Nova Scotia. The largest wildfire on record in the province, outside Shelburne, destroyed 60 homes and impacted over 23,000 hectares. The 2023 fire season was unprecedented in the scale of its impact but not entirely unique, with past events like the 2009 Spryfield fire burning 800 hectares and also triggering evacuations.

Wildfire has always been part of the Wabanaki-Acadian Forest's natural renewal process. However, evidence suggests that the frequency and severity of fire events are increasing, at least in part due to climate change, which brings warmer and often drier conditions.

While fire behaviour is complex, coniferous fuel types generally support more severe fire behaviour than broadleaf. More than 45% of HRM's forested areas would be considered a coniferous fuel type (**Figure 2-3**).

Nova Scotia's Forest Datasets

The government of Nova Scotia has been monitoring Nova Scotia's forest resources for nearly 60 years. Sophisticated field collection programs used in combination with modern remote sensing and GIS technologies allows the Province to capture change in its resources over time. The inventory data enables decision makers to make informed choices on sustainable forest management. Varied analyses are used to define and track forest components and processes, such as volume and growth, and results are reported in a range of reports. The data also supports modeling volumes, biomass and forest carbon. This valuable database is regularly updated and shared with the HRM. These datasets have been drawn on to produce the analyses contained in this section.

In the urban core, coniferous fuels are still dominant, but broadleaf and mixed fuels make up a greater share of forested stands. When it comes to building fire resilience communities, local governments have several tools, including:

- Fuel treatments on municipal land to influence the wildfire behaviour in priority areas,
- Mapping the wildland-urban interface (WUI) and requiring built form and site design to meet fire-resilient standards,
- Developing education and community awareness of wildfire threat, and helping property owners understand how they can maintain fire resilient properties themselves.

Wind

Fire is not the only disturbance in the Wabanaki-Acadian Forest. In much of the Acadian-Wabanaki Forest, wind is a more influential form of disturbance than fire. Strong winds and gusts can bring down limbs, entire trees, and even entire stands in severe cases. Large-scale blowdown, known as windthrow events, create large openings in otherwise continuous forest areas. Like fire, windthrow is a natural disturbance that releases the next generation of trees from the understory. However,

▲ The Shelburne Wildfire. >23,000 hectares burned. June 2023. CR: Shutterstock Imagery.

FireSmart Canada™

FireSmart™ Canada is a national program that helps Canadians increase neighbourhood resilience to wildfire and minimize its negative impacts. The program was established in 1993 to address common concerns about wildfire in the wildland urban interface. Whether you are a homeowner, resident, business, government, or Indigenous community, FireSmart™ principles focus on specific actions community members can implement to build wildfire resilience. Actions identified by FireSmart™ can be done yourself in areas immediately surrounding your home or business, but it is recommended to apply them with local and site-specific knowledge. This is known as the Home Ignition Zone.

Visit **FireSmart™ Canada** to learn more.

▲ The Spryfield Wildfire. ~ 800 hectares burned. April 2009. Cr: Ross O'Flaherty.

Fuel Type

Pie chart values:
- C5, 1.0%
- C3, 4.2%
- UNC, 7.6%
- WAT, 7.3%
- SF, 0.7%
- S2, 3.8%
- O1/O2, 4.1%
- CC10, 1.7%
- M3-60/M4-60, 0.3%
- NS1, 5.9%
- M1-75/M2-75, 10.8%
- M1-50/M2-50, 9.3%
- M3-30/M4-30, 0.3%
- M1-25/M2-25, 3.6%
- C2, 30.7%
- C4, 2.3%
- C6, 2.3%
- D1/D2, 4.0%

Legend:

- ☐ Urban Core
- ☐ Service Requirement Area

Fuel Type

- C5 Red/White Pine
- C1 Conifer
- C3 Mature Softwood
- C2 Boreal Spruce
- C4 Immature Dense Softwood
- C6 Conifer Plantation

- D1/D2 Hardwood
- M1/M2-25 Mixed 21-39% Conifer
- M1/M2-50 Mixed 40-59% Conifer
- M1/M2-75 Mixed 60-79% Conifer
- M3/M4-30 Mixed 26-50% Dead
- M3/M4-60 Mixed 51-75% Dead
- M3/M4-100 Mixed 76%+ Dead
- CC10 Clearcut
- NS1 NS Special (Ericaeous Heath)

- O1/O2 Grass
- S1 Slash
- S2 Spruce/Fir Slash
- S3 Heavy Slash/Windthrow
- SF Seasonal Fuel
- WAT Water
- UNC Not Classified/Non-Fuel
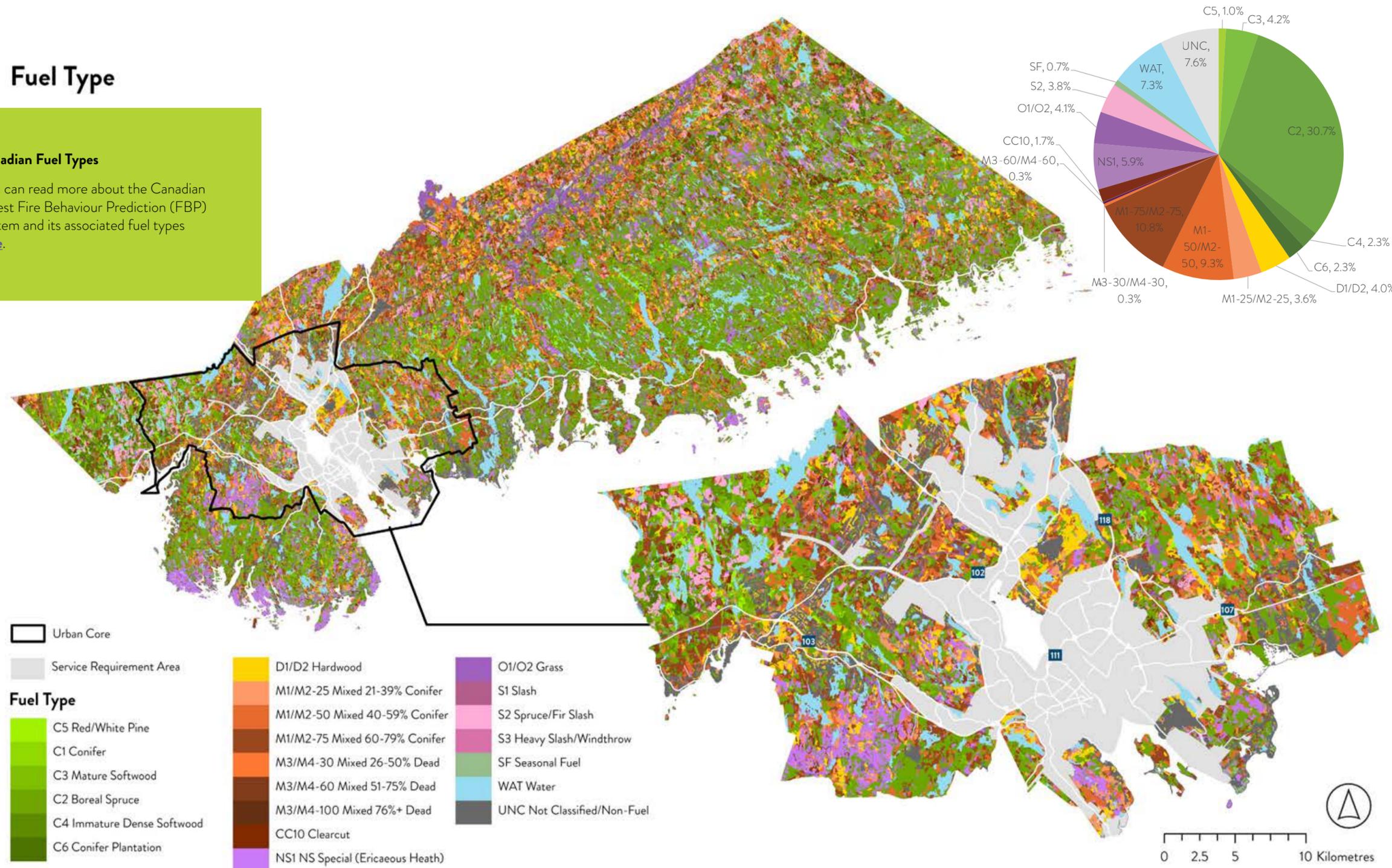
0 2.5 5 10 Kilometres

Figure 2-3. Provincial fuel type mapping within HRM.

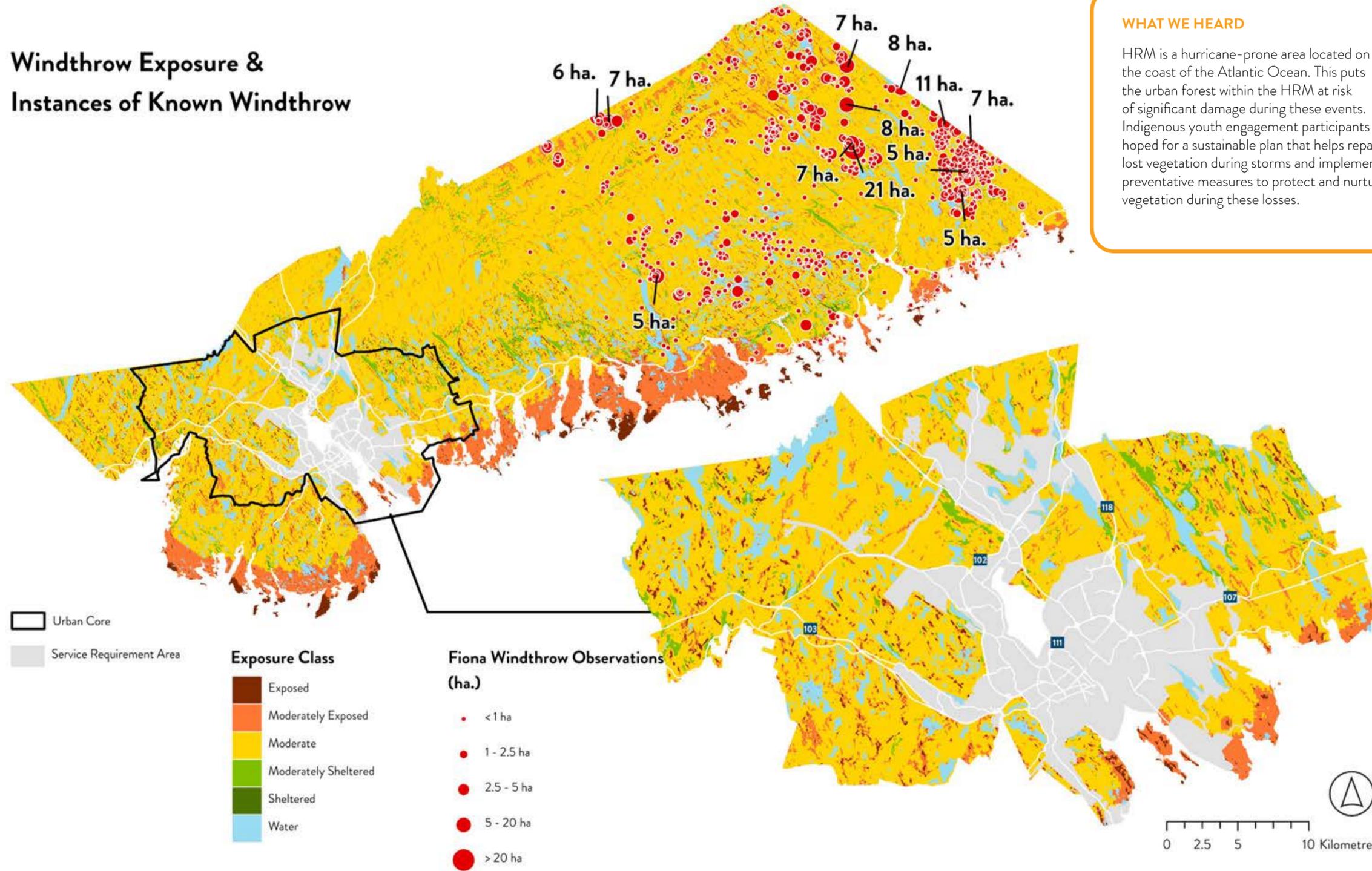▲ Tree down following Hurricane Juan. September 2003. Credit: Peter Duinker.

more frequent and severe weather events, including hurricanes, may increase wind's impact on forests and trees.

Hurricane Fiona made landfall in Guysborough on September 24, 2022, as the strongest storm in Canadian history by barometric pressure. With sustained winds of nearly 170 km/h and peak gusts of almost 180 km/h, the storm caused significant damage. The storm also generated large waves and destructive storm surge. Provincial analyses suggest over 10,000 hectares of forests were impacted by windthrow, including 800 hectares within HRM. The cleanup cost to HRM was $1.6 million, not including provincial or private expenditures.

HRM manages wind-related risks primarily through tree maintenance. A proactive maintenance program can reduce the likelihood of tree failure during storms, but severe storms like Fiona will always result in considerable cleanup costs. Municipally owned parks and forested areas will be closed during extreme weather. Windthrow will continue to drive forest renewal, and the municipality can explore practices to avoid creating new areas with heightened susceptibility to windthrow events.

[Figure 2-4](#) on the following page identifies windthrow risk within Halifax's forested areas given relative exposure, compositional, and soil conditions. Wind risk in urban areas is more complex than can be predicted through these variables alone, and so the analysis shown

Windthrow Exposure & Instances of Known Windthrow

7 ha.
8 ha.
6 ha. 7 ha.
11 ha. 7 ha.
8 ha.
5 ha.
7 ha.
21 ha.
5 ha.
5 ha.

Legend:

- ☐ Urban Core
- ☐ Service Requirement Area

Exposure Class

- ■ Exposed
- ■ Moderately Exposed
- ■ Moderate
- ■ Moderately Sheltered
- ■ Sheltered
- ■ Water

Fiona Windthrow Observations (ha.)

- · < 1 ha
- • 1 - 2.5 ha
- ● 2.5 - 5 ha
- ● 5 - 20 ha
- ● > 20 ha

0   2.5   5   10 Kilometres

Figure 2-4. Windthrow exposure and instances of known windthrow in the wake of Hurricane Fiona.

WHAT WE HEARD

HRM is a hurricane-prone area located on the coast of the Atlantic Ocean. This puts the urban forest within the HRM at risk of significant damage during these events. Indigenous youth engagement participants hoped for a sustainable plan that helps repair lost vegetation during storms and implements preventative measures to protect and nurture vegetation during these losses.

in **Figure 2-4** does not extend into the Municipality's Service Area.

Pests and Diseases

Pests and disease have always been an important agent of change in the Wabanaki-Acadian Forest. Spruce budworm, for example, has long played a role in the renewal of forested communities. However, the last 200 years has brought significant change to the role of pests and disease in HRM's forested areas.

Globalization has allowed new, invasive species to reach our shores. Beech bark disease, beech leaf-mining weevil, brown spruce longhorn beetle, Dutch elm disease, emerald ash borer, and hemlock woolly adelgid have all been introduced to the forest a little more than a century ago. Even native pests have seen their role in forest renewal evolve. There is concern that patterns of cyclic defoliation owed to spruce budworm will become more severe under the combined influence of climate change and forest industry legacies.[29]

More challenging is that the threat posed by pests and disease may evolve under the influence of climate change. Trees already experiencing climate stress are less resilient to other stressors, like pests and disease. This can facilitate outbreaks that are both more detrimental and wider-spread. At the same time, life-cycles and range associated with pests and disease may also change under future climate; meaning we may see certain pests and disease become more of a challenge in areas where this was historically not the case.

In 2022, HRM developed an Integrated Pest Management (IPM) Strategy in response to the increasing risks of invasive species and pests. The IPM Strategy aims to address gaps in current pest management practices by providing a formalized, holistic, and ecological approach with reduced pesticide use. The Municipality will continue to implement and update its IPM Strategy in response to the ever-changing pest management landscape.

What's Bugging my Trees?

Beech Bark Disease
Cryptococcus fagisuga / Neonectria faginata

Type: Insect-fungus complex

Target(s): American beech and European beech

ID: 10 mm long; metallic green body with bronze-coloured wing covers; white tufts of hair on along the sides and rear of the abdomen

Character damage: wilting foliage, undersized leaves, crown thinning, character orange-red beech bark disease cankers and fruiting bodies, waxy and woolly secretions of beech scale insect.

Note(s): Beech bark disease occurs after extensive bark invasion by the beech scale insect.

Emerald Ash Borer
Agrilus planipennis

Type: Invasive borer

Target(s): ash - in particular green ash, black ash, and white ash

ID: metallic green color; very short antennae; ~13 mm long and 3 mm wide; larvae creamy-white in color with flattened but segmented bodies

Character damage: 'D' shaped exit holes, larval galleries behind bark, yellowing foliage, waterspouts, foliage feeding, crown thinning, mortality.

Note(s): EAB infestation is typically fatal for ash trees, posing high risk. Most high-risk public ash trees have been removed. If you have an uninfected ash, consider consulting a tree professional for treatment.

Eastern Spruce Budworm
Choristoneura fumiferana

Type: Invasive plant feeder

Target(s): balsam fir, white spruce, and sometimes red and black spruce

ID: Small greyish-brown moth with wingspan of 20-25mm; wings have faint wavy lines across and may have pale spot near the centre

Character damage: Defoliation happens at the top of trees; severely affected stands turn rust colour due to the presence of dried out needles

Note(s): Spruce budworms feed on foliage and cones of plants, causing significant mortality and growth loss in mature spruce-fir forests. Timber and non-timber resources are severely affected.

Hemlock Woolly Adelgid
Adelges tsugae

Type: Invasive plant feeder

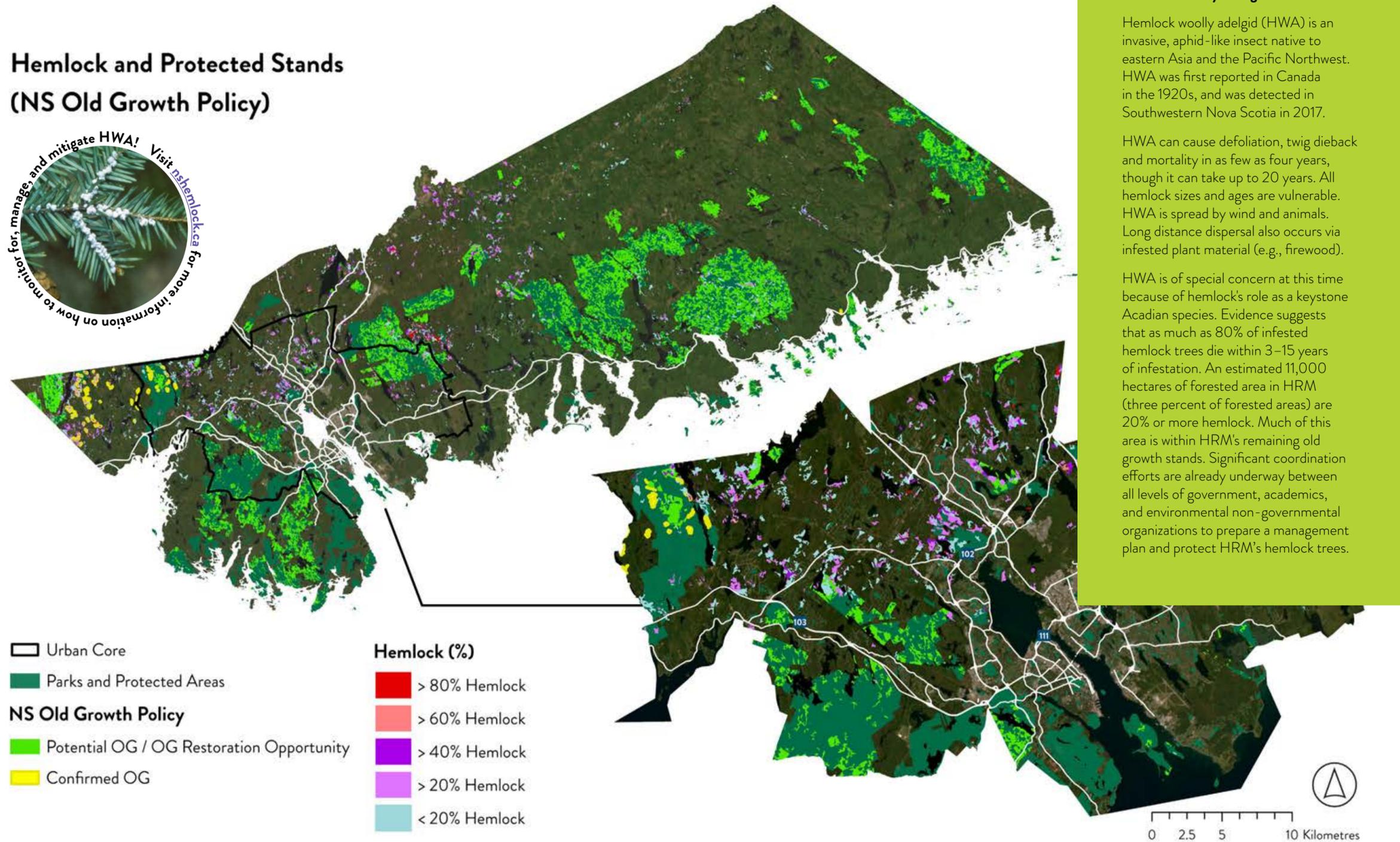**Target(s):** hemlock, some spruce

ID: white "wooly" sacs resembling cotton swab at the base of needles (spring), premature bud and shoot dieback, needle loss, foliage discoloration, dieback, decline.

Character damage: feeds by sucking sap from hemlock and some species of spruce.

Note(s): The absence of a winged generation in North America means HWA spreads primarily through assisted migration (e.g., by humans, animals, or wind) to new areas.

Hemlock and Protected Stands
(NS Old Growth Policy)

Visit nshemlock.ca for more information on how to monitor for, manage, and mitigate HWA!

Legend

- ☐ Urban Core
- ■ Parks and Protected Areas

NS Old Growth Policy
- ■ Potential OG / OG Restoration Opportunity
- ■ Confirmed OG

Hemlock (%)
- ■ > 80% Hemlock
- ■ > 60% Hemlock
- ■ > 40% Hemlock
- ■ > 20% Hemlock
- ■ < 20% Hemlock

0   2.5   5   10 Kilometres

Figure 2-5. HRM forested area mapping by proportion of Hemlock and stands protected under Nova Scotia's Old Growth Policy.

Hemlock Woolly Adelgid

Hemlock woolly adelgid (HWA) is an invasive, aphid-like insect native to eastern Asia and the Pacific Northwest. HWA was first reported in Canada in the 1920s, and was detected in Southwestern Nova Scotia in 2017.

HWA can cause defoliation, twig dieback and mortality in as few as four years, though it can take up to 20 years. All hemlock sizes and ages are vulnerable. HWA is spread by wind and animals. Long distance dispersal also occurs via infested plant material (e.g., firewood).

HWA is of special concern at this time because of hemlock's role as a keystone Acadian species. Evidence suggests that as much as 80% of infested hemlock trees die within 3–15 years of infestation. An estimated 11,000 hectares of forested area in HRM (three percent of forested areas) are 20% or more hemlock. Much of this area is within HRM's remaining old growth stands. Significant coordination efforts are already underway between all levels of government, academics, and environmental non-governmental organizations to prepare a management plan and protect HRM's hemlock trees.
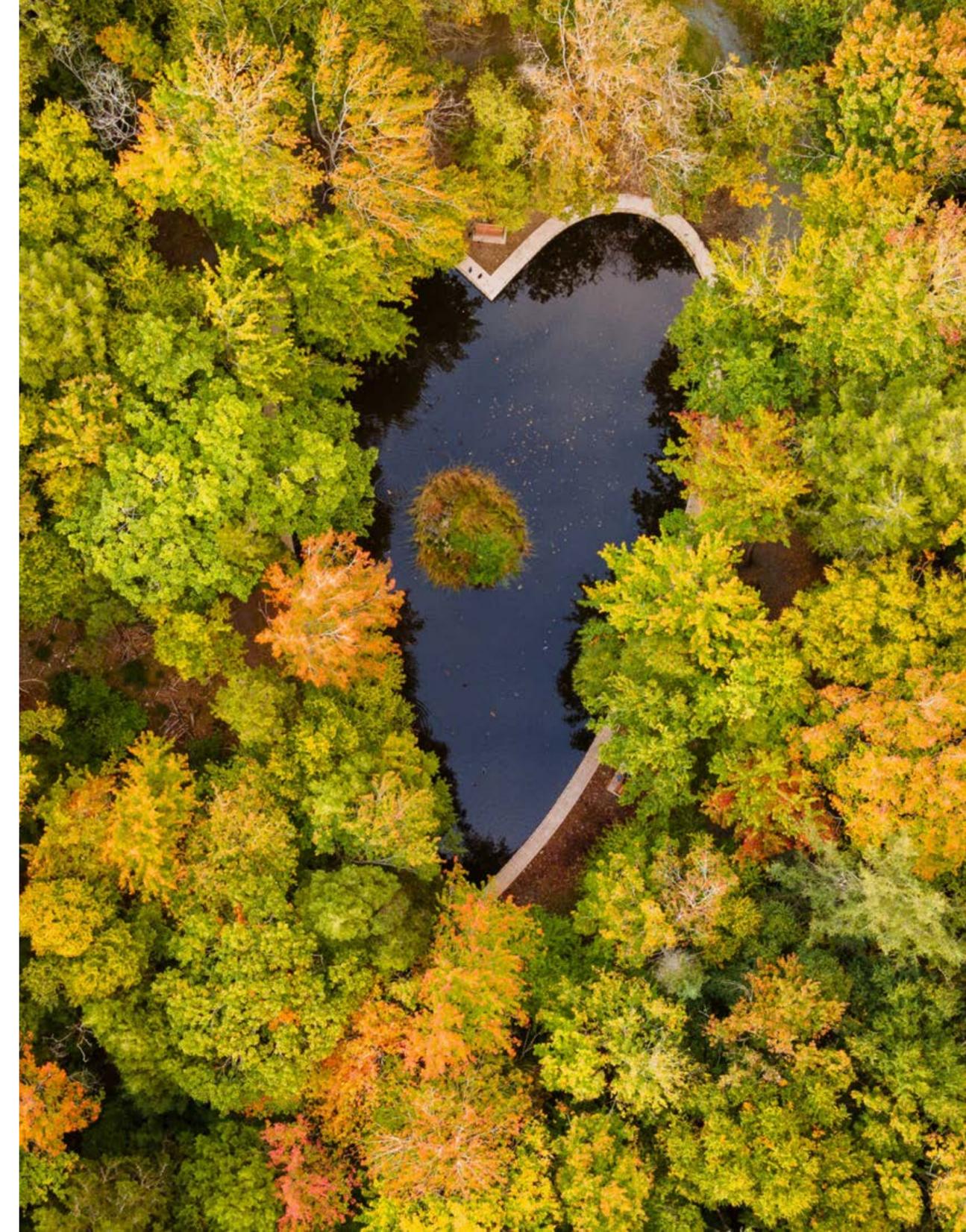
In 2022, HRM's municipality-wide canopy cover was 58%, covering nearly 3,200 km². Inside the urban core, canopy cover was 65%. This section examines canopy cover in relation to different summary units, land uses, and land ownerships within HRM:

- **Land use:** Provides insights into the relationship between land use and canopy cover.
- **Urban Core:** Provides insights into the current urban forest program's operational focus area within HRM.
- **Land ownership:** Provides insights into the relationship between anopy cover and land ownership.
- **2013 Urban Forest Master Plan area:** Supports comparisons of canopy change since prior analyses.
- **Service Requirements Area:** Defined through Schedule B of HRM's Subdivision By-law, these are areas connected to municipal water and/or sewer that can support urban use and densities, demanding a management approach different than that of rural areas.
- **Centre plan area:** Highlights baseline canopy conditions in HRM's urban heat.

PRIOR CANOPY ASSESSMENT

HRM's 2013 Urban Forest Master Plan study area (**Figure 2-7**) was estimated to have 34% canopy cover using 2022 data. A 2016 study[30] also estimated canopy cover to have been 34% at that time, which would have been an increase from 25% in 2007 (also reported in the 2016 study).

While this suggests canopy cover grew by nine percent in the decade between 2007 and 2016 and has remained stable since, this observation may not be reliable. A global forest change dataset[31] suggests that canopy loss may have exceeded gain since 2001 (**Figure 2-9**). Historic trends can be challenging to report with confidence due to the low-resolution of imagery available in 2007 and 2016, because lower-resolution inputs yield less accurate canopy cover estimates.

2.2. URBAN FOREST CANOPY COVER

What *is* Canopy Cover?

Canopy cover refers to the extent of tree canopy covering a defined area. Imagine you are flying above a tree. That tree's canopy cover is the amount of ground obstructed from your top-down view by the tree's leafy crown.
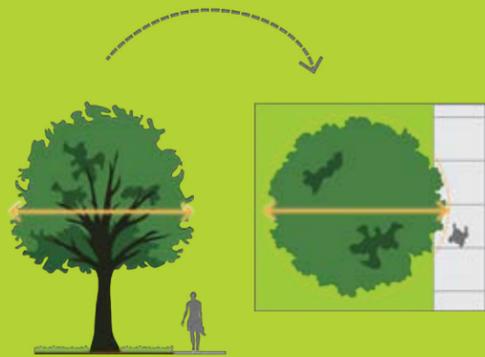
Many jurisdictions track canopy cover over time to monitor change in their urban forest, and to inform management planning.

Measures of canopy cover are commonly used to evaluate the expansiveness and coverage of an urban forest. Many jurisdictions actively track canopy cover over time to monitor changes and inform adaptive management planning. While canopy cover is a valuable metric in urban forestry, it does not fully capture the health, challenges, or successes of an urban forest management program. It should be considered alongside a full range of other factors including land use, program funding and scope, canopy distribution, tree inventory, as well as varied ecological considerations.

HRM's canopy cover was measured using LiDAR (Light Detection and Ranging), high-resolution imagery, and machine learning methods. Though measurement methods were consistent, input datasets varied between urban and rural areas. Canopy cover mapping in this UFMP excluded Sable Island, which is within HRM's jurisdiction. In the urban core, LiDAR data from 2019 was combined with imagery from 2017 and 2022. In rural areas, LiDAR data from 2018 was combined with imagery from 2017.

Table 2-1. Canopy summary by land use in the Urban Core and across HRM (including the urban core)

Use	Urban Core 2022			HRM 2022		
	Land Area (ha)	Canopy Area (ha)	Canopy Cover (%)	Land Area (ha)	Canopy Area (ha)	Canopy Cover (%)
Community Commercial	613	131	21.3	613	131	21.3
Comprehensive Development District (CDD)	308	107	34.8	308	107	34.8
Downtown	73	4	5.0	73	4	5.0
Industrial	4,163	1,169	28.1	6,988	2,558	36.6
Institutional	243	37	15.2	243	37	15.2
Mixed Use	283	67	23.6	347	94	27.1
Protected Area	17,918	13,204	73.7	92,832	61,712	66.5
Rural	32,662	23,959	73.4	374,775	213,397	56.9
Right of Way and Others	5,109	1,840	18.5	9,116	2,560	28.1
Residential						
Interface	18,993	12,722	67.0	39,893	24,175	60.6
Medium Density	295	77	26.0	295	77	26.0
Single Family Density	6,465	2,736	42.3	6,465	2,736	42.3
Parks						
Community	977	555	56.8	1,257	675	53.7
District	475	234	49.3	511	250	48.9
Neighbourhood	198	135	68.0	238	157	66.2
Park	3,520	2,342	66.5	10,504	6,174	58.8
Plaza	2	0.3	13.3	2	0	13.3
Provincial	53	34	63.9	4,772	2,388	50.0
Regional	2,690	2,126	79.0	3,351	2,604	77.7
Totals	**95,041**	**61,478**	**64.7**	**552,583**	**319,834**	**57.9**

Canopy Coverage

Canopy cover within the Urban Forest Master Plan area was 34% (6,300 ha) in 2022.

Canopy cover within the Municipality's Service Area was 36% (9,200 ha) in 2022.

Canopy cover within the HRM Regional Centre was 28% (1,000 ha) in 2022.
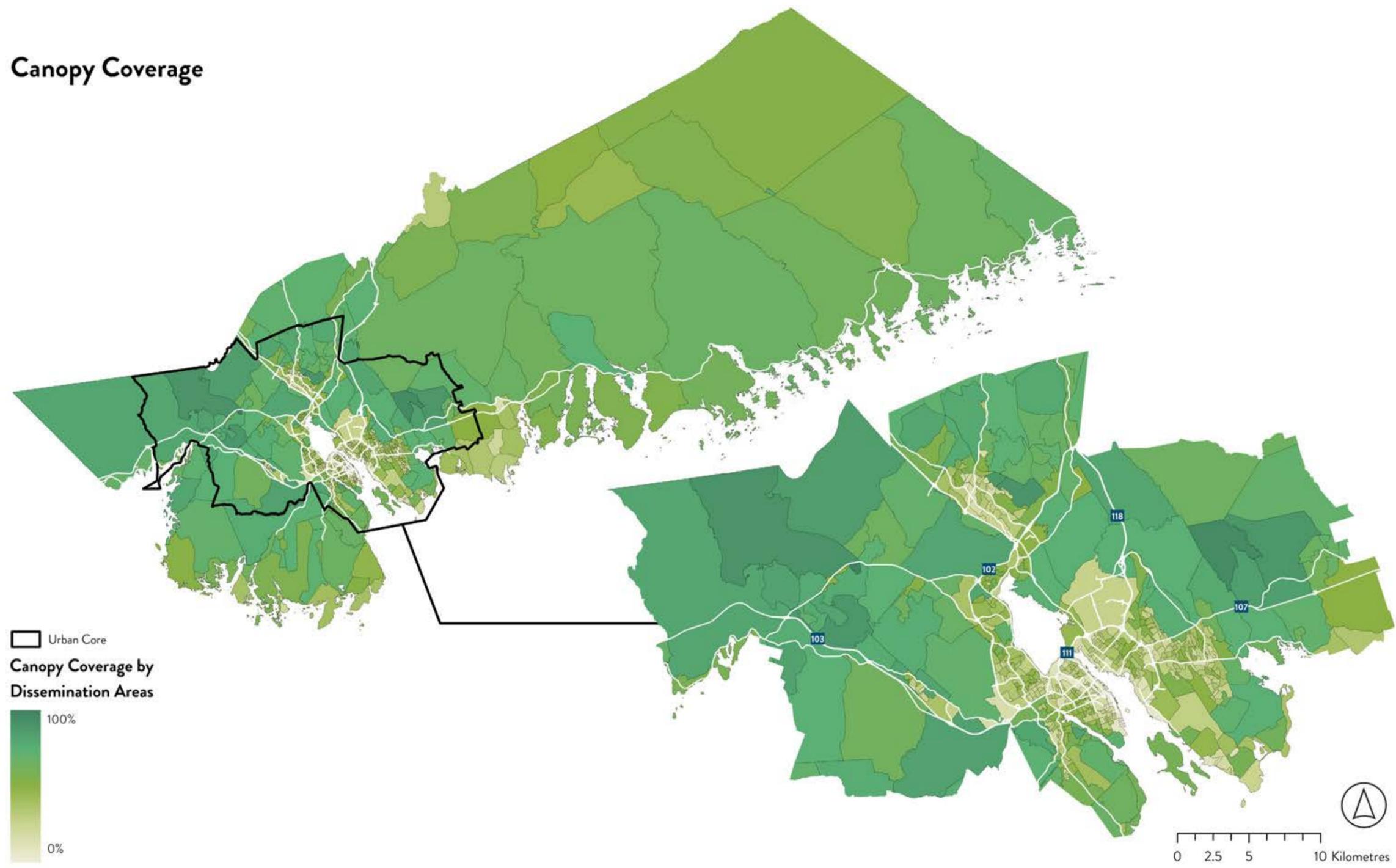
Urban Core

Canopy Coverage by Dissemination Areas

100%

0%

Figure 2-6. HRM canopy cover mapping by Tree Equity Score (TES).
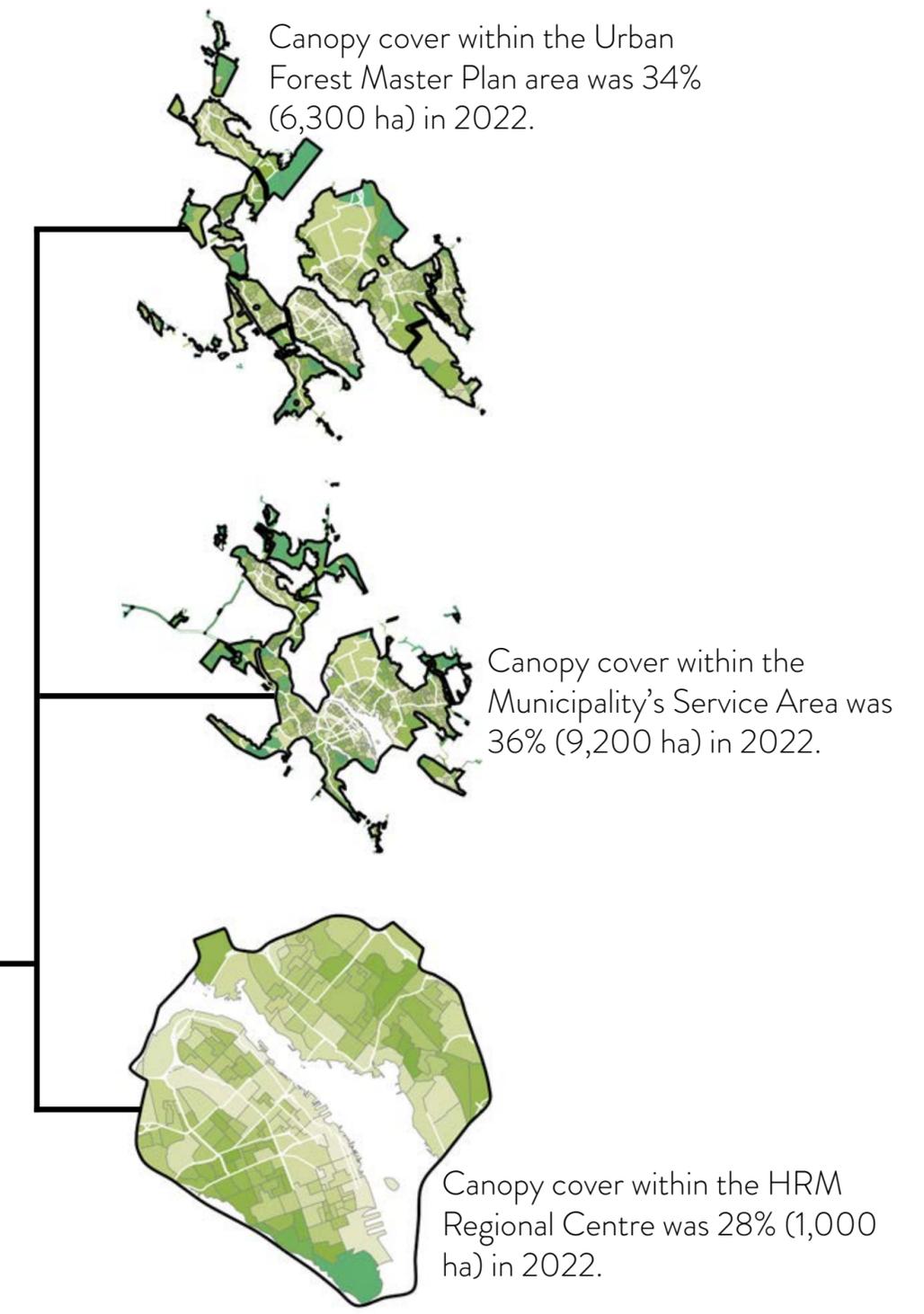
Figure 2-7. Additional canopy cover spatial units in HRM.

CANOPY BY LAND USE

HRM is a large Regional Municipality with diverse land uses (**Table 2-1**). Land use is an important summary unit when we think about canopy cover because built form tends to be a primary driver in urban forest composition and canopy extent.

In HRM, rural land dominates, accounting for over two-thirds of municipality's land base. Other significant land uses include parks, protected areas, and low-density residential areas integrated with forested and rural features (**Table 2-1**). Within HRM's urban core, rural uses, protected areas, parks, and low-density residential areas still dominate. However, single-family subdivisions, industrial uses, and rights-of-way are also significant components (**Table 2-1**).

HRM's downtown area, which is home to the highest density of people and highest intensity of urban uses in the municipality, also has the lowest canopy cover in the HRM, and is relatively low compared to the downtowns of several of HRM's peer communities. For instance, downtown canopy cover is over 15% in Winnipeg, MB[32] and in Burlington, ON[33], and nearly 12% in Surrey, BC[34].

Institutional land uses in HRM often have large buildings and surface parking, contributing to low canopy cover despite housing groups that significantly benefit from greenery, such as patients, seniors, and students[35] .

CANOPY BY LAND OWNERSHIP

Ownership is an important summary unit when we think about canopy cover because it helps us understand differences in urban forest composition and canopy extent across different land uses within the municipality.

Over 71% of HRM's land area and 70% of tree canopy cover is on private property (**Table 2-4**). HRM owns less than 2.5% of the Municipality's total land area, but 10% of the land area in the urban core where Municipal services are concentrated. Provincial lands make up a significant component of landholdings outside of the urban core (26%, **Table 2-4**), however the Municipality generally has limited influence over the management of crown land.

Whether considering just the urban core or all of the HRM, canopy cover on municipal lands exceeds 50%. Future change in HRM's canopy cover considered at any spatial scale will be moderated in large part by changes in the abundance and size of trees on land uses not owned or managed by the City; namely private and crown land.

Table 2-2. Canopy summary by land ownership in HRM.

Use	Urban Core 2022				HRM 2022			
	Land Area (ha)	Proportion of Urban Centre Land Area (%)	Canopy Area (ha)	Canopy Cover (%)	Land Area (ha)	Proportion of Jurisdictional Land Area (%)	Canopy Area (ha)	Canopy Coverage (%)
First Nation Reserves	82	0.1	60	73.1	580	0.1	442	76.3
Federal	117	0.1	83	71.2	261	0.0	83	31.9
Government of Nova Scotia	13,361	14.1	10,461	78.3	143,880	26.0	88,363	61.4
Halifax Water	33	0.0	5	16.5	49	0.0	12	23.7
Halifax-Dartmouth Bridge Commission	10	0.0	3	27.8	10	0.0	3	27.8
HRM	10,073	10.6	5,106	50.7	12,621	2.3	6,731	53.3
HRCE	13	0.0	4	32.5	13	0.0	4	32.6
Institutional	10	0.0	6	57.3	11	0.0	6	56.0
Nova Scotia Power	6	0.0	2	28.6	11	0.0	5	48.3
Private	70,427	74.1	45,443	64.5	394,147	71.3	223,851	56.8
Rail	632	0.7	205	32.5	664	0.1	218	32.9
Unopened Road Allowance	276	0.3	100	36.1	354	0.1	116	32.8
Totals	**95,041**	**100.0**	**61,478**	**64.7**	**552,600**	**100.0**	**319,834**	**57.9**

Consolidated land use

Urban Core

(Consolidated) Land Use

- Downtown
- Medium-density Residential
- Single-family Detached
- Interface Residential
- Mixed Use
- Comprehensive District
- Community Commercial
- Industrial
- Institutional
- National Park
- Provincial Park
- Regional Park
- Community Park
- District Park
- Neighbourhood Park
- Plaza
- Park
- Protected Area / Feature
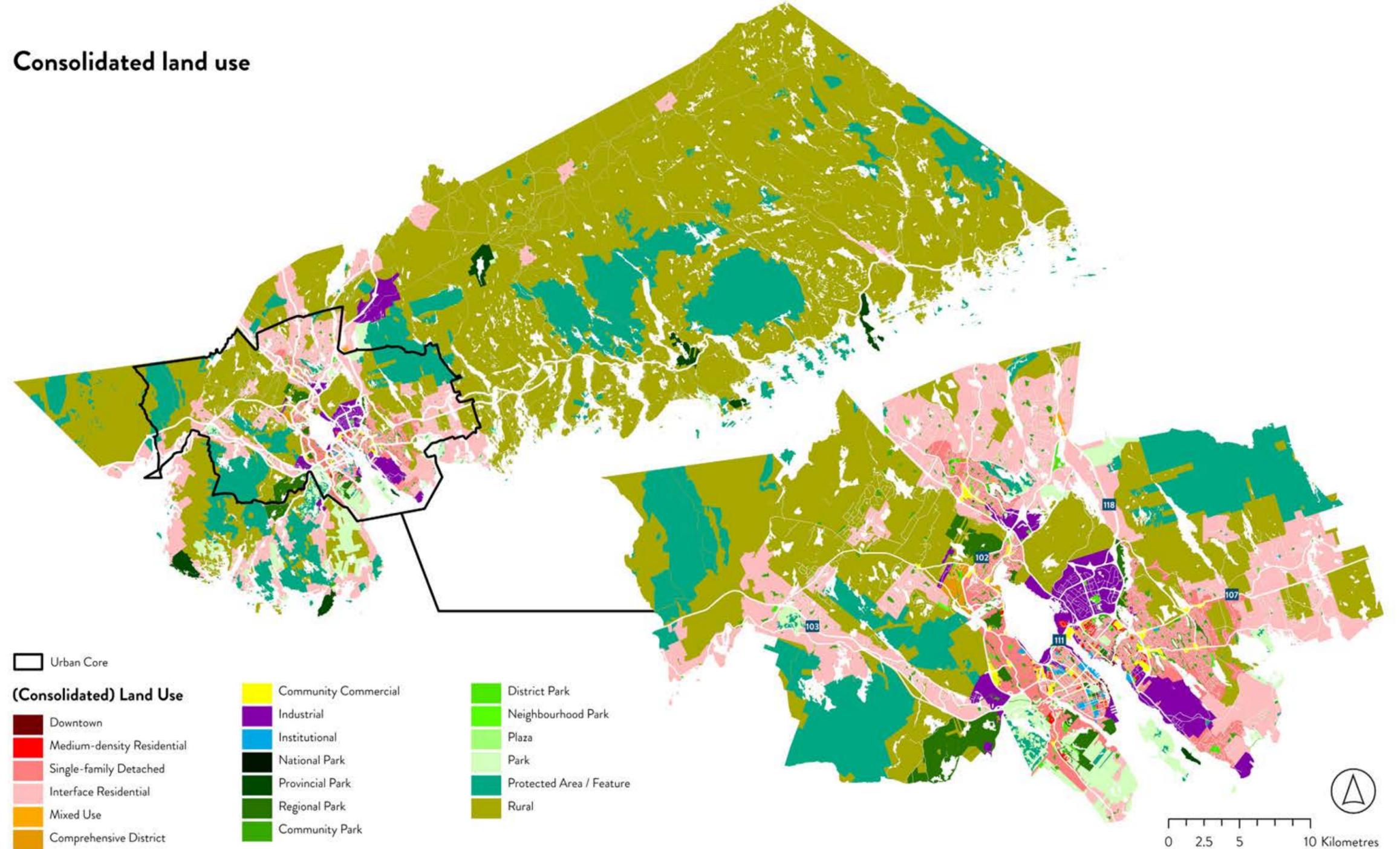- Rural

0   2.5   5   10 Kilometres

Figure 2-8. HRM consolidated land use mapping.

CANOPY CHANGE 2001-22

The University of Maryland's Global Land Analysis & Discovery (GLAD) Lab has monitored annual forest cover change using global satellite imagery for over 20 years.[36] The dataset, with a resolution of 30 m x 30 m, is too coarse to detect individual tree canopies but can identify larger canopy loss/gain events, providing a sense of broad canopy change within the municipality.

GLAD analysis suggests HRM lost over a fifth of its municipality-wide canopy cover between 2000 and 2022, totalling nearly 100,000 hectares. About 10% of this lost canopy began to regrow, and the municipality gained over 20,000 hectares of new canopy in previously non-canopied areas. Overall, this dataset suggests canopy cover in HRM has decreased by nearly 15% over the past twenty years. While some of these losses can be attributed to permanent conversion of forested land to other uses, or to disturbance events (e.g., fire or windthrow), much of the loss observed through GLAD data has been temporary in nature (i.e., has begun the process of regrowth since loss). While GLAD dataset does not support a means for tracking sources of loss, industrial activities, and in particular forest management, it has been and remains a significant driver in canopy cover change within HRM.

HRM is home to a working landscape. Forestry practices and other industrial activities offer important contributions to our growing community and to the broader Nova Scotian economy. Forest management activities, and in particular harvest, by their nature can significantly reduce canopy cover over relatively large areas. It can then take years, or even decades for forests and canopy cover to return to a pre-harvest state. The regulation of forest operations, agriculture, mines, and quarries is the purview of the Province of Nova Scotia.

In HRM's urban core, the municipality lost an estimated 11% (7,500 hectares) of its canopy cover between 2000 and 2022 according to the GLAD analysis. Canopy loss in the urban core is more often permanent due to land use conversion. In the urban core, 10,500 hectares has been lost, 500 hectares of that loss has begun to recover, and another 2,500 hectares of new canopy area has been introduced. Major loss events include the development of the Burnside Industrial Park, the Bedford Bypass, forested area temporarily lost to the Mineville Road fire (this forested area will recover with time), new Bedford subdivisions, and Mansion Avenue land clearing.

Table 2-3. Municipality-wide canopy change.

Year	Gross Canopy Loss (ha.)	Gross Loss (% Canopy)	Losses Recovered 2001-22 (ha.)	Losses Recovered 2001-22 (% of Gross Loss)	Unrecovered Losses 2001-22 (ha.)	Unrecovered Losses 2001-22 (% of Gross Loss)
2005 - 2005	33,759	11.4	8,824	26.1	24,935	73.9
2006 - 2010	28,933	11.0	792	2.7	28,141	97.3
2011 - 2015	19,364	8.3	251	1.3	19,112	98.7
2016 - 2020	12,023	5.6	392	3.3	11,631	96.7
2021 - 2022	2,677	1.3	252	9.4	2,425	90.6
Loss Totals	**96,756**	**32.6%**	**10,511**	**10.9%**	**86,244**	**89.1%**
Maintained (pre-2000) Canopy Area (ha., % of Municipality-wide canopy maintained new since 2000)					**199,864**	**62.5%**
New (post-2000) Canopy Area (ha., % of Municipality-wide canopy cover new since 2000)					**23,205**	**7.3%**
Totals (ha., % Municipality-wide canopy cover)					**319,780**	**58.5%**

Canopy Cover Change (2001 - 2022)

Bedford Bypass

Burnside Industrial Park

Mineville Road fire

Bedford subdivisions (new)

Mansion Avenue land clearing

Urban Core

Canopy Gain
Gain (Since 2001)

Canopy Loss Year
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
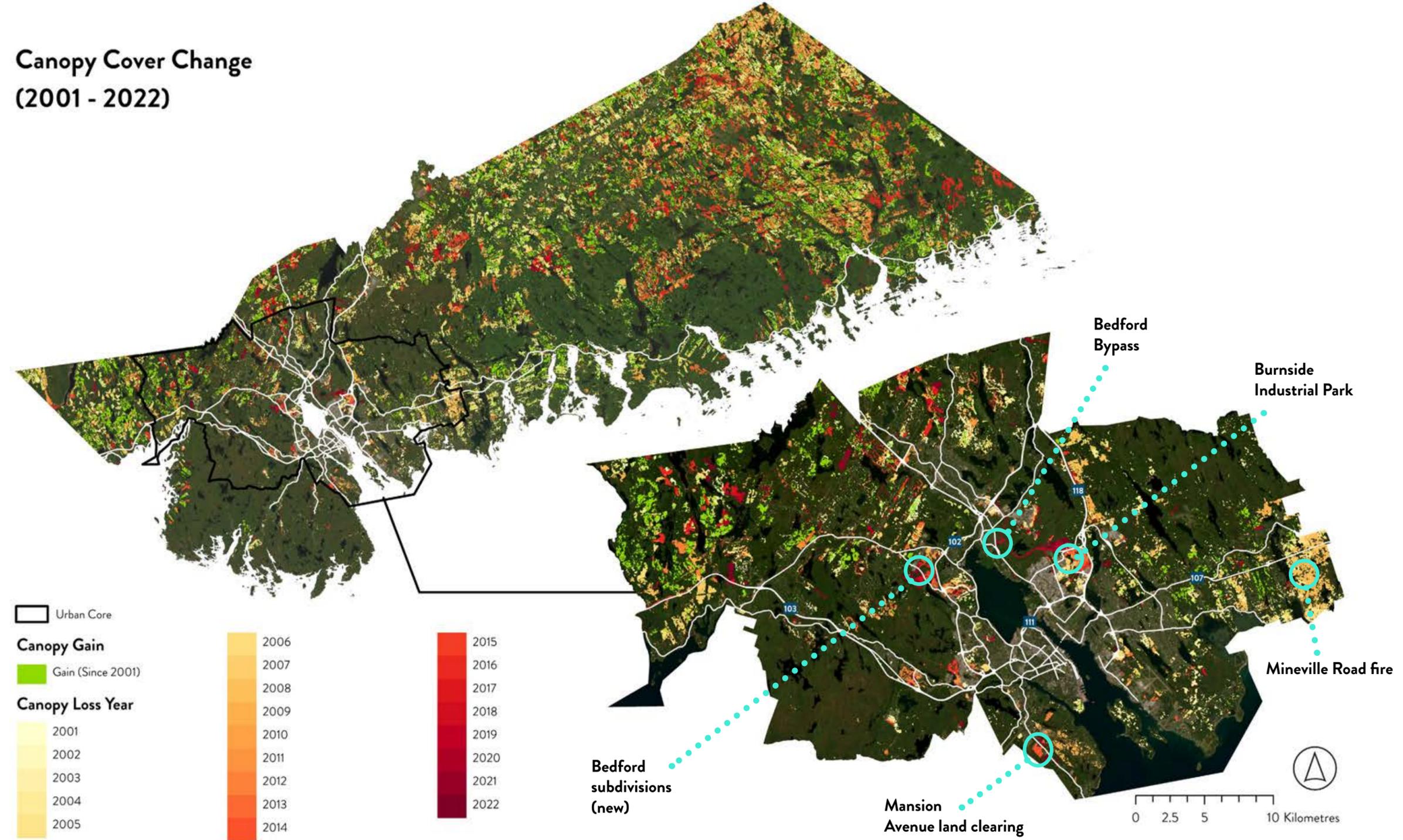2019
2020
2021
2022

0   2.5   5   10 Kilometres

Figure 2-9. HRM canopy loss and gain mapping by year.

2.3. ORNAMENTAL TREES

HRM's Urban Forestry Section maintains an inventory of nearly 80,000 ornamental street trees within the urban core. Most of these trees are intentionally planted along urban boulevards. The tree inventory is about 80% complete as of 2024, with efforts ongoing to finalize the dataset to support operational planning.

SPECIES DIVERSITY

HRM's boulevards are home to approximately 150 tree species and 85 genera. About one in three inventoried trees is a maple, with Norway maple making up 14% and red maple seven percent of the total (**Figure 2-10**). Oak, linden, and elm each constitute eight to ten percent of the tree genera. In terms of individual species, basswood, white elm, and northern red oak make up four to seven percent alone. All other tree species account for less than three percent individually.

Prioritizing diversity in urban planting supports resilience pest and disease outbreak. Where pests or disease often target a relatively small range of plants, having good diversity in a tree population helps to ensure that large clusters of boulevard trees will not be lost in the event of a single outbreak.

HRM's Urban Forestry Section has reduced the planting of maple in recent years in an effort to improve urban forest resilience, however the limited availability of diverse planting stock can hinder the Municipality's capacity to diversify. Ornamental tree diversification is also a gradual process as HRM will not replace healthy trees. Maple will therefore persist as a dominant species in the inventory for many years.

STRUCTURAL DIVERSITY

The core elements of structural diversity are the range of tree sizes and age classes present in an ornamental tree population In many cases, diameter measurements indicate the maturity of the trees. Currently, half of HRM's trees have a diameter (dbh) of less than 15 cm, which is indicative of stable urban forest structure.

Diameter distributions that lack smaller-diameter trees can indicate reduced planting in recent years (**Figure 2-10**). For example, HRM has decreased ash planting due to the threat of emerald ash borer (EAB). Similar trends in pine and spruce reflect reduced planting to avoid susceptibility to spruce budworm. The diameter distribution of maple suggests a shift from past over-planting. Increased use of species like oak, walnut, ginkgo, lilac, hackberry, plane tree, and sweetgum are evidence of HRM's efforts to increase diversity and resilience in the urban forest.
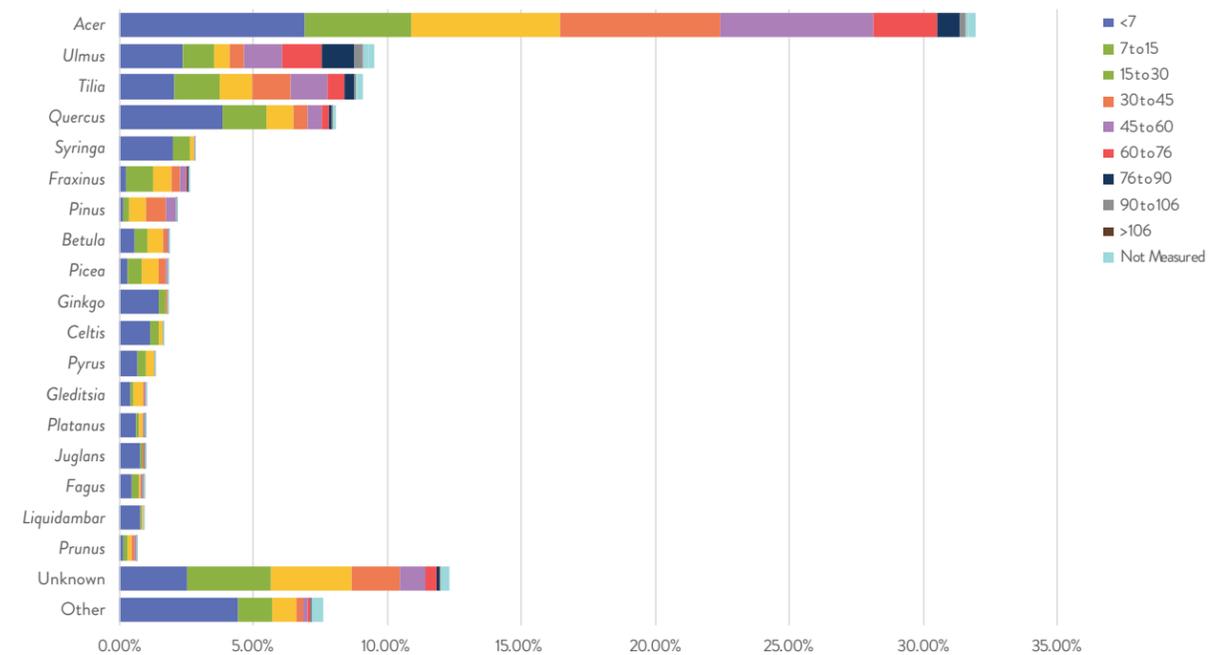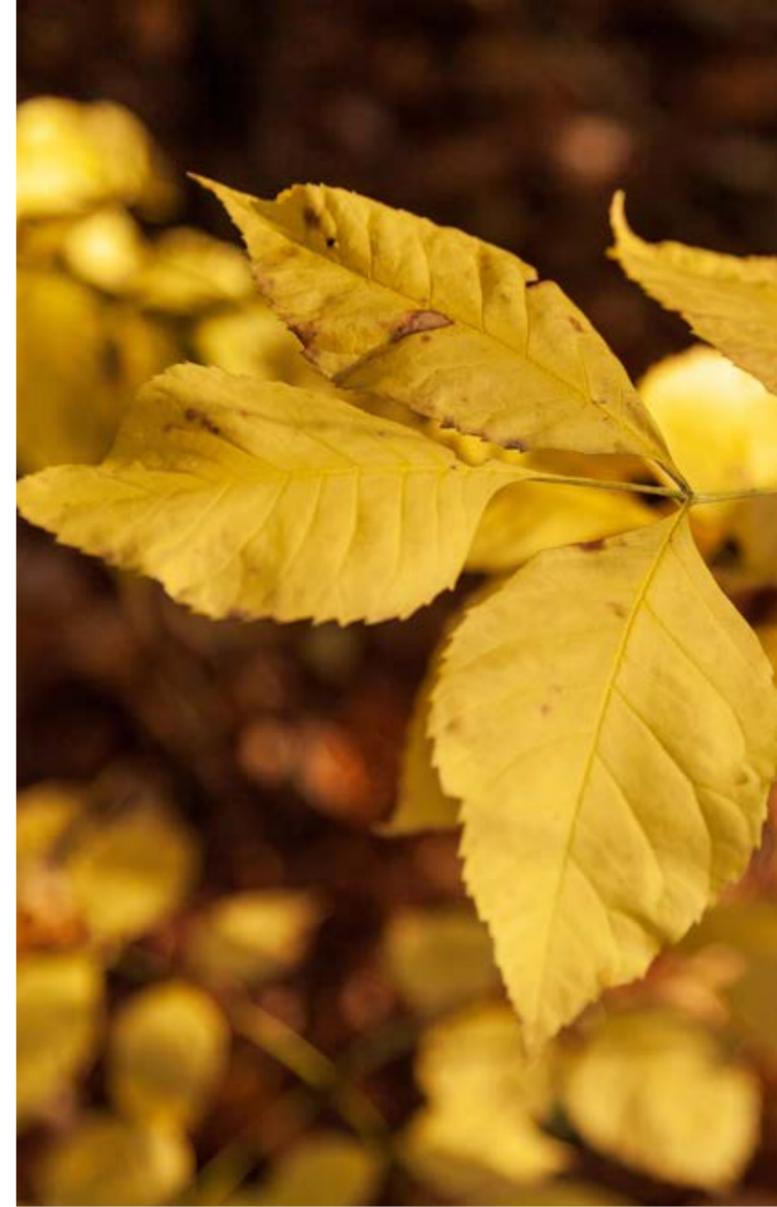

Figure 2-10. HRM top 20 most populous genera by diameter class distribution.

Character Trees

HRM is home to an estimated 150 species of tree, belonging to 85 genera. From evergreen to vibrant fall foliage, the Municipality's parks and streetscapes are home to a great diversity of plants.

A small selection of our favourite trees are shown adjacent. Look for these as you are out walking around our streetscapes.

Did you Know?

That planting objectives, site conditions, and constraints should guide the type of tree you are considering planting on your property? Different species of trees have different traits. Some have showy spring flowers, or vibrant fall foliage, others grow well in areas where soils are limited or of poor quality. Some trees are less resilient to constrained growing sites, or will grow too large if the overhead clearance available is limited (e.g., near a power line). Trees require after care in the years following planting. After care responsibilities differ from one tree to the next. Some species require significant aftercare (e.g., watering), while others tend to more readily become established in a new site.

Consider what you want to accomplish in planting your tree, as well as the limitations of the site you are planting within. Consult with a local nursery, arborist, or do your due diligence when selecting planting stock.

Black Ash
Fraxinus nigra
Shade intolerant, requires moisture. 7-13 opposite leaflets
Leaf · Seed

White Ash
Fraxinus americana
Fast-growing, slightly tolerant to shade 5-9 opposite leaflets, clearly stalked
Leaf · Seed

Pin Oak
Quercus macrocarpa
Large stature, one of the faster to grow, and one of the first oaks to bloom in the spring. Distinctive, dense growth habit.
Leaf · Seed

Japanese Tree Lilac
Syringa reticulata
Small stature, showy flowers. Salt, drought and shade tolerant (full sun for best flowering).
Leaf · Flower

American Hophornbeam /Ironwood
Ostrya virginiana
Small stature, slow growing. Tolerant to shade and low soil volumes. Slow to establish after being planted, but once it does it makes excellent growth.
Leaf · Seed

Katsura
Cercidiphyllum japonicum
Medium-sized stature, medium—fast growth rate. Impressive colour: purplish in spring, blue-green in summer, red and yellow in autumn.
Leaf · Seed

Kentucky Coffeetree
Gymnocladus dioicus
Slow-medium growth rate, large & doubly compound leaf. Very adaptable to drought and city conditions. One of the last trees to leaf out in the spring.
Leaf · Seed

Bur Oak
Quercus macrocarpa
Large stature, slow growing. Very adaptable to various soils/more tolerant of city conditions than most oaks.
Leaf · Seed

Swamp White Oak
Quercus bicolor
Large stature, slow growing, excellent drought resistance.
Leaf · Seed

Red Oak
Quercus rubra
Large stature, one of the faster growing oaks, withstands the polluted air of cities.
Leaf · Seed

Gingko (Male)
Ginkgo biloba
Large stature, slow growing. Extremely tolerant to urban conditions, unique fan shaped leaves. No know pests or diseases affect it.
Leaf · Fruit

Hackberry
Celtis occidentalis
Medium-large stature, medium-fast growth rate. Performs admirably under adverse conditions, interesting ridged bark.
Leaf · Seed

European Hornbeam
Carpinus betulus
Medium-sized stature, Slow-medium growth rate. Very tolerant to urban conditions, pruning seldom required although withstands heavy pruning.
Leaf · Seed

Basswood
Tilia americana
Large stature, medium growth rate. Very shade tolerant. Has a tendency to produce suckers at its base.
Leaf · Flower

European Beech
Fagus sylvatica
Slow-medium growth rate. Attractive smooth grey bark, dense canopy, resistant to beech bark disease. Tendency to retain leaves into the winter.
Leaf · Seed

American Elm
Ulmus americana
One of Halifax's most common street trees. Very hardy, large, vase shaped. Medium-fast growing. Grows well under a variety of conditions.
Leaf · Seed

Sweetgum
Liquidambar styraciflua
Tolerant to wet conditions, medium-fast growing. Bright fall colour, symmetrical shape.
Leaf · Seed

Silver Linden
Tilia tomentosa
Large stature, medium growth rate. Tolerates heat and drought better than other lindens.
Leaf · Seed

Northern Catalpa
Catalpa speciosa
Large stature, medium-fast growth rate. Tolerant to varying soil conditions, grows in sun or partial shade. Large, heart shaped leaves.
Leaf · Seed

Yellow Birch
Betula alleghaniensis
Large stature, medium growth rate. The largest and most shade tolerant of the eastern birches.
Leaf · Seed

Shagbark Hickory
Carya ovata
Large stature, slow growing. Sweet, edible fruit. Large, deep taproot. Unique bark - long, flat plates which are free at the base or both ends.
Leaf · Seed

Tuliptree
Liriodendron tulipifera
Large stature, fast growing. Large showy flowers blooming from May-June, suited to a wide climatic range.
Leaf · Flower

Red Maple
Acer rubrum (species and cultivars)
Large stature, medium - fast growing, red fall colour. Very tolerant of soils but prefers slightly acidic.
Leaf · Seed

Honeylocust
Gleditsia triacanthos Inermis
Very tolerant to urban conditions, fast growing, casts a light shade due to small leaflets. Only the thornless variety is planted in the right of way.
Leaf · Seed

White Pine
Pinus strobus
Large stature, one of the fastest growing landscape pines. Thrives in full sunlight, occurs naturally on a variety of sites (dry sandy soil, rocky ridges, sphagnum bogs).
Needles · Seed

Sycamore Maple
Large stature, medium growth rate. Withstands the full force of salt-laden winds in exposed places Very adaptable to soil types.
Leaf · Seed

Sugar Maple
Acer saccharum
Large stature, slow growing. One of the best larger shade/lawn trees, but tends to suffer in exteded periods of heat
Leaf · Seed

Larch
Larix laricina
Large, slender stature, slow-medium growth rate. Grows best in moist, well-drained, acidic soil. Intolerant of shade.
Needles · Seed

ORNAMENTAL TREE DENSITY

Ornamental tree maintenance programs are typically the largest expense in an urban forest management program. Mapping ornamental tree density helps illustrate where HRM's urban forestry resources are predominantly being directed (**Figure 2-11**).

Figure 2-11 shows the average number of ornamental trees per kilometre of public road within each census dissemination area in the urban core. Ornamental tree density in HRM ranges from zero in rural dissemination areas to over 250 trees per kilometre in some peninsular neighbourhoods. The lowest densities in the urban core are in sparsely populated, interface areas (less than 10 trees per kilometre of public road). Large commercial and industrial areas also have low densities, between 30 and 50 trees per kilometre of public road. Residential and mixed-use areas generally have higher densities, over 50 trees per kilometre of public road, although this varies by neighbourhood. In peninsular Halifax and Dartmouth, ornamental tree density is influenced by built form and available planting space in urban streetscapes.
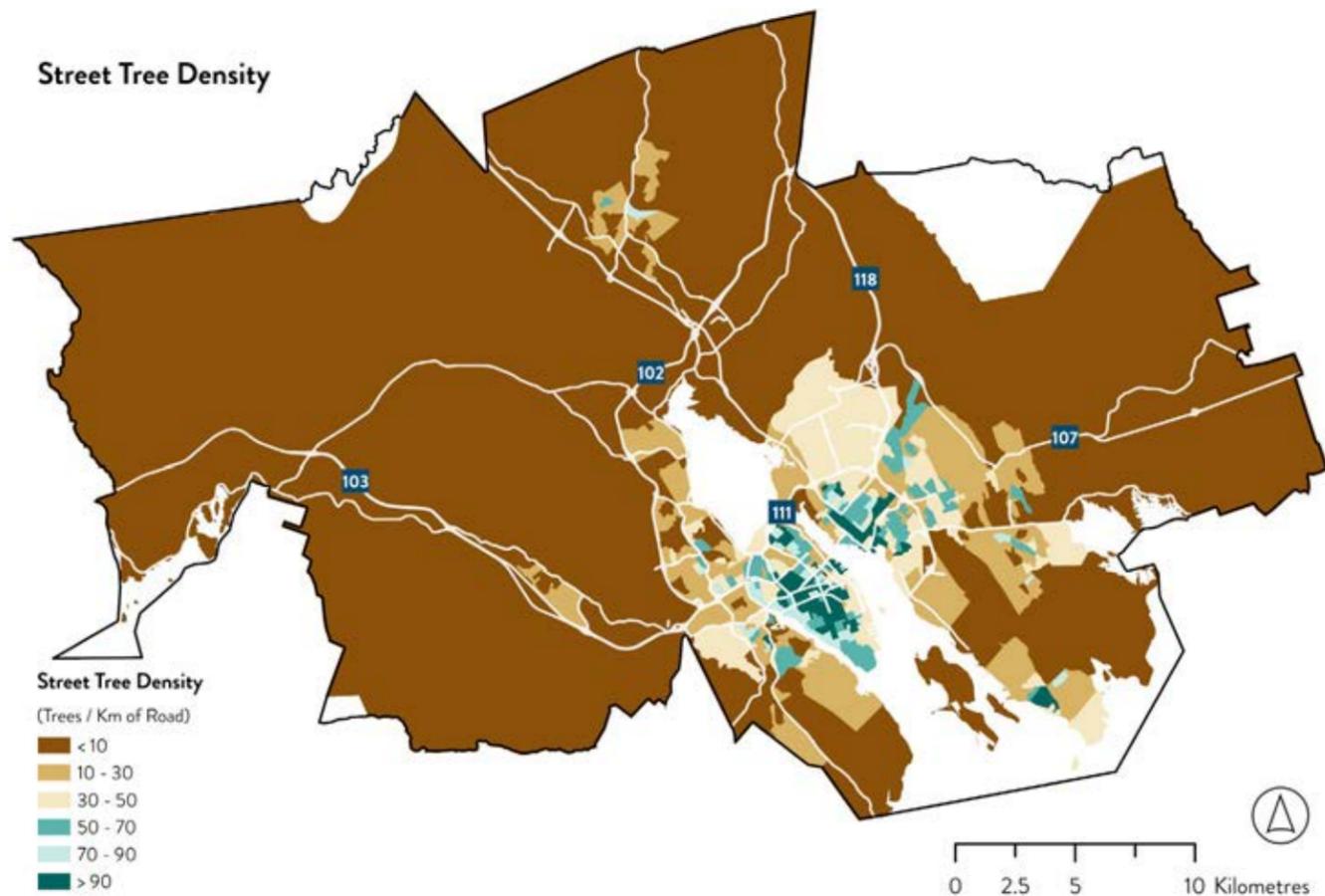
SUCCESSION MANAGEMENT

Succession management describes a process of proactively removing and replacing trees that are reaching the end of their life. Succession occurs with or without a formalized approach in place. The benefit of a formalized approach is that the municipality can avoid entire streetscapes or neighbrouhoods reaching the end of useful life along a similar trajectory. Today, this is a concern in some of HRM's older subdivisions where trees were planted at the same time, with only one or two species, and are now aging along a similar timeline.

Proactive succession management involves gradual removal and replacement of senescing trees, facilitating a more gradual canopy loss and allowing time for replacement trees to grow as older trees are removed. Proactive succession management also ensures future tree age classes are staggered. Converting monocultural neighbourhood palletes to a more diverse species mix also ensures trees have different life expectancies, and builds resilience to pests and disease.

While the current tree inventory does not include age data, it does provide diameter distributions. Diameter class can be used as a coarse proxy for age, although the relationship between size and age is not exact. **Figure 2-3** maps HRM's dissemination areas with concentrations of relatively large trees (over 60 cm dbh). Dissemination areas with particularly high concentrations of large trees have been designated Succession Monitoring and Management Districts (SMMDs). In these districts, the Municipality will need to monitor old trees and begin to consider proactive approaches to managing successional replacement.
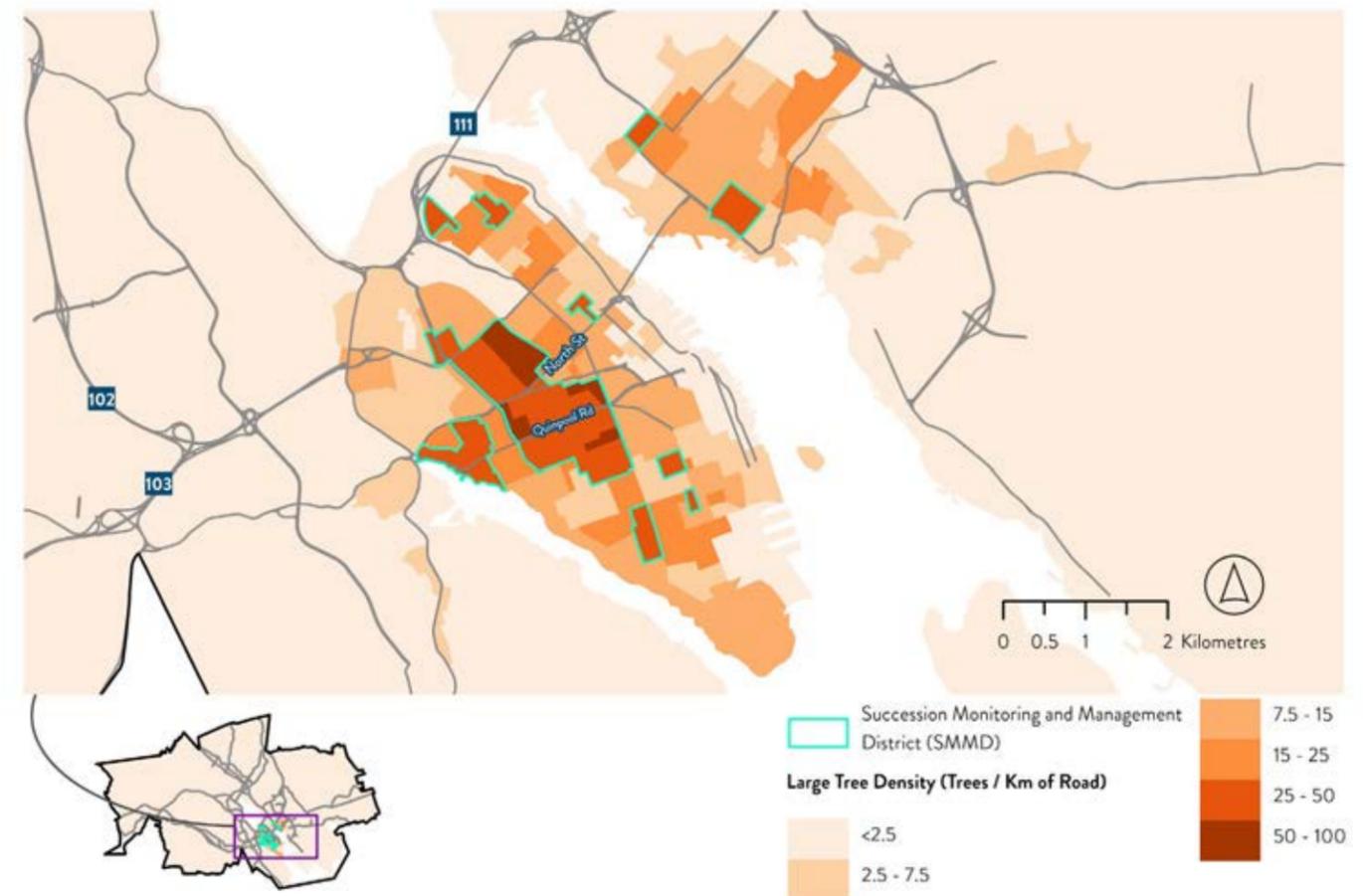

Figure 2-11. HRM ornamental tree density by DA in the urban core (2023).

Figure 2-12. HRM large tree density and Succession Monitoring and Management Districts (SMMDs).

Tree Equity Score Calculation

Surface temperatures and a socioeconomic index that includes income, age, race and employment are combined to yield a priority index. Priority index is then combined with tree equity to yield a Tree Equity Score (**Figure 2-17**).

High priority index values are represented as HRM's ECMDs (**Figure 2-17**). Low Tree Equity Score Values are represented as HRM's UFEDs.
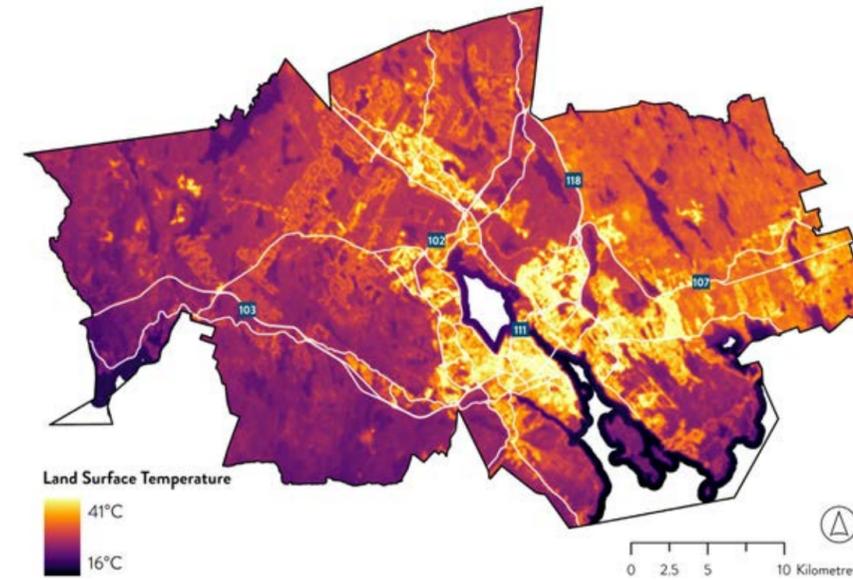

Land Surface Temperature
41°C
16°C

Figure 2-13. Mean surface temperature mapping in HRM's urban core (July 2020).

Socioeconomic Index
Low Concentration of Cenus Groups
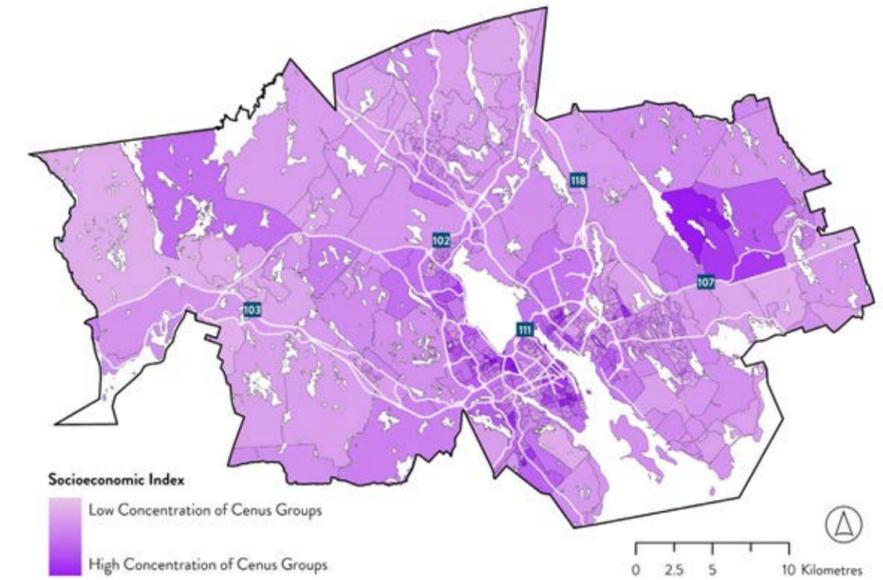High Concentration of Cenus Groups

Figure 2-14. Socioeconomic indicators mapping in HRM's urban core.

2.4. URBAN FOREST EQUITY

Studies have found that trees and tree canopy are often inequitably distributed within urban communities.[38,39] While specific patterns of inequity vary by local context, education level and income correlate with canopy cover in many urban centres. Tree inequities can often exacerbate uneven climate change impacts across demographic and socioeconomic profiles.[40,41] Older adults, for example, are often more vulnerable to extreme heat, and lower-income households may not be able to afford cooling systems.

Figure 2-17 contains current canopy equity mapping across census dissemination areas in HRM using methods adapted from an approach pioneered by American Forests'.[42] The adapted methods support the calculation of a Tree Equity Score (TES) using census and climatic datasets widely available in Canada (**Table 2-4**).

TES is an evaluation of how well tree canopy and surface temperature aligns with localized income, employment, race, age, and health factors in a neighbourhood (in this case, census dissemination areas). Tree Equity Score values range from 0 to 100, with lower values corresponding to dissemination areas that have combinations of high land surface temperatures and low canopy cover relative to equity-deserving and vulnerable

WHAT WE HEARD

African Nova Scotians/Canadians expressed wanting better access to parks, green spaces, walking trails, and sidewalks in rural and suburban African Nova Scotian communities.

populations. **Figure 2-13**, **Figure 2-14**, **Figure 2-16**, and **Figure 2-15** on the following page illustrates how TES is calculated. Census indicators (**Table 2-4**, **Figure 2-14**) are fused with urban heat mapping (**Figure 2-13**) to yield a 'priority score' (**Figure 2-16**), which is then combined with canopy mapping (**Figure 2-15**) and relevant canopy targets, to produce a final TES layer.

TES in HRM ranges from 40 to 100, with a mean score of 95. The Municipality's dissemination areas with the lowest tree equity scores (bottom five percent), have TES scores of less than 80 (**Figure 2-17**).

Two new classes of management district have been established through this plan(**Figure 2-17**) - **Urban**

Canopy Coverage

Canopy Coverage
100%
0%
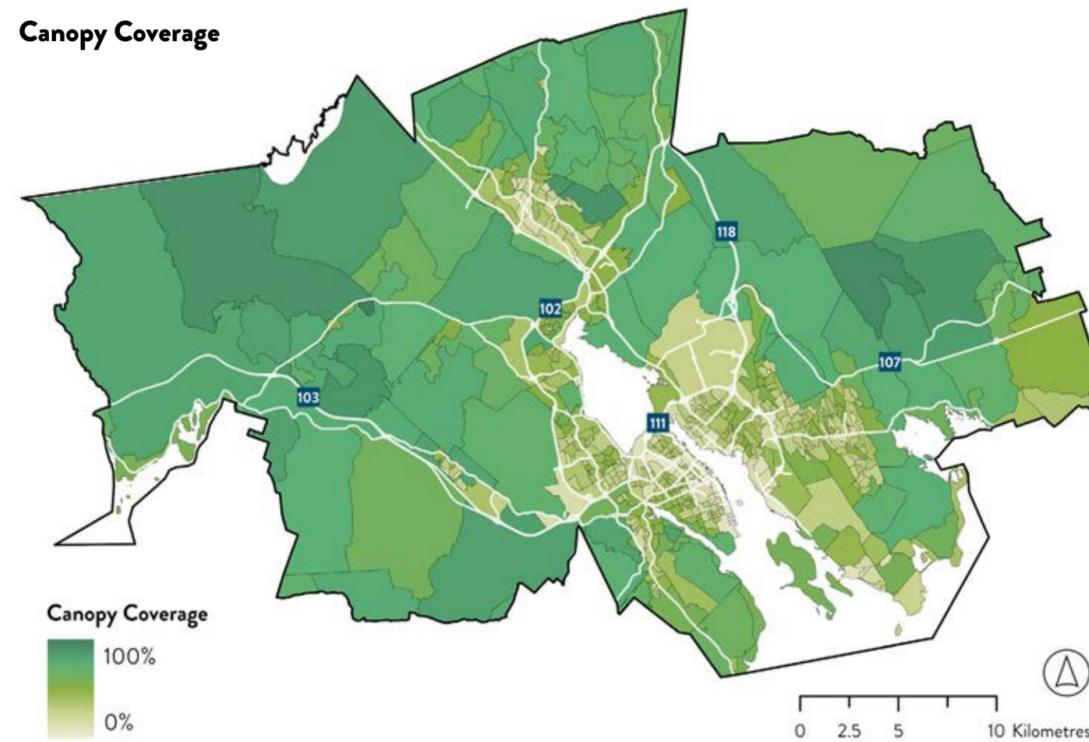
Figure 2-15. Tree canopy mapping in HRM's urban core.

Priority Index

Priority Index
Lower Social Priority
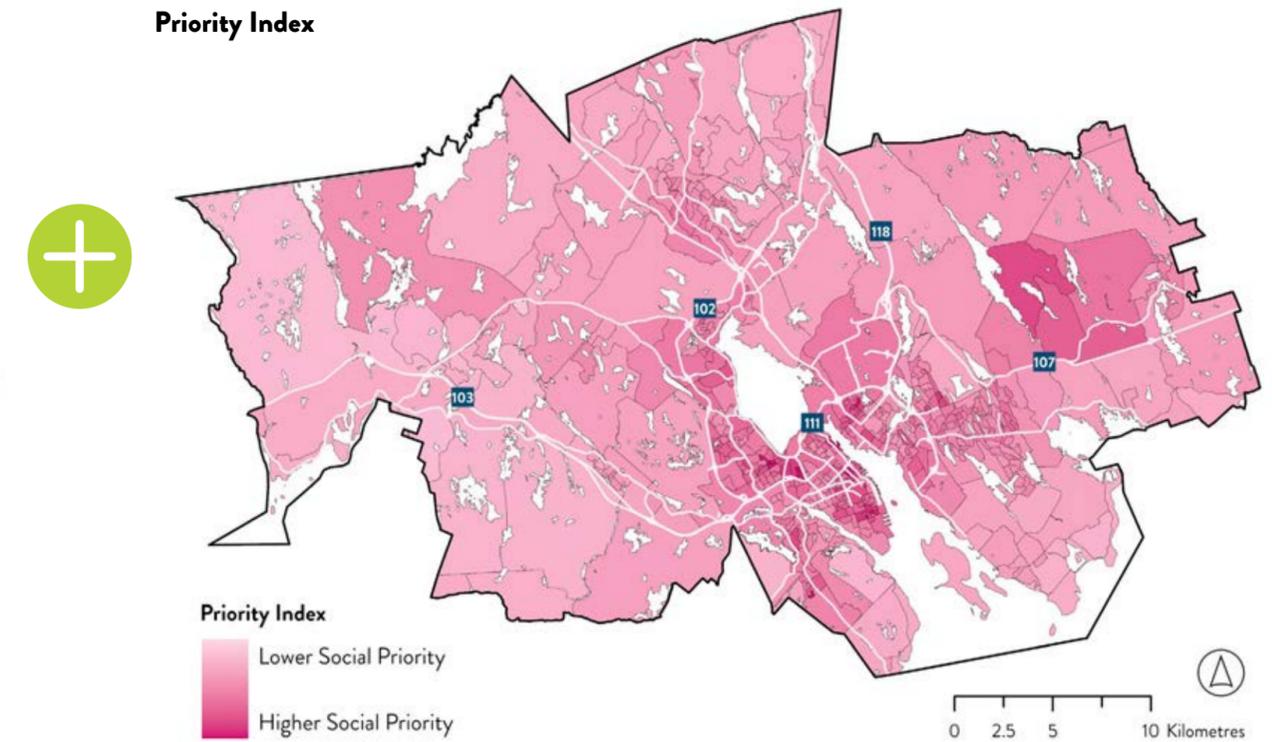Higher Social Priority

Figure 2-16. Priority index mapping in HRM's urban core obtained by merging surface temperature and socioeconomic indicators.

Urban Forest Enhancement Districts (UFEDs)

Several areas of HRM stand out in the Tree Equity Score mapping (**Figure 2-17**). These areas include:

- Bayer's Lake and Beechville,
- Parts of Glenbourne and Sherwood Heights,
- Parts of Southdale and Russell Lake West,
- Areas of the North End, Halifax peninsula,
- Parts of Mt Uniacke and Upper/Middle Sackville, and
- Parts of Cole Harbour and Westphal.

These are the areas where HRM should place heightened priority on tree-supportive outcomes on both public and private land. This can be achieved through the regulation of private development, but may also involve incentives, subsidies, and special attention through capital works and construction projects.

Table 2-4. Demographic, economic, and environmental factors used in determining priority canopy areas within Burlington.
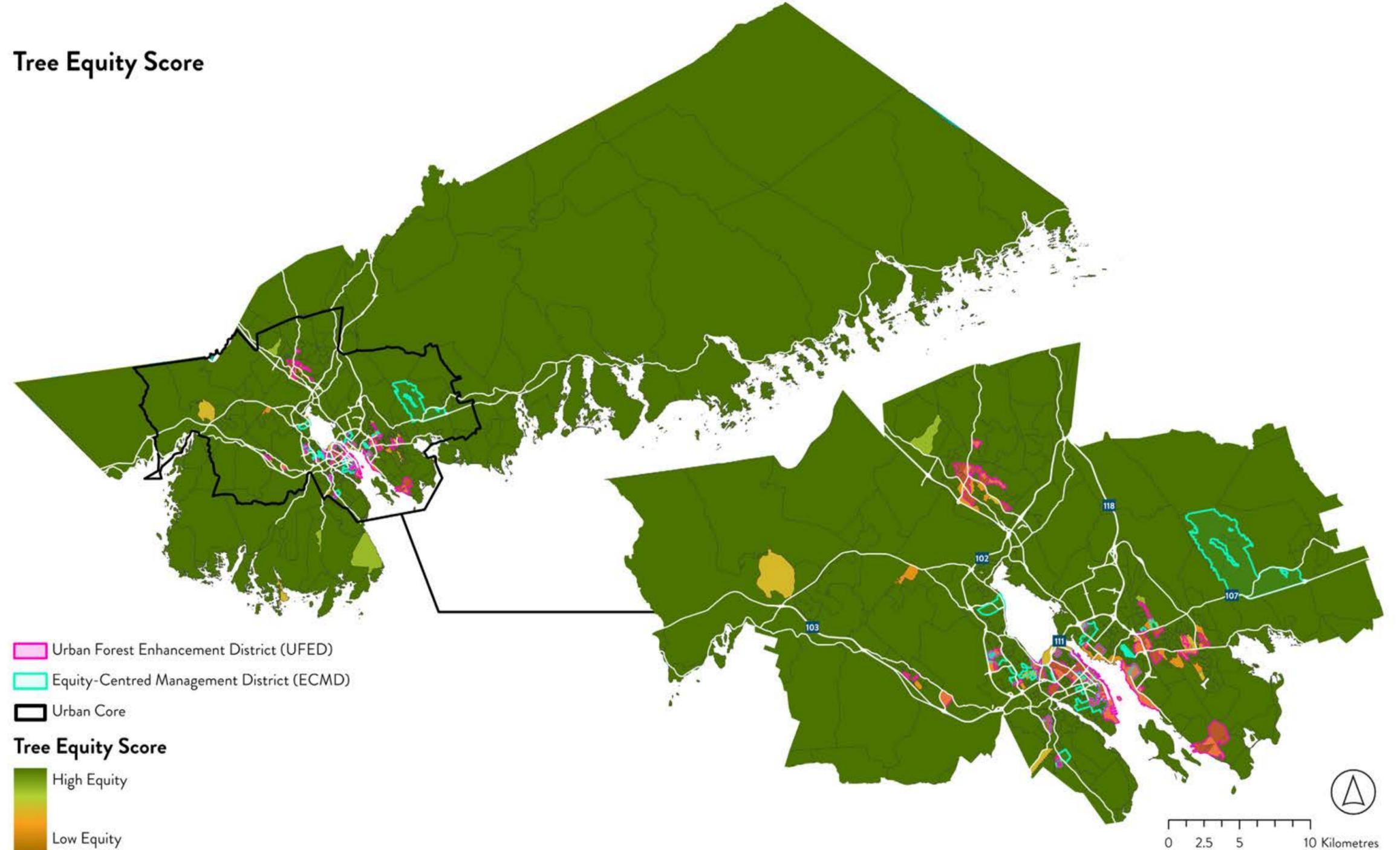
Factor	Description of Measurement
Climate	Average surface temperature, as measured from remote sensing data.
Income	Percentage of people living on incomes below 200% of the federally-designated poverty line (< CAD $40,000)
Age	Seniors (age 65+) and children (0-14) as a proportion of working age adults (15-64).
Race	Percentage of people who belong to visible minority groups, as defined by the Employment Equity Act and, if so, the visible minority group to which the person belongs.
Employment	Percentage of the labour force that do not have a job, but are available and willing.

Forest Enhancement Districts (UFEDs) and **Equity-Centered Management Districts (ECMDs)** (**Figure 2-17**). UFEDs are geographies where tree canopy is low, despite high concentrations of equity-deserving individuals. To reconcile this issue, the Municipality will prioritize tree protection in such areas, as well as design and construction details on both private and public property that improve the provision of trees in such UFEDs.

This contrasts ECMDs, which are areas characterized by high concentrations of equity-deserving individuals, but are also areas where tree canopy is already fairly high. In ECMDs, tree planting is therefore not necessarily an optimal equity-centered management approach. There may however be other management approaches and interventions that could support equitable outcomes in these areas.

Beyond select districts, HRM can adopt management and outreach processes that ensure equitable outcomes are considered through management interventions, procurement, community outreach and engagement, and urban forest investment.

Tree Equity Score

Legend:
- Urban Forest Enhancement District (UFED)
- Equity-Centred Management District (ECMD)
- Urban Core

Tree Equity Score
- High Equity
- Low Equity

0   2.5   5   10 Kilometres

Figure 2-17. HRM's urban core TES mapping, equity-centered management districts (ECMDs) and Urban Forest Enhancement Districts (UFEDs) for illustrative purposes only. Full analysis conducted for HRM and used in this to guide this plan.

Equity-Centered Management Districts (ECMDs)

Several areas of HRM stand out in the Prioritization mapping (**Figure 2-16**), but not necessarily in the Tree Equity Score mapping (**Figure 2-17**). These areas include:

- Uniacke Square and surrounding residential area,
- Residential areas immediately surrounding South Street,
- Albro Lake and Harbourview neighbourhoods,
- Parts of Fairview and Clayton Park,
- Parts of Spryfield,
- Millview neighbourhood, and
- North and East Preston.

These areas, coined Equity-Centered Management Districts (ECMDs), generally have adequate tree canopy at present. As a result, tree planting may not be needed, but equity considerations should still inform management interventions and approaches. Several of these ECMDs are comprised of lower income, immigrant, refugee, and African Nova Scotian populations, including the two largest African Nova Scotian communities in Nova Scotia, East and North Preston. Uniacke Square, Fairview and Spryfield have a significant immigrant, refugee, and African descended population. Some of these areas may need more support for cleanup after significant storms, while others may need to be a priority for replacement replanting if trees are reaching the end of their life expectancy. In rural areas, equity-cenetered management might focus on building wildfire resilience or ensuring quality trails infrastructure on public lands meets community needs.

EQUITY AND ORNAMENTAL TREES

HRM can measure the extent to which it has contributed to tree equity gaps by mapping areas where tree equity overlaps with areas of low ornamental tree density (**Figure 2-18**). In areas with both low ornamental tree density and low tree equity, we can assume scarcity of municipal investment in ornamental tree planting has directly contributed to lower tree equity. As an organization, HRM will prioritize the introduction of new ornamental trees to areas with low tree equity.

Put simply, in **Figure 2-18** below, **purple** can be viewed as areas of the municipality where tree equity and public ornamental tree density are both high, **blue** as areas where tree equity is high despite relatively low public ornamental tree density, **vibrant green** as areas where tree equity is low despite relatively high public ornamental tree densit (i.e., these are areas where private land may be driving existing urban forest equity gaps), and **muted green** as areas where public ornamental tree density and tree equity are both low (i.e., these are areas where a lesser presence of public ornamental trees may be contributing to existing urban forest equity gaps).
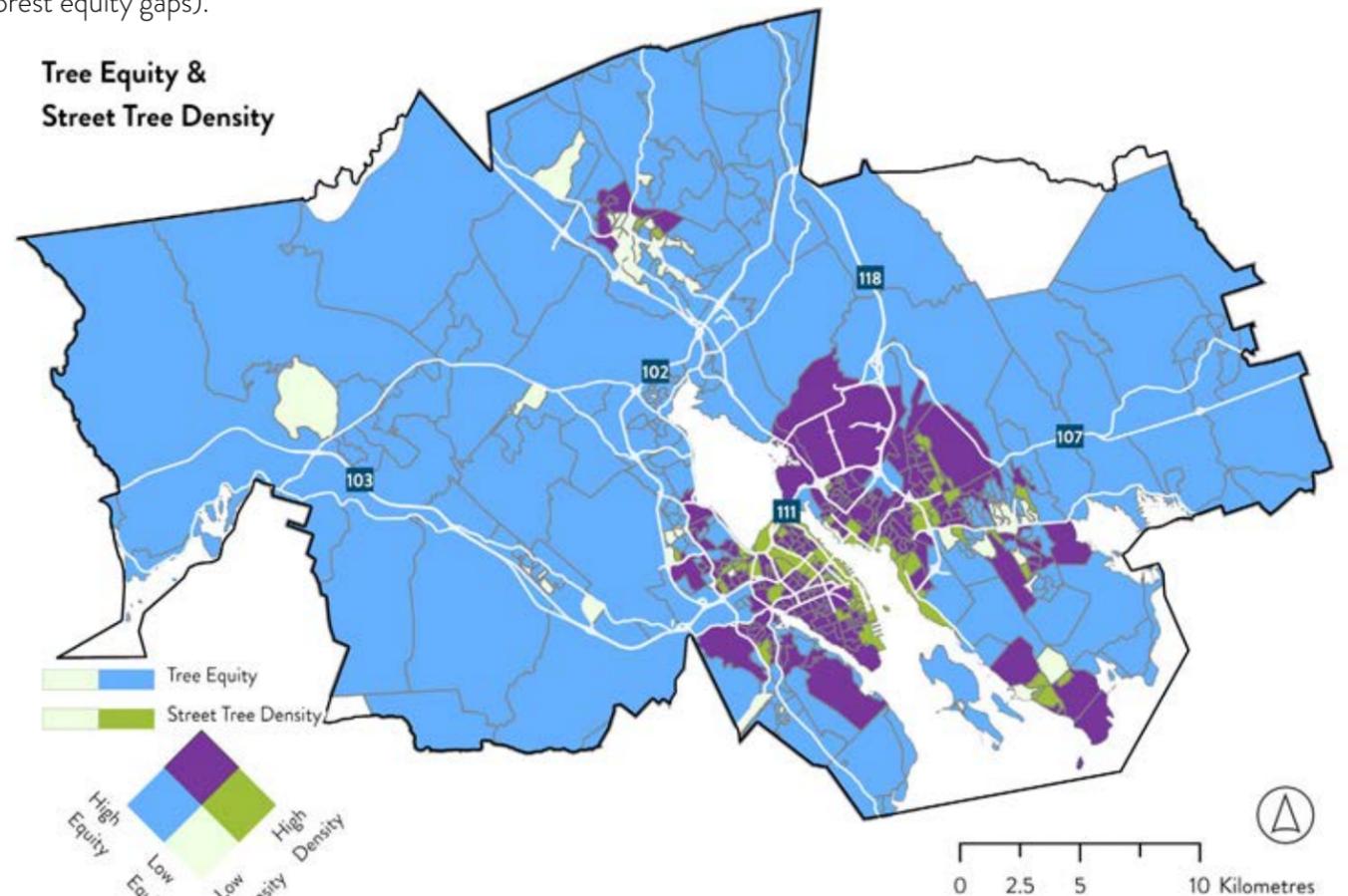

Figure 2-18. Bivariate equity-ornamental tree density analysis in HRM's urban core (2023).

Our Program
Notre programme

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3

3.1. HRM'S URBAN FOREST PROGRAM

PUBLIC WORKS BUSINESS UNIT

The Urban Forestry Section, under the Property, Fleet & Environment Unit, is primarily responsible for municipal trees in HRM. This includes tree inventory, maintenance, planting, and removal (including stump removal), rural vegetation management, and coordination with other departments and external parties on tree-related matters. However, Urban Forestry is not the only entity involved in managing HRM's urban forest. This section explores the roles, responsibilities, and interests of various stakeholders.

OTHER VESTED PARTIES

Parks and Recreation

Parks and Recreation manages tree maintenance and planting within HRM's parks but lacks arboricultural capacity and relies on Urban Forestry for tree care. Currently, HRM has no formal program for managing the municipality's forested parks, and these assets are managed reactively as issues arise.

Planning and Development

Planning and Development significantly influences the urban forest through HRM's planning and development processes, policy documents, and bylaws. The unit liaises with Urban Forestry, but tree-related outcomes on private property depend on planning policies and standards.

Public Works

Public Works influences the urban forest through HRM's capital design and construction processes, standards documents, and specifications. This includes engineering standards for rights-of-way and the management of trees during construction projects, affecting the retention of trees along streetscapes.

Halifax Regional Fire and Emergency

Fire and Emergency is responsible for emergency management in HRM, including storm response and cleanup. The unit will collaborate with Urban Forestry on wildfire management initiatives that interface with municipal tree assets.

Environment and Climate Change

Environment and Climate Change offers subject matter expertise and logistical support to the Urban Forest team as needed. Some examples of these collaborative efforts include, supporting urban forest initiatives like the annual Tree Giveaway, collaborating on tree planting programs as they relate to naturalization programs, and managing the Invasive Pest Management Strategy which often overlaps with other urban forest activities.

Finance and Asset Management Unit

Finance and Asset Management influences urban forest management through administering the Municipal approach to asset management, which can encompass green infrastructure, such as trees. Efforts are underway to integrate ornamental trees into HRM's asset management framework, with opportunities to enhance natural asset management through better planning and accounting processes.

Government of Nova Scotia

The Province manages trees along provincial highways, forest management on Crown land, and regulates forest practices on private land. It also oversees the Halifax Charter, detailing HRM's development regulation, taxation, and tree-related liabilities. The Province manages trees in Provincial Parks and administers the Old Growth Forest Policy and protected areas.

Halifax Water

The Halifax Regional Water Commission, publicly known as Halifax Water, is the municipal water, wastewater and stormwater utility serving the residents of the HRM, pursuant to the Public Utilities Act. Given its role in the upkeep and development of new water infrastructure, Halifax Water has an important role in accommodating ornamental trees through their design work and construction activities.

Nonprofits and Community Organizations

Organizations like the Nova Scotia Nature Trust, Nature Conservancy of Canada, and Ducks Unlimited influence HRM's urban forest through conservation practices on their land. Collaborations with nonprofits and community organizations can support community initiatives and investment in the urban forest, enhancing community capacities.

Nova Scotia Power

Nova Scotia Power manages transmission lines in HRM and addresses tree-related issues affecting power lines. The utility coordinates with Urban Forestry on clearance, maintenance, and storm cleanup.

Private Residents, Businesses, and Land Managers

With 71% of HRM's land privately owned, most trees are under private ownership. While HRM intervenes in specific circumstances (e.g., clearance pruning, hazard abatement), private property owners are responsible for most of HRM's tree canopy. Residents and businesses can support the urban forest by practicing good tree care, planting trees, or participating in urban forestry events.
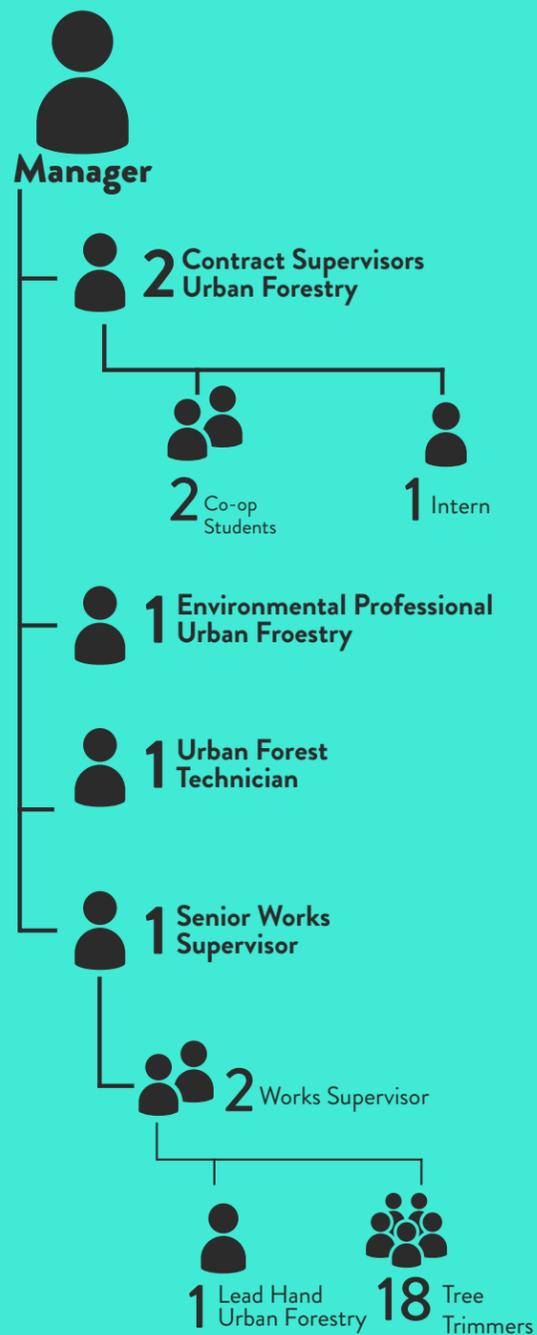
Figure 3-1. Urban Forestry Division organizational chart.

Manager

2 Contract Supervisors Urban Forestry

2 Co-op Students

1 Intern

1 Environmental Professional Urban Froestry

1 Urban Forest Technician

1 Senior Works Supervisor

2 Works Supervisor

1 Lead Hand Urban Forestry

18 Tree Trimmers

URBAN FORESTRY PROGRAM AT A GLANCE

HRM's Urban Forestry Section is the primary entity responsible for managing the Municipality's trees, comprising a team of 30 staff (**Figure 3-1**). These front-line workers in urban forest management:

- Implement HRM's proactive tree maintenance program,
- Undertake tree inspection,
- Liaise with other departments,
- Lead in storm response, and
- Administer capital contracts

In 2023/24, Urban Forestry operated on a budget of $4.2 million (**Figure 3-3**). Capital funds totalling $1.7 million supported tree planting, and the annual tree giveaway. Since 2018, HRM's Urban Forestry's operating budget has been tied to the number of assets under the Section's care. This is an industry best practice, but is contingent on adequate base funding to meet service level commitments. As of 2023/24, HRM's operating funding is approximately $10 per resident, $2 less per resident than the average among cities of similar size with populations over 100,000, and $4 per resident less than leading urban forestry programs (**Figure 3-3**).

Despite the lower per-resident funding, Urban Forestry has had success in its public tree planting program. Since 2018, HRM has planted about 5,300 more boulevard trees than have been removed (**Figure 3-2**), averaging 1,000 new trees per year, though annual numbers have varied (partly due to COVID-19). These figures
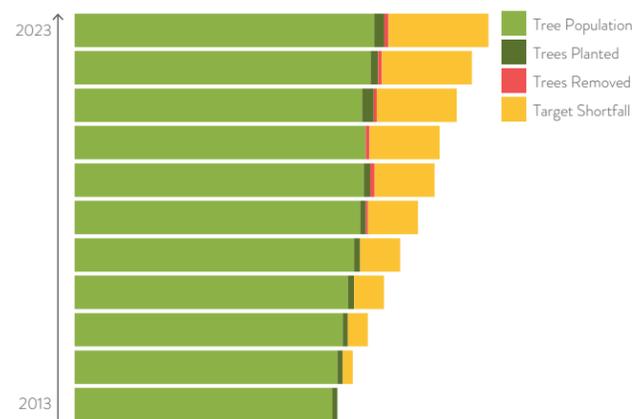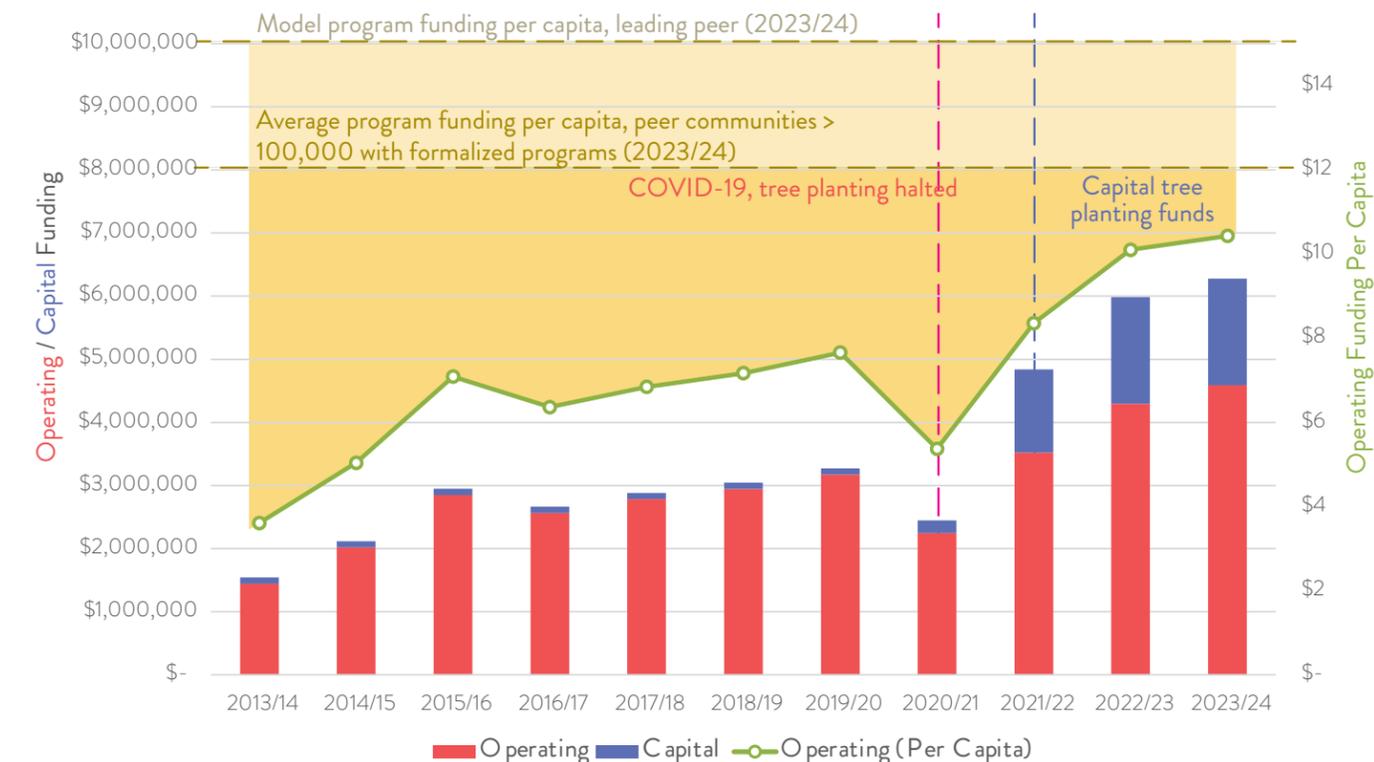

Figure 3-2. Tree inventory, removals, planting, and 2013 UFMP target shortfalls between 2013/14 and 2023/24.

exclude new trees planted during development. These achievements are commendable but also highlight the Municipality's struggle to meet its annual planting targets as set out through the preceding 2013 Urban Forest Master Plan (**Figure 3-12**). Targets identified through the 2013 Urban Forest Master Plan have never been met and the shortfall between real planted numbers and the Municipality's cumulative planting target has grown steadily since 2014 (**Figure 3-12**).

The growing challenges in ornamental tree planting and maintenance have been compounded by resource constraints. The Municipality's commitment to a seven-year grid pruning cycle is undermined by insufficient budget, forcing a longer cycle at present. Proactive care for both young (i.e., structural training) and mature (i.e., grid pruning) are the hallmark of a sustainable forest management program, and are widely recognized to net the best returns for public investment in public tree care.

HRM's Parks Department holds responsibility in the management of municipality's forested areas. Despite this formal role, there is currently no formal program or resources to support proactive management interventions in the HRM's large network of forested parks. Much the same as with ornamental tree

maintenance, proactive investment into public forested and natural areas is considered to be an industry best practice.

As service demands continue to rise with population change, so to will the need for urban forest management resources in order to both maintain existing service levels and undertake any identified expansions to the Municipality's urban forest program scope.

Figure 3-3. Urban Forestry operating and capital budgets by fiscal year.

As a Regional Municipality with a large rural area, HRM is somewhat unique in its size, makeup, and responsibilities within a Canadian context. While this context impedes some direct comparisons to other municipalities, understanding how HRM's program compares to its peers remains insightful, especially regarding shared program elements.

A jurisdictional scan was conducted as part of the UFMP update (Figure 3-4). Nine peer communities were selected based on qualitative criteria such as being a regional peer, having similar urban and rural areas, similar population, or comparable community densities. For example, Victoria, BC, is similar to peninsular Halifax-Dartmouth.

Contacts from each peer community were asked to complete a brief survey identifying key elements of their urban forestry programs. Survey responses were self-reported and standardized by project staff as much as possible. Significant differences in program structure, funding, and scope exist among Canadian communities, so this comparison provides only a rough evaluation of HRM's urban forestry program relative to its peers.
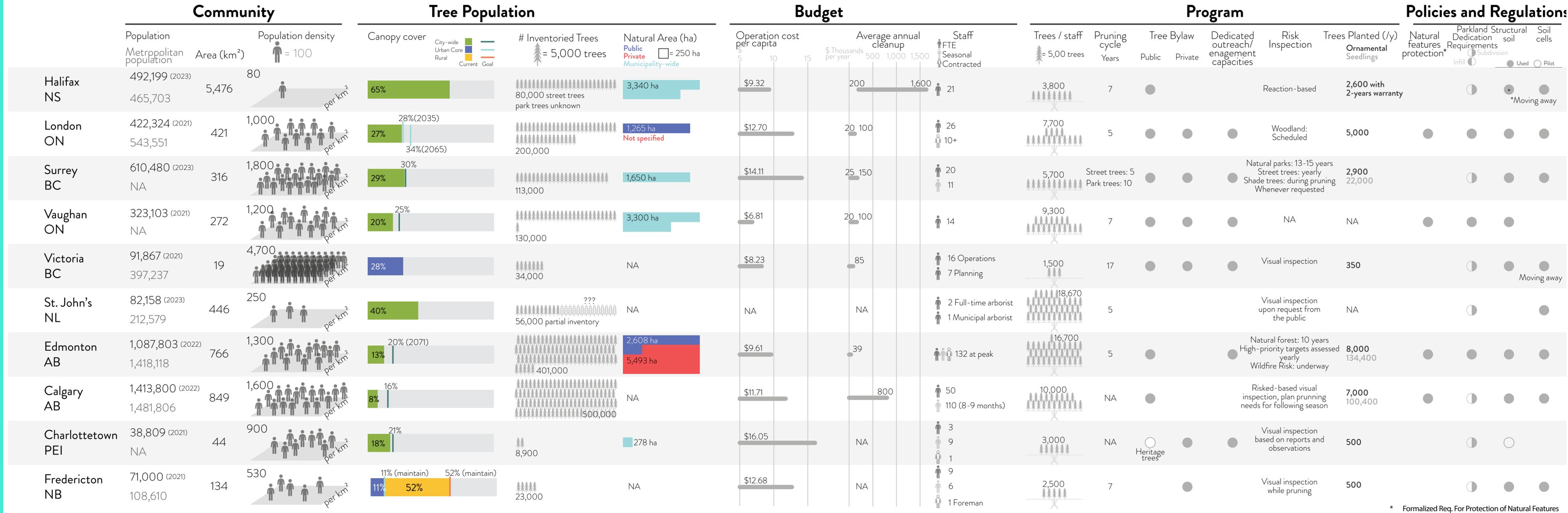
Community | Tree Population | Budget | Program | Policies and Regulations

	Population / Metropolitan population	Area (km²)	Population density (= 100)	Canopy cover	# Inventoried Trees (= 5,000 trees)	Natural Area (ha) (= 250 ha)	Operation cost per capita	Average annual cleanup ($Thousands per year)	Staff (FTE / Seasonal / Contracted)	Trees / staff (= 5,000 trees)	Pruning cycle (Years)	Tree Bylaw (Public / Private)	Dedicated outreach/engagement capacities	Risk Inspection	Trees Planted (/y) (Ornamental / Seedlings)	Natural features protection*	Parkland Dedication Requirements	Structural soil	Soil cells
Halifax NS	492,199 (2023) / 465,703	5,476	80 per km²	65%	80,000 street trees, park trees unknown	3,340 ha	$9.32	200 … 1,600	21	3,800	7	●		Reaction-based	2,600 with 2-years warranty	◑		*Moving away	
London ON	422,324 (2021) / 543,551	421	1,000 per km²	27%; 28%(2035); 34%(2065)	200,000	1,265 ha; Not specified	$12.70	20 … 100	26 FTE; 10+ seasonal	7,700	5			Woodland: Scheduled	5,000	●	●	●	●
Surrey BC	610,480 (2023) / NA	316	1,800 per km²	30%; 29%	113,000	1,650 ha	$14.11	25 … 150	20; 11	5,700	Street trees: 5; Park trees: 10			Natural parks: 13-15 years; Street trees: yearly; Shade trees: during pruning; Whenever requested	2,900 / 22,000	◑	●	●	●
Vaughan ON	323,103 (2021) / NA	272	1,200 per km²	25%; 20%	130,000	3,300 ha	$6.81	20 … 100	14	9,300	7			NA	NA	●	●	●	●
Victoria BC	91,867 (2021) / 397,237	19	4,700 per km²	28%	34,000	NA	$8.23	85	16 Operations; 7 Planning	1,500	17			Visual inspection	350				Moving away
St. John's NL	82,158 (2023) / 212,579	446	250 per km²	40%	56,000 partial inventory ???	NA	NA	NA	2 Full-time arborist; 1 Municipal arborist	18,670	5			Visual inspection upon request from the public	NA	◑			
Edmonton AB	1,087,803 (2022) / 1,418,118	766	1,300 per km²	13%; 20% (2071)	401,000	2,608 ha; 5,493 ha	$9.61	39	132 at peak	16,700	5	●		Natural forest: 10 years; High-priority targets assessed yearly; Wildfire Risk: underway	8,000 / 134,400	●	●	●	●
Calgary AB	1,413,800 (2022) / 1,481,806	849	1,600 per km²	16%; 8%	500,000	NA	$11.71	800	50; 110 (8-9 months)	10,000	NA	●		Risked-based visual inspection, plan pruning needs for following season	7,000 / 100,400	●	●	●	●
Charlottetown PEI	38,809 (2021) / NA	44	900 per km²	21%; 18%	8,900	278 ha	$16.05	NA	3; 9; 1	3,000	NA	○ Heritage trees	●	Visual inspection based on reports and observations	500	◑	●	●	○ Pilot
Fredericton NB	71,000 (2021) / 108,610	134	530 per km²	11% (maintain); 52% (maintain)	23,000	NA	$12.68	NA	9; 6; 1 Foreman	2,500	7			Visual inspection while pruning	500	◑	●	●	●

Canopy cover legend: City-wide, Urban Core, Rural, Current, Goal

Natural Area legend: Public, Private, Municipality-wide

Policies and Regulations legend: Parkland Dedication Requirements (Infill, Subdivision); Soil cells (Used, Pilot)

*   Formalized Req. For Protection of Natural Features

Figure 3-4. HRM peer municipality comparison.

3.2. HRM URBAN FOREST POLICY

HRM's Urban Forest Legacy

The Urban Forest Management Plan is not HRM's first strategic urban forest document. Following council motions in 2001 to develop a management plan for urban forests and research conducted by HRM and Dalhousie University on HRM's urban forest in 2007, HRM developed a comprehensive Urban Forest Master Plan in 2013. At the time of its adoption, the Plan was amongst the first of its kind in Canada, and aimed to address the impacts of rising temperatures, air and water quality concerns, stormwater and flood damage, and offered improved community wellbeing.

Engagement

Community engagement supporting the development of the Urban Forest Master Plan took place from 2010 to 2012. Four public workshops were conducted between May and June of that year. More than 100 citizens took part in the workshops. Nearly 500 individuals also took part in an online survey. It is worth noting the engagement program for this Plan did not include specific scope for consultation with equity-deserving population segments.

Plan Architecture

One of the primary objectives of the Urban Forest Master Plan was to reconcile challenges common to the multiple spatial scales at which an urban forest program typically operates. The Urban Forest Master Plan sought to resolve this through a neighbourhood management approach that consisted of four spatial levels; i) the UFMP study area (which then excluded rural HRM), ii) communities, which followed boundaries of pre-amalgamation cities and towns, iii) neighbourhoods, which exhibit distinctive environmental and settlement patterns, and iv) neighbourhood divisions, consisting of unique land-use subsets within neighbourhoods. This spatial organization resulted in 111 urban forest neighbourhoods, and became the operative unit to which the plan's strategic framework applied.

Fifteen operating principles informed the framework for the Urban Forest Master Plan and 32 broad program actions (often implemented through nuanced neighbourhood-level sub-actions).

Implementation

HRM's Urban Forest Master Plan has faced challenges in its implementation. Still, despite obstacles, HRM's urban forest management program has matured considerably over the past decade. Current estimates are that a fifth of those actions contained to the Urban Forest Master Plan have been implemented in some capacity. As many as 40% of Urban Forest Master Plan actions may have been implemented since 2013, however with varying degrees of intentionality and limited means to retroactively confirm implementation where progress was often not tracked.

Three central challenges impeded the execution of the 2013 Urban Forest Master Plan more than others: retirements and turnover (i.e., responsibility gaps), over-prescription, and difficulties/gaps in monitoring and evaluating progress in implementation.

The strategic framework put forward by the revised and updated Urban Forest Management Plan attempts to resolve the challenges faced by the Urban Forest Master Plan, through remaining at a broader, strategic level to support operational discretion in implementation. Engagement processes involved in the development of this UFMP employed dedicated streams for reaching equity-deserving population segments (see **4.1. Plan Process**).

Halifax Regional Municipality
Urban Forest Ma
July, 2013

HALIFAX REGIONAL MUNICIPALITY **DALHOUSIE UNIVERSITY** *Inspiring Minds*

Highlights

- Neighbourhood-level strategic units.
- Significant community turnout and support through plan development.
- Fairly novel document and approach amongst peer municipalities at the time.

Challenges

- Retirements, staff turnover, and silos between departments resulted in uncertainties around implementation responsibilities, a scarcity of internal "champions" of the document.
- The neighbourhood spatial scale was too prescriptive/restrictive for practical use in operations capacities.
- Challenges over the past decade (e.g., COVID-19, inflation, housing crisis) have taken centre stage and tightened municipal wallets.
- Limited formalized monitoring following adoption. The status of the plan faced growing uncertainty over time as a result.

Successes

- Geospatial ornamental tree inventory.
- Commitment to a seven-year grid pruning cycle.
- Planting 18,000 trees

Opportunities

- Increased emphasis on equitable service delivery through the update.
- Increased focus on strategic-level program operations, giving operations greater latitude to make operational decisions and adapt.
- Improved framework for UFMP implementation and monitoring.
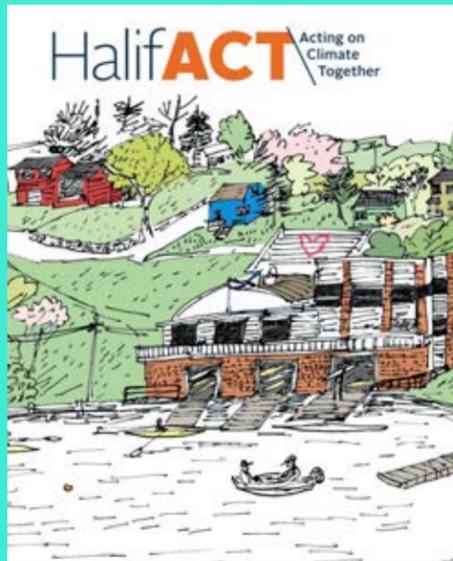
HALIFACT

HalifACT is one of the most ambitious climate action movements in Canada. It is our community's response to the climate crisis that will build a more resilient and healthy future in Atlantic Canada while preparing for current and future climate impacts. On June 23, 2020, Halifax Regional Council unanimously adopted HalifACT – a transformational plan to achieve a net-zero economy by 2050.

HalifACT contains various actions which have either been reiterated, or further supported through this UFMP. Where the Municipality has earmarked real and significant resources to support HalifACT's implementation, those resources can often also support implementation of this plan.

HALIFAX GREEN NETWORK PLAN

The Halifax Green Network Plan (HGNP) defines an interconnected open space system for the municipality, highlights ecosystem functions and benefits, and outlines strategies to manage open space. Specifically, the HGNP provides land management and community design direction to:

- Maintain ecologically and culturally important land and aquatic systems;
- Promote the sustainable use of natural resources and economically important open spaces; and
- Identify, define and plan land suited for parks and corridors.

HRM's urban forest is part of the Green Network. Where the HGNP is centered around planning and strategic use of HRM's open space network, the UFMP is centered around the strategic management, planning and protection of forested areas and trees. The UFMP provides more detailed strategies and actions for forested areas and trees which support HGNP's strategic objectives.

INTEGRATED MOBILITY PLAN

HRM's Integrated Mobilty Plan (IMP) is a strategic initiative designed to create a connected, healthy, affordable, and sustainable transportation network within HRM. Where trees commonly share space with our transportation infrastructure (e.g., roads, sidewalks, multi-use paths), the IMP is an important guiding document to urban forest management- and the IMP itself recognizes this in several capacities. Projects supporting the continued implementation of the IMP will therefore also influence urban forest management in HRM.

Other Influential Documents

Beyond HaliFACT and the HGNP, there is a range of legislation, documents, guidelines, standards, and specifications that influence trees and tree protection in HRM. These are briefly explored below.

The Halifax Charter

The Halifax Regional Municipality Charter is the primary legislation under which the municipality operates. The Charter includes language identifying HRM's powers respecting trees, as well as the Municipality's powers and capabilities with respect to bylaws and processes that influence trees. The Charter does not currently enable HRM to collect parkland dedications, or cash-in-lieu, through intensification projects or redevelopment. The Charter also limits the Municipality's powers with respect to the types of lands that can be requested through redevelopment, as well as the circumstances under which a tree bylaw can be adopted.

Land Use By-laws

HRM is home to 22 Land Use By-laws, each specific to a plan area within the region. These by-laws identify applicable zoning within different areas of the municipality. Zoning prescribes minimum performance standards which new development must generally satisfy. Where more than 71% of HRM's land is currently under private ownership, and development is the single greatest moderator of canopy change within urban communities, the requirements through the Municipality's Land Use By-laws are amongst the most influential guiding provisions affecting forest change in HRM.

Municipal Design Guidelines (the 'Red Book')

HRM's Municipal Design Guidelines (i.e., the 'Red Book') was developed to provide consistency in design and construction issues among developers, consultants and contractors within the HRM. These specifications are to be used as minimum standards in the design of streets, drainage, street trees & lighting, and associated municipal infrastructure. The Red Book is a key document in supporting the integration of trees in the municipal right-of-way. The Red Book contains good specifications supporting proven and emerging standards to better support the integration of trees in urbanized environments and streetscapes. The Red Book will be periodically updated to reflect best practices, new insights, and municipal experience. As the Red Book matures, there may be opportunities to revisit certain aspects of the document to improve urban forest outcomes, based on staff and project experiences.

Regional Plan

HRM's Regional Plan establishes long-range, region-wide planning policies outlining where, when, and how future growth and development should take place between now and 2031. A sustainable environment is core to the Plan's vision and guiding principle. In February 2020, Regional Council initiated a review of the current plan, which has been in effect since October 18, 2014. A Draft Plan of the updated plan was released in June 2023.

The Regional Plan presents a key opportunity for the policies and direction put forward through the UFMP to make it into a critical policy document that steers municipal growth at the highest level. Good integration of tree interests into the Regional Plan is critical in assuring tree interests are represented through the varied development, construction and planning processes that moderate growth within the community.

Public Tree By-law

HRM's Public Tree By-law (T-600) primarily functions to describes the circumstances under which a member of the public may alter or remove a public (i.e., municipally-owned) tree. In brief, no member of the public may alter or remove a municipally-owned tree without the written consent of the HRM, or otherwise having secured a permit to do so from HRM.

HRM does not currently have a private tree by-law, although the Halifax Charter does enable such within the Municipality's Service Requirements Area, or otherwise within Riparian Areas anywhere within the Municipality.

Regional Subdivision By-law

The Regional Subdivision By-law details requirements for the subdivision of land within the Municipality and administered by HRM's Development Officers. The Subdivision By-law sets out various design and process-related requirements that new subdivisions projects within HRM are required to meet. Many of these processes and design requirements impact trees.

3.3. URBAN FOREST REPORT CARD

HRM's urban forest management program has been evaluated against a sustainability model for urban forests, first introduced by Clark et al. (1997)[43] and subsequently updated by Leff (2016).[44] The framework was adapted by the Urban Forest Management Plan project team to better facilitate deployment in HRM. These criteria and performance indicators help measure the program's status against an idealized state. Each criterion is linked to one of the five objectives and has been assessed through a detailed review of policies, analyses, and staff interviews. The reasoning behind the rankings can be found in **Apendix 1**.

HRM's urban forest management achieved a scoring of "Fair" in 2024. Key opportunities for improvement include:

- **Tree protection:** Strengthening policies for regulating the conservation of sensitive ecosystems, soils, and permeability on private property. Also allocating resources for creating and implementing effective protective measures.

- **Forest health:** Incorporating diverse tree species when planting. Conducting inventories that assesses the risks of ornamental trees that informs active tree management.

- **Canopy growth:** Implementing a strategic tree planting program that considers equity, species diversity, and climate change in regards to tree risk for species selection.

- **Partnership:** Involving more of the community and introducing neighbourhood actions. Fostering partnership with large private land and institutional land holders.

The Urban Forest Report Card summarizes the assessment of each indicator, serving as a baseline for future comparisons. As HRM implements its Urban Forest Management Plan, it will be essential to monitor progress and track improvements to guide ongoing efforts to enhance the forest.

Urban Forest Report Card

2024 program grade (in colour)

OBJECTIVE 1: PLANNING AND PROTECTION

Indicator	Poor	Fair	Good	Optimal
Awareness of the urban forest as a community resource			Good	
Interdepartmental/municipal agency cooperation in urban forest strategy implementation		Fair		
Clear and defensible urban forest canopy cover				Optimal
Relative tree canopy cover				Optimal
Municipality-wide urban forest management plan			Good	
Municipal green infrastructure asset management				Optimal
Municipal-wide biodiversity or green infrastructure strategy			Good	
Municipal urban forestry program capacity		Fair		
Urban forest funding to implement a strategy		Fair		
Policies/regualtions regulating the protection/replacement of private and Municipality trees		Fair		
Policies or regulations for conservation of sensitive ecosystems, soils, or permeability on private property through development	Poor			
Internal protocols guide Municipality tree or sensitive ecosystem protection		Fair		
Standards of tree protection and tree care observed during development or by local arborists and tree care companies		Fair		
Cooperation with utilities on protection (and pruning) of Municipality trees			Good	

OBJECTIVE 2: PLANTING

Indicator	Poor	Fair	Good	Optimal
Municipality planting and replacement program design, planning, and implementation		Fair		
Developement requirements to plant trees on private land		Fair		
Streetscape and servicing specifications and standards for planting trees			Good	
Equity in planting program delivery	Poor			
Forest restoration and native species planting	Poor			
Selection and procurement of stock in cooperation with nursery industry		Fair		
Ecosystem services targeted in tree planting projects and landscaping		Fair		

OBJECTIVE 3: MAINTENANCE

Indicator	Poor	Fair	Good	Optimal
Tree inventory		Fair		
Knowledge of trees on private property		Fair		
Natural areas inventory		Fair		
Age diversity (size class distribution)			Good	
Tree risk management	Poor			
Publicly owned tree species condition	Poor			
Maintenance of intensively managed trees		Fair		

OBJECTIVE 4: STEWARDSHIP

Indicator	Poor	Fair	Good	Optimal
Citizen involvement and neighbourhood action		Fair		
Involvement of large private land and institutional land holders (e.g., schools)		Fair		
Urban forest research			Good	
Regional collaboration			Good	

OBJECTIVE 5: MANAGEMENT AND MONITORING

Indicator	Poor	Fair	Good	Optimal
Emergency response planning			Good	
Pest and Disease Management		Fair		
Waste biomass utilization		Fair		
Tracking of operational carbon footprints and urban forest carbon-cycle balance		Fair		
Species diversity	Poor			
Species suitability			Good	

2024 URBAN FOREST REPORT CARD

POOR 6 | FAIR 19 | GOOD 10 | OPTIMAL 3

The Path Forward
La voie à suivre

new **4**

4.1. PLAN PROCESS

PHASE

1 Identifying key directions

   a Listen and learn
      Jan 2024 - May 2024

2 Draft plan

   a Strategic planning and program actions
      Mar 2024 - Jul 2024

   b Collecting feedback
      Jul 2024 - Sep 2024

3 Implementation
   (Date)

The development of HRM's Urban Forest Management Plan took place between the fall 2023 and the fall 2024. Community engagement was an important element in the development of the plan. Community member perspectives helped to shape the vision for the management of HRM's urban forest. To support meaningful public discourse, two phases of engagement were undertaken.

Engagement progamming and outreach was designed to reach diverse and typically under-represented people and communities. Through the planning process, the Municipality engaged with Mi'kmaq Peoples, African Nova Scotians/Canadians, francophone and Acadian communities, newcomer residents, community groups, businesses and industry, non-profits, and other interested parties that are involved in urban forestry. The engagement also involved the Municipal Council and all departments of the HRM.

COMMUNITY ENGAGEMENT PROCESS

Phase one of engagement took place in early 2024 and sought to gather insights into core community values, concerns, and priorities for the management of HRM's urban forest. This input informed the development of the urban forest vision, goals, and the action plan now contained in **Part 5** of this document. The second phase will occur after the draft UFMP is released for public review, with the goal of gathering community feedback to ensure the draft UFMP accurately reflects their values and priorities.

The engagement process took place over four months, with opportunities to provide input for the public, engaged organizations, as well as five typically under-represented communities, including Indigenous communities, African Nova Scotians/Canadians, Francophone and Acadian communities, people with disabilities, and newcomers. Unique engagement approaches were prepared for each group to ensure diverse voices could be freely and comfortably expressed. The general public provided their input online and in person through a survey, a mapping tool, and two public open houses. Engaged organizations, including government agencies, non-profit organizations, and industry representatives, were invited to provide input through online or in-person workshops.

The workshops, interviews, and focus groups aimed to identify concerns and aspirations for the urban forest and find solutions for implementing the UFMP, focusing on four themes: tree planting, tree protection, urban forest management, and urban forest engagement.

COMMUNITY ENGAGEMENT HIGHLIGHTS

Values

More than 740 community members responded to the phase one survey. Of those who responded, 97% believed HRM's urban forest was "very important" or "Important". Respondents highlighted a wide range of benefits that an urban forest could provide, such as improving air quality, reducing urban heat, supporting wildlife and biodiversity, and enhancing the overall well-being of residents. The urban forest was recognized by many participants as an important component of a livable and environmentally sustainable municipality.

Vision

Survey respondents were invited to contribute to the vision statement for HRM's urban forest management through to 2050. More than 700 written contributions to the shaping of the vision were recieved through the community survey, and countless more through in-person discussions, workshop, and engagement with targeted community groups. The resultant vision statement for this plan, a synthesis of all of that feedback, is identified below.

HRM's Urban Forest Management Plan Vision Statement

HRM is a municipality of trees. Through a shared legacy of sustainable management, the urban forest has been carefully woven into the fabric of our communities and neighbourhoods, which are characterized by biodiverse native ecosystems and large, mature trees lining our streets and parks. Our green network, consisting of its trees, forests, and other native ecosystems, benefits all members of our community and supports our identity as a diverse coastal municipality. These trees also support critical community benefits such as building urban resilience to the challenges faced under climate change.

PARTICIPATION BY THE NUMBERS

PHASE 1 Over 4 months

ONLINE PUBLIC ENGAGEMENT
- **744 survey responses**
- **94 identified locations**
  - 54 places of value
  - 39 places needing improvements

IN-PERSON PUBLIC EVENTS
- **2 open houses**
  - ~45 participants

INDIGENOUS COMMUNITES
Represented by **71** participants from:
- Wasoqopa'q First Nation (Acadia)
- Wijewinen - Mi'kmaw Friendship Centre (multiple programs)
- Diamond Bailey Healing Centre
- Dalhousie Indigenous Student Centre
- Kiknu Indigenous Student Centre (St. FX University)
- Native Council of Nova Scotia
- Sipekne'katik Treaty Truck House
- Aboriginal Youth Outreach Program

AFRICAN CANADIANS & NOVA SCOTIANS
Represented by **20** participants from:
- Historic African Nova Scotian communities
- Newcomer African-Caribbean Community
- Newcomer Continental African Community
- Rural, Sub-Urban and Urban communities
- Eleven community organizations

NEWCOMERS
Represented by **XX** participants from:
- Placeholder

FRANCOPHONE & ACADIAN COMMUNITY
Represented by **5** organizations:
- L'Acadie de Chezzetcook
- Alliance Française Halifax
- Conseil scolaire acadien provincial
- Conseil communautaire du Grand Havre

PEOPLE WITH DISABILITIES
Represented by **XX** participants from:
- Placeholder

ENGAGED ORGANIZATIONS
Represented by **39** participants from:
- Federal, provincial, and municipal governments, such as Nova Scotia Power
- Not-for-profit organizations
- Arboriculture and development industries

Concerns

Open house participants, survey respondents, and engaged organizations expressed concerns about the impacts of development and climate change on the urban forest. Development activities, particularly those supported by clear-cutting, were viewed as a significant threat. In response to these threats, survey respondents identified their top three objectives for urban forest management over the next ten years as addressing climate change impacts, integrating urban forest policies into regional and community planning processes, and protecting, maintaining, and enhancing the urban forest.

Priorities

Planting

Partner organizations requested the Municipality to take bold actions to enhance street growing conditions, such as burying utilities and meeting positive right-of-way standards, using Argyle Street as an example. Partner organizations suggested establishing stock selection standards for ornamental trees consider challenges like snowplows. Participants also highlighted the need to balance urban forest goals with programmed and unprogrammed outdoor facilities. Engaged community members also recommended prioritizing native species and bird-friendly plants to increase biodiversity within the community. Engagement also identified a perceived need for street planter maintenance, especially on Lower Water Street and Bedford Row. To make downtown more vibrant, participants hoped to see more success stories like Granville Park as well as the designation of more tree planting sites for non-profit organizations like Scouts Canada.

Protection

Many participants saw the protection of vegetated waterways and wetlands from suburban development as critical. Survey respondents wanted the Municipality to prioritize tree protection over replanting in new subdivisions, noting that road construction often removes large trees and replaces them with smaller ones, causing runoff and erosion. Participants suggested that perhaps the Municipality could create urban forestry positions within the planning department to support tree retention and help acquire forested parkland to improve biodiversity and ecosystem services.

Survey respondents sought clear ornamental tree protection requirements when widening rights-of-way for active transportation projects. They called for better strategies to balance competing priorities and recommended updating the Red Book to include an urban forestry section for more predictable development outcomes. They also advocated for retaining dead trees to preserve habitat value, emphasizing the importance of incorporating biodiversity and wildlife considerations into the Urban Forest Management Plan.

Management

Survey respondent satisfaction with HRM's urban forestry program areas was mixed (**Figure 4-1**). Partner organizations were often unaware of the adoption of the Municipality's 2022 Integrated Pest Management (IMP) Strategy and, as a result, recommended developing an invasive species management plan to address potential pests, invasive plants, and weather disasters. Respondents identified a desire for clearer guidelines for post-extreme weather event response and management, including reducing risks posed by vulnerable trees and providing clear cleanup guidelines.
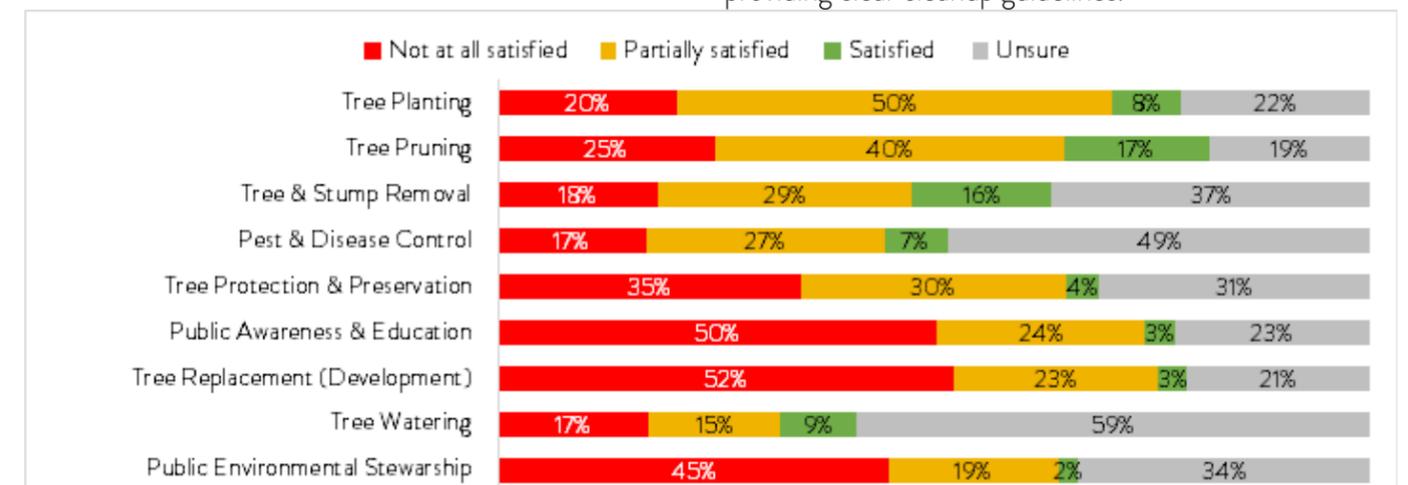

	Not at all satisfied	Partially satisfied	Satisfied	Unsure
Tree Planting	20%	50%	8%	22%
Tree Pruning	25%	40%	17%	19%
Tree & Stump Removal	18%	29%	16%	37%
Pest & Disease Control	17%	27%	7%	49%
Tree Protection & Preservation	35%	30%	4%	31%
Public Awareness & Education	50%	24%	3%	23%
Tree Replacement (Development)	52%	23%	3%	21%
Tree Watering	17%	15%	9%	59%
Public Environmental Stewardship	45%	19%	2%	34%

Figure 4-1. Respondent's satisfaction with current levels of service by service type

Community Engagement

Community engagement in urban forestry initiatives fosters ownership and support. Survey participants called for mandatory engagement with developers and better communication strategies targeting all community members, including Indigenous values and knowledge in forest management. Participants also advocated for engaging youth through partnerships with schools.

INDIGENOUS ENGAGEMENT

Indigenous communities were engaged through methodologies rooted in Indigenous knowledge systems, including keeoukaywin (The Vising Way) and etuaptmumk (Two-Eyed Seeing), which emphasize rationality, respect, and the integration of Indigenous and Western ways of seeing and knowing for more comprehensive and inclusive solutions. The engagement process involved direct outreach to Indigenous communities, facilitated visits, and interviews to gather diverse perspectives.

Indigenous communities highlighted the following priorities for the Urban Forest Management Plan. One of the Indigenous participants' priorities was to **include Indigenous language** in the plan through approaches such as a naming ceremony for the strategic document and the use of traditional names for places, flora, and fauna to strengthen connections with Indigenous communities. Equally important was **increasing education and knowledge sharing** of Indigenous ecological knowledge and sustainable practices. Participants described this as involving the co-creation of an education plan to bridge Indigenous perspectives into the Urban Forest Management Plan. They also indicated it should embody etuaptmumk and Indigenous pedagogy, such as land-based learning, into broad education and engagement approaches. **Collaborations and partnerships** between HRM and Indigenous communities was also highlighted as an important way to support urban forest outreach and management with Indigenous communities. This would include clarifying and strengthening internal collaborations within the HRM and streamlining dialogues and processes to improve efficiency for Indigenous organizations.

Participants considered **protecting culturally significant species** very important, especially Birch, Black Ash, and White Ash. These species hold cultural importance for Indigenous communities and need to be preserved and integrated into urban forest planning. Similarly, participants expressed a strong desire to **plant food forest** and support community food sovereignty, especially in areas where houseless community members reside or access for Indigenous communities is limited. Participants also suggested introducing a greater variety of food and creating more opportunities for vertical farming and pollinator programs. **Creating urban spaces for ceremony and healing** was also emphasized as Indigenous communities need dedicated space to practice their cultural traditions and activities.

Participants also wanted the HRM to **ensure malleability and responsiveness** in its implementation of the Urban Forest Management Plan so it can evolve with community needs and priorities. This would need to be supported by ongoing engagement with Indigenous communities to ensure continued alignment with their priorities. Additionally, **enhancing protection and restoration post-disaster** was important to Indigenous participants, especially in disaster-prone areas. Youth expressed a strong desire for a sustainable plan to protect and restore vegetation lost during storms and to manage for a resilient and adaptive urban forest for future generations.

AFRICAN NOVA SCOTIANS/CANADIANS ENGAGEMENT

Engagement with African Nova Scotians/Canadians involved detailed in-person and online interviews and focus groups with community development specialists, heads of development organizations, educators, social workers, and recreation specialists. The engagement aimed to provides both a historical and socio-political analysis of African Nova Scotian development challenges, highlighting seven key themes related to culture and race-specific concerns and considerations for the Urban Forest Management Plan.

Overall, African Nova Scotian/Canadian participants aspired to robust, inclusive policies and programs to ensure diversity and equity, protect against commercial development, and preserve historical and cultural connections to the land.

Protecting urban forests from development was seen as crucial. Participants are concerned about the impact of disappearing trees on air quality and wildlife, emphasizing the importance of preserving green spaces for both cultural practices and environmental quality. Participants suggested reconsidering the use of "management" as it failed to capture the holistic picture of nurturing, caring for, and protecting the urban forest. They expressed support for **programs to grow the urban forest** and highlighted the **importance of planting fruit trees** and the food forest.

Participants **desired more knowledge and information** to empower African Nova Scotian/Canadians to take care of trees and expressed interest in **volunteering in urban forest initiatives** if informed about opportunities. They also noted the need for **community involvement and partnership with HRM in decision-making processes** and emphasized that low African Nova Scotian/Canadians participation in urban forest management activities was due to a lack of access to information, not disinterest.

African Nova Scotian/Canadian participants also shared culture-specific considerations and concerns, emphasizing the need to incorporate their viewpoints into the Urban Forest Management Plan due to their historical and ongoing experiences of systemic economic neglect, social exclusion, and racial marginalization.

A key cultural concern was the historical exclusion from civic affairs and the resultant lack of awareness of the HRM Urban Forest Master Plan. Regardless, participants expressed a high interest in learning about urban forest management and suggested c**ulture-specific public information campaigns**.

Participants felt that urban forest management should also consider **economic development opportunities** such as job creation in tree care and maintenance industry and income generation through sustainable timber harvesting. **Access to resources and infrastructure** was another key concern. Participants noted the need for better access to green space, as well as tools, funding and other infrastructure needed to connect urban forest management with other emerging issues such as food security.

Participants emphasized the importance of building trust through transparent and inclusive engagement processes. Addressing issues of loss and trust through **reparatory justice** was highlighted as a critical aspect. Participants discussed the need for acknowledging past harms and creating pathways for healing and rebuilding

▲ February 2024 phase one stakeholder workshop.

FRANCOPHONE AND ACADIAN ENGAGEMENT

Engagement with francophone and Acadian organizations was conducted through French-language interviews in French, with results translated into English for broader accessibility. Participants envisioned an accessible urban forest with well-protected mature trees and **enhanced greenery along pedestrian and cycling routes**. Participants strongly supported the **protection of mature trees and forests near schools** and ensuring community access to natural areas by means other than driving. They had concerns about trees causing power outages during storms, prompting suggestions for **better management practices** like pruning and undergrounding utilities.

Participants also highlighted their involvement in urban forest activities such as tree planting or tree giveaway events and expressed interest in **more educational initiatives** such as 'remarkable tree walks' about native species, wildlife habitat maintenance, and invasive species removal.

Participants shared important cultural considerations, such as the role forests played historically in providing shelter for Acadians during the "Grand Dérangement" (Great Upheaval) and witnessing the ties with the Mi'kmaq People. They emphasized the importance for the Acadian community of seeing the Mi'kmaq culture well represented in the plan. Participants also noted that French-language signage in parks could improve their community's access and make spaces more welcoming.

trust between HRM and African Nova Scotian and Canadian communities.

WHAT WE HEARD

"Our absence and erasure from historical narrative of settlements keeps us from connecting to the land and the trees on it."

WHAT WE HEARD

Meaningfully supporting relationships with Indigenous communities can be challenging without an Indigenous Framework to support direct interactions with the First Nations within the Halifax Regional Municipality. Some engaged communities have identified their approaches to engagement, which the HRM should meaningfully reflect on and incorporate into their own engagement processes

4.2. RECAP: THE MAJOR CONCERNS

HRM's first urban forest plan was developed out of a sense of urgency to respond to a series of destructive events including Hurricane Juan, several severe storms, and a longhorn beetle infestation. In the decade since, HRM's urban forest has been impacted by hurricanes, interface wildfires and the arrival of new pests and disease. Threats to the urban forest are increasing and, while HRM's urban forestry program has made significant strides since 2013, more must be done to establish a healthy urban forest legacy for future generations. This Urban Forest Management Plan aims to provide the strategic direction necessary to build urban forest resilience and maximize the benefits trees provide to HRM's diverse communities and neighbourhoods.

Climate Change and Extreme Weather

Climate change is a "wicked problem" – a complex issue with interdependent challenges and diverse perspectives, making it difficult to resolve. Climate projections for HRM indicate wetter, wilder weather, with secondary impacts beyond direct extreme weather events like hurricanes Juan (2003), Dorian (2019), and Fiona (2022). Neighbourhoods in the peri-urban interface (those between forested wildlands and urban areas) in particular have to deal with the growing threat of severe weather and forested areas. Hurricane-force winds can blow down trees, while periods of warm, dry weather prepares forests for burning.

Pests and Pathogens

Pests and pathogens, both native and invasive, may change their life cycles due to longer growing seasons and warmer weather, potentially increasing tree stress and mortality. HRM is an international port and a gateway for invasive species that threaten the urban forest. In the past, arrival of beech bark disease and the dutch elm disease caused significant damage to native tree populations. Now, the emerald ash borer and hemlock woolly adelgid threaten ash and hemlock. These organisms degrade ecosystems, contribute to habitat loss, and pose major threats to urban forests.

An Aging Tree Population

Many of HRM's trees lining streets and parks were planted in the 1900s. Old ornamental trees are an important part of HRM's identity as a tree municipality but many are reaching the end of their safe useful life expectancy. The loss of old trees will have a significant impact on tree canopy in the urban core, and particularly in neighbourhoods dominated by trees planted in the early 20th century. In some cases, measures can be taken to sustain large, old trees in urban landscapes for as long as possible but HRM will not have the capacity to take such measures extensively.

Many parks have relatively low canopy cover, and could be planted now to ensure that there are young trees to replace older trees as they die. In streets, it will be necessary to plan for successional replacement in blocks where trees are reaching the end of their lives, in order to spread the cost and impact of losses out over time.

Mixed Ownership

Management of the urban forest across all ownership types is challenging due to varying interests represented. HRM manages public trees along roads and in parks, but achieving urban forest goals in areas with little municipal land will require the buy in of other landowners-predominately private individuals and organizations.

Limited Program Resources

Like any municipal department, HRM's Urban Forestry program is constrained by available resources. Most resources are allocated to ornamental tree maintenance, aiming for a seven-year grid pruning cycle, but current funding does not permit achievement of that target. HRM lacks dedicated funds for managing its extensive forested parks, despite the need for invasive species control, restoration, tree planting, recreation, trails management, risk management, and fuel management within those assets.

Urban Development

HRM, with almost 275 years of urban history, has experienced many growth periods. The COVID-19 pandemic spurred dramatic growth, with HRM's population increasing by nine percent between 2016 and 2021. This growth has necessitated thousands of new homes, commercial amenities, industry, and public services, primarily concentrated in the Urban Core

Urban growth often leads to tree removal to support redevelopment and construction, and an increase in impervious surfaces. In some cases, such exchanges are necessary. However, a balance must be achieved to preserve the urban forest canopy while facilitating development. Trees and development are not mutually exclusive; both are essential to a complete community.

These challenges are significant and will require varied solutions, adaptive management and sustained investment. This plan will initiate new and amended processes, procedures, programs and standards to address the challenges facing urban forest management in HRM.

▲ Tree down following Hurricane Juan. September 2003. Credit: Peter Duinker.

4.3. STRATEGIC FRAMEWORK

The Strategic Framework for HRM's Urban Forest Management Plan implements our community vision, which has been further distilled into three big ideas.

The Strategic Framework itself is applied through Five Objectives, which form the broad foundations of HRM's Urban Forest Management Plan. Nineteen strategies further implement these five objectives, and 101 actions provide the detailed program actions HRM will undertake toward achievement of the Municipality's 2050 urban forest vision.

Key components of the strategic framework:

- **Vision:** The vision shapes the objectives and strategies, ensuring the Plan is focused and impactful.
- **Three Big Ideas:** These ideas further refine the vision, and provide more structure to the objectives and strategies.
- **Five Core Objectives:** These objectives guide the overall direction of the Urban Forest Management Plan.

Detailed implementation approach:

- **19 Strategies:** These strategies provide specific details on how each objective will be achieved.
- **101 Program Actions:** Grouped under the strategies, program actions detail the specific steps the Municipality will take in urban forest management from 2025 to 2050.
  - **18 Priority Actions ⚠:** These actions will have a significant impact on the success of the Municipality's program and implementation of this UFMP.
  - **Five Quick Start Actions ⚠:** These are actions the Municipality will implement in the early years of the Plan's life.
  - **78 Medium- to Long-Term Actions:** These are longer-term actions to support the achievement of the vision and core objectives

4.4. THREE BIG IDEAS

The broad aspirations for the Urban Forest Management Plan have been captured through Three Big Ideas. Grounded in community priorities and values, these ideas expand on HRM's **urban forest vision statement** to better guide the Urban Forest Management Plan's objectives, strategies, and supporting actions.

EQUITY
HRM's urban forest management program is both sustainable and equity-centered in its service delivery.

BALANCE
Balance between forest and biodiversity conservation and the continued growth of HRM.

COMMUNITY
Community values, education and stewardship capacities are prioritized- its people are HRM's most influential urban forest management resource.

4.5. TARGET-SETTING AND MONITORING

To monitor success during the implementation of the Urban Forest Management Plan, HRM plans to adopt a canopy cover target and monitor several indicators. The HRM will monitor plan implementation using adaptive management to remain flexible in the face of evolving communities priorities and challenges.

CANOPY COVER TARGET

Canopy cover is a useful tool for monitoring broad changes in the abundance and distribution of a community's urban forest. For this reason, many Canadian municipalities choose to adopt canopy cover targets as one of the main monitoring metrics to define what they want to achieve in their urban forest plans. Canopy cover targets can easily be integrated into long-term planning policy and development processes, making them a helpful tool to support decision-making. Canopy cover alone, however, is not sufficient to monitor all aspects of the urban forest because it does not account for all facets of sustainable urban forest management, making metrics important to monitor implementation success.

Leading urban forest organizations like American Forests recommend that municipalities set a canopy cover target as informed by their local ecosystems as well as an understanding of what is achievable given the community's population density and land use constraints. Developing an informed canopy cover target for HRM requires an understanding of tree protection policies, rates of replacement, historical rates of loss, and anticipated rates, patterns, and areas of population growth and development. Making those assumptions about canopy change in HRM is presently challenging due to several factors:

- Canopy cover datasets of a fine geospatial scale have only recently been acquired, meaning there is a limited historical record to understand how canopy cover has changed within HRM (although coarse estimates exist, see section **2.2**),

- Private tree protection is currently negotiated through the development process, with limited formalized processes supporting private tree protection outside riparian setbacks, making it hard to estimate how much tree canopy will be retained through development,

- Regional development will be informed by the Regional Plan, which is currently under review, and its direction will influence the rate, location and pattern of growth within HRM over years to come,

- Development form and density are dictated by twenty-two land use by-laws that make it challenging to integrate into regional targets, and

- Recent legislative shifts to expedite the development approvals process create uncertainty about what municipal policies and standards will be overridden by provincial directives.

As a result, HRM's Urban Forest Management Plan is not proposing a canopy cover target. Nonetheless, the Municipality has committed to five actions through the action plan (**Part 5. Action Plan**) that will support the establishment of an informed canopy cover target through future review of the UFMP:

1. HRM will plant 1,000 net new ("ball and burlap" ornamental trees until at least the first review of the UFMP,

2. HRM will revisit the possibility of establishing an informed canopy cover target at the second (10-year) review of the UFMP, once the Regional Plan Update has been completed and equipped with a decades' worth of change monitoring to support forecasting efforts,

3. HRM will review its net new planting target at each five-year review and ensure committed rates of tree planting are being achieved, and contributing to desired urban forest outcomes,

4. HRM will continue to support reforestation and community planting events in addition to planting 1,000 net new trees, per year, and

5. HRM will formalize planting opportunities mapping to support informed canopy modelling through a future review.

MONITORING APPROACH

Monitoring is essential for the successful implementation of any strategic initiative. Forest management programs informed by current, high-quality datasets best support adaptive planning efforts. In addition to monitoring canopy cover, tracking several other indicators will provide information to evaluate successes and failures in implementation, allowing staff to plan, respond, and adjust to changes for better implementation outcomes. **Table 4-1** identifies the core monitoring framework to track successes and gaps in the implementation of this plan.

In **Part 5**, the icons representing these tools and datasets appear alongside actions they can be used to monitor. This integration ensures that monitoring is a key component of each initiative, providing a robust framework for evaluating progress and making informed adjustments.

Table 4-1. Core monitoring framework to support the tracking of the UFMPs' implementation.

Indicator	Method	Assessment (iterative)	Current (Last Measure)	Target (Asp. Year)
Canopy coverage.	LiDAR	Five years		
Resident satisfaction with urban forestry program areas.	Survey	Five years	Lowest rate of satisfaction in a single program area is 21% (2023)	Lowest rate of satisfaction in a single program area is no higher than ten percent (2030)
Grid pruning cycle	Inventory	Ongoing	~9-year (2023)	Seven-Year (2030)
Frequency of ornamental tree inventory updates.	Inventory	Ongoing	~9-year (2023)	Seven-Year (2030)
Ornamental trees in "poor" or worse condition	Inventory	Ongoing	Unknown (2023)	< 2.5% (2040)
Annual ornamental tree care budget per unit	Budgets	Annual	$57 (2023)	
Frequency of natural park assessments	Inventory	Ongoing	None (2023)	Seven-year (2035)
Natural parks in "poor" or worse condition per natural park assessments	Inventory	Seven-year	Unknown (2023)	< 10% (2050)
Annual forested areas budget per hectare	Budgets	Annual	None (2023)	$500 (2034)
Mortality rate of newly planted trees within 10 years of planting	Inventory	Ongoing	Unknown (2023)	90% method inventory (2050)

4.6. ADAPTIVE MANAGEMENT

Adaptive management is an iterative approach to decision-making and management that allows for flexibility and adjustment in response to changing conditions, uncertainties, and new information.[45,46] This approach is particularly valuable in complex, dynamic systems where uncertainty is high. It recognizes the inherent complexity in managing urban ecosystems and natural resources and seeks to improve outcomes through systematic planning, learning and adaptation. In urban forest management, adaptive management involves proactive planning, regular monitoring, and ongoing adjustments of implementation approaches to changes and new information. It will help the HRM ensure that the UFMP action plan remains relevant and effective in the face of changing environmental conditions, urban development pressures and community needs.[48,47]

Adaptive management is a continuous, cyclical process. Key components of adaptive urban forest management include:

6. **What do we have** – **Part 2** and **Part 3** of this Plan provide baseline information on the current state of HRM's urban forest, the municipality's urban forestry program and resources that will be an essential reference for informed planning and decision-making.

7. **What do we want** – **Part 4** of this plan establishes a vision, goals and targets in a defined timeframe. They are based on community and partner values and consider emerging challenges and opportunities that may impact the resilience and longevity of the urban forest.

8. **How do we get there** – **Part 5** of this plan includes a list of actions to achieve the established vision, goals and targets. Implementing this action plan will require thoughtful planning, adequate resourcing, and close coordination among departments and partners to ensure practices and operations remain aligned with the UFMP's vision and goals.

9. **How are we doing** – **Part 5** of this plan also includes monitoring indicators for HRM to evaluate its implementation process and outcomes. It involves regularly collecting data, assessing the effectiveness of actions, and adjusting actions and processes as necessary to ensure continuous improvement.

The intent of the UFMP is to establish a foundational framework for a robust adaptive management approach that will enable the Municipality to use to continuously plan, monitor, evaluate, and adapt urban forest management efforts to ensure they remain relevant and effective over time.

▼ Birch basal shoots following a burn.

Action Plan
Plan d'action

5 na'n

This action plan is structured around five objectives that encompass the core aspects of urban forest management needed to implement the vision. Several strategies are identified to achieve each objective. Finally, the strategic framework identifies 101 specific program actions. These are specific, often measurable, program actions the Municipality will take to achieve these strategies. Where measurable, actions have been related back to monitoring tools that can be used to monitor the individual action (**page 85**), and to any other municipal initiative that would also be supported through their implementation.

Where the cover of another initiative appears next to an action, the action supports or aligns with the actions put forward in the relevant document.

1. Planning and Protection

Objective: **HRM facilitates urban growth while avoiding or offsetting canopy cover loss in the urban core.**

Planning and protection are essential to sustainable urban forest management. Planning involves the processes, regulations, provisions, and standards HRM uses to include trees in new developments, whereas protection focuses on retaining existing trees during development. Planning approvals often include tree protection requirements or conditions.

HRM's rapid growth presents a challenge in balancing development with the conservation of natural areas and features. Although development and tree protection can coexist, some development sites will inevitably require tree removal. The key is using planning tools to determine when the removal of trees to facilitate development is acceptable and to ensure trees are replanted on-site or elsewhere after construction.

Climate change and its full range of impacts can also present a source of tree loss. Coordinated planning can ensure tree management and development processes are supporting healthy trees and resilient urban environments so that the impacts of climate change are mitigated to the degree possible.

Actions and strategies in this section aim to support HRM in achieving a balance between urban growth and conserving or enhancing natural areas and features. Strategies encompassing tree protection measures, planning tools, design-phase integration, and building climate resilience are each covered.

The strategies to achieve this objective:

- Ensure tree protection processes and tools are achieving desired outcomes,
- Ensure planning processes and tools support desired outcomes,
- Enhance the design-phase integration of urban forest assets and interests, and
- Build resilience to wildfire threats, extreme weather, and climate change.

Strategy 1.1: **Ensure policies promote canopy cover in the Urban Core.**

HRM's has two forms of policy at it's disposal with respect to the municipality's trees: tree protection, and design-based intervention.

Tree protection focuses on preserving existing trees and forested areas on a site. Mature trees support significant canopy area and significantly more community benefits than smaller trees. It is in the community's interest to balance new development with the protection of mature trees and forested lands. In HRM, public trees are protected by the Public Tree By-law, which requires permits for any activities by private entities that involve the removal of public trees. Private tree protection is typically negotiated during the development process, often as part of park dedication in greenfield developments, but this can vary by site.

Design-based policy interventions ensure the availability of suitable planting space and soils following development, and are as important as tree protection. HRM's varied development applications and permitting processes must consistently achieve a balance between supporting growth and leaving suitable areas for ornamental trees and green infrastructure.

Actions under **Strategy 1.1** aim to further tree protection requirements within the Municipality, as well as to better integrate trees into urban sites through enhanced specifications, site design criteria, and standards.

A CASE STUDY IN RIPARIAN PROTECTION

The **City of Toronto's Ravine and Natural Feature Protection By-law** requires a permit for various activities that would impact trees in the City's ravines and natural areas. The structure of the by-law provides regulations more tailored to woodland and ravine protection than a private tree by-law, and applies to features mapped through attached schedules.

INDICATOR(S):

Canopy coverage.

HalifACT	1.1 A	Explore a private tree by-law establishing watercourse buffer zones, within which existing trees or vegetation must be retained or removed only pursuant a municipal permit.
	1.1 B	Consider updates to contract language which would require hold-backs related to tree protection where private contractors are working around public trees.
	1.1 C	Periodically review the Municipality's Public Tree By-law to ensure design remains aligned with the needs of the HRM.
	1.1 D	Formalize internal procedures outlining expectations for the retention, removal, and replacement (if necessary) of trees in municipal capital projects considering when: (i) Urban Forestry review/ sign off is required, and (ii) construction work requires arborist supervision.
	1.1 E	Review the Municipality's engineering standards to identify opportunities for tree and soil retention during greenfield development.
	1.1 F	Continue efforts to keep suburban expansion compact and maintain existing forested areas surrounding urbanized areas, for example by continuing efforts to intensity infill development on lands that are already disturbed instead of expanding the urbanized footprint of the municipality to the extent possible.

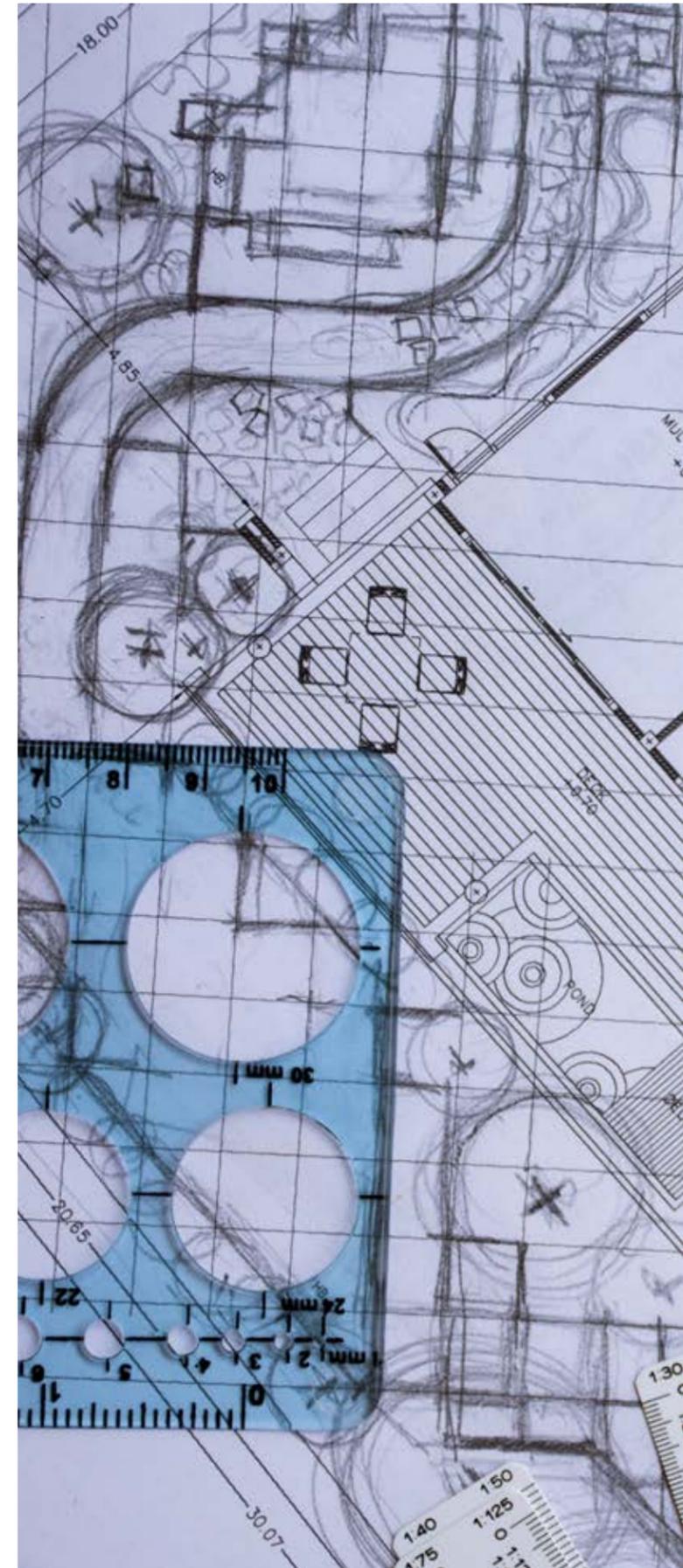|		
	1.1 G	Consider expanding the Land Use By-law requirements for landscaping to increase tree planting on private property following development, such as maintaining a minimum front yard setback of 3 metres where the municipality wishes to enable yard tree planting and implementing tree planting requirements for parking lots when developing the Suburban and Rural Land Use Plans.
HalifACT	1.1 H ❗	Support the Halifax Green Network Plan in the development of new policies that will foster the acquisition and stewardship of forested environmental lands by HRM, the Province and NGO's.
HalifACT	1.1 I ❗	Support the Halifax Green Network Plan in the development of new policies that will enable the Municipality to acquire new and improve existing parkland as part of urban infill and redevelopment projects.
HalifACT	1.1 J	When amending community plans and land use by-laws, consider updating site design and built form requirements to ensure existing trees are protected and there is sufficient space for new trees to grow.
	1.1 K	Where the details of a Streets and Services permit trigger a Construction Management Plan, require tree planting in any rehabilitated street right-of-way to meet the requirements of the Municipal Design Guidelines.

❗ **quick start actions** ❗ **priority actions**

Tree policy? Support nat. infrastructreu in

SUCCESSES IN DESIGN PHASE INTEGRATION

HRM's Cogswell District Redevelopment Project aims to revitalize the 1960s-built Cogswell Interchange area, transforming it from an overbuilt interchange into a vibrant downtown neighbourhood. The $122.6M initiative involves reinstating the original street grid network, realigning and upgrading underground utilities, integrating green infrastructure, and constructing six building lots and four parks. This transformation marks a significant effort to create a thriving community hub in the heart of downtown, enabling future development."

Through this redevelopment, the municipality will be conducting significant regreening, including the planting of over 539 street and park trees of which more than 100 will be installed into soil cells. This is a significant investment into the Urban Forest of HRM, and in a high-impact area of the municipality that historically has had less canopy coverage.
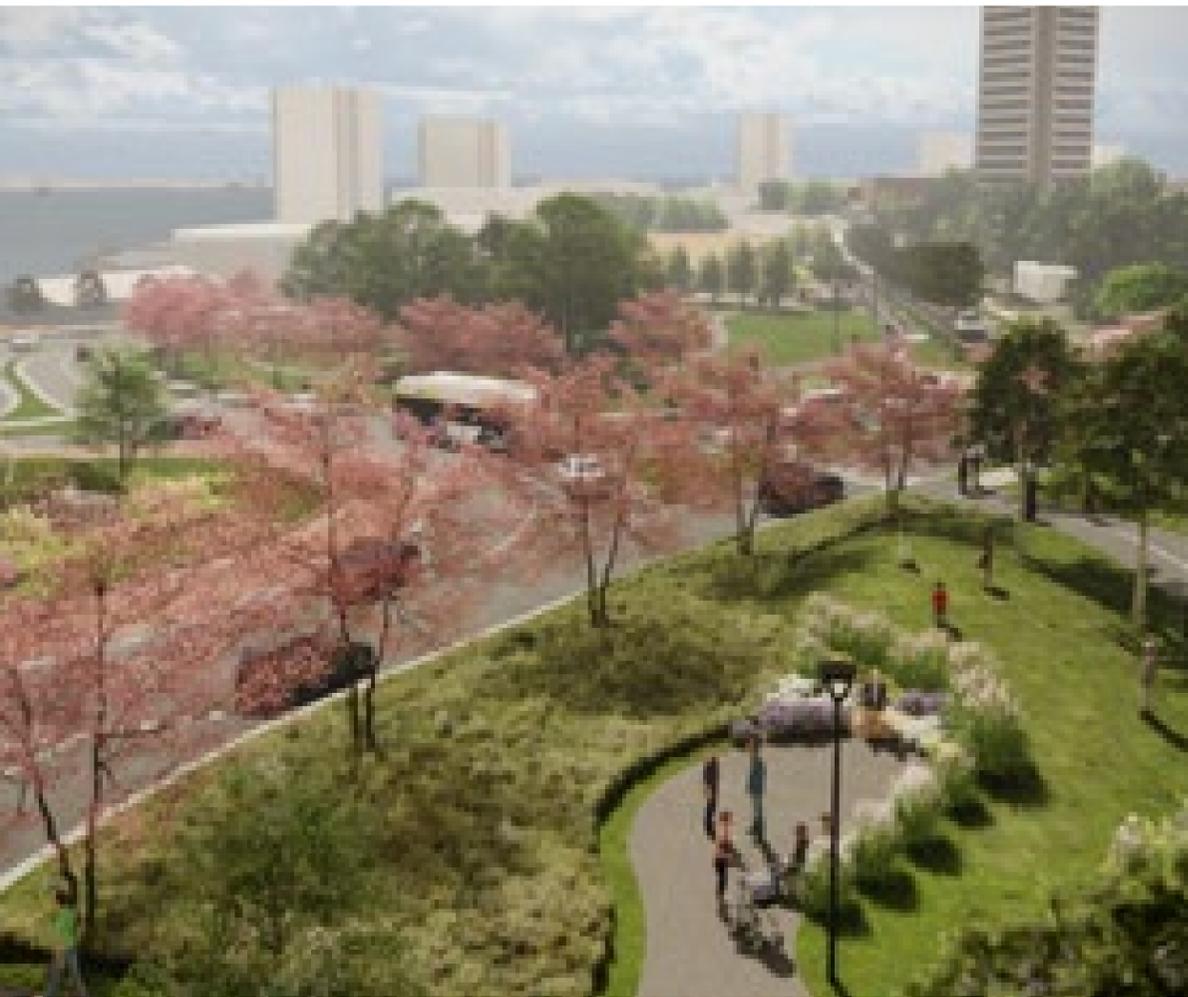
▲ Renderings of HRM's Cogswell District Redevelopment Project.

Strategy 1.2: **Prioritize urban forests in the planning and design phase of projects.**

The best outcomes for ornamental trees are achieved when trees are considered early in the project planning and design process. At this stage, opportunities for alternative approaches, tree-sensitive design, and bolstered protection measures are generally still feasible. Beyond the design stage, once detailed design has been completed or work has been brought to tender, the opportunities for positive tree outcomes in the event of an unforeseen conflict are significantly reduced. Adjustments to approach are often prohibitively expensive, and can also compromise critical project timelines and put budgets at risk. The actions under **Strategy 1.2** seek to improve the consideration for trees through the design phase, through improved design-phase information, discretion in planning approvals, and enhanced consideration through capital projects.

INDICATOR(S):

Tree removal through capital projects.

1.2 A ⓘ Consider amending plans and land use by-laws to introduce flexible development regulations that would incentivize protecting mature tree stands and/or forested areas on lands proposed for development. Tools to consider include development agreements, site plan approval, or bonus zoning.

1.2 B Consider developing new policy to require additional arborist reports or tree protection plans where it would support decision-making as part of development processes.

1.2 C Update to asset registry to track tree removals and replacements specified through capital projects and processes.

1.2 D Work with utility providers to define preferred and minimum planting setbacks from infrastructure assets, and to identify acceptable solutions (e.g., utility sleeves, root barriers, vertical setbacks) supported through minimum setbacks.

1.2 E Explore opportunities for tree planting and green infrastructure integration in surface parking lots through facility design.

1.2 F Create a prioritization matrix for trees, biodiversity, stormwater management, and active transportation considerations with area weighting base don community access to green space and active transportation resources

Strategy 1.3: **Build resilience to wildfire threat, extreme weather, and climate change.**

HRM's urban forest faces numerous challenges brought on by climate change. From extreme weather, to wildfire risk and pests and disease, forests face no shortage of climate-related stressors in the years ahead. The actions under **Strategy 1.3** seek to develop urban forest resilience in the face of these challenges, securing urban forest in a healthy state for the enjoyment of current and future generations.

INDICATOR(S):

Area of municipal forest treated annually.

1.3 A ⓘ Identify and map the wildland-urban interface (WUI) and high fire risk areas to inform where fire resilient construction and landscaping standards will apply.

1.3 B ⓘ Formalize wildfire risk mapping to inform wildfire resilience programming and planning within the wildland-urban interface.

1.3 C ⓘ Through the review of the Regional Plan, consider wildfire risk mapping in settlement patterns and develop planning policy to support risk mitigation.

1.3 D Require that forested areas be treated, or that treatment costs be included in transfer agreements, for fuels (if appropriate) and invasive species before being conveyed to the municipality.

1.3 E Work with local nurseries to identify fire susceptible and fire resilient landscaping plants at the point of sale.

1.3 F Develop internal and external (i.e., contractor) expertise related to fuels and wildfire management in forested areas.

1.3 G Record weather-related tree losses in the Municipality's tree inventory to better inform future emergency preparedness.

ⓘ **quick start actions**　　ⓘ **priority actions**

2. Planting

Objective: **Tree planting is sufficient to offset canopy cover losses and increase canopy cover within HRM's Service Area Boundary.**

This Plan commits HRM to planting 25,000 net new ball and burlap trees over the coming 25 years. This is in addition to continuing to support such initiatives as HRM's free tree giveaway and identifying opportunities for community planting events.

However, sustainable rates of tree planting are more involved than simply getting more trees in the ground. Perhaps more important, the strategies under the planting objective also ensure HRM is planting trees where trees are most needed, and to ensure that the tree planting standards and specifications are supporting trees growing to healthy maturity. The municipality's new Equity-Centered Management and Urban Forest Enhancement Districts are intended to bridge existing equity gaps in the design of the urban forest management program, alongside other actions toward the same ends.

The strategies to achieve this objective are to ensure:

- Sufficient trees are being planted,
- Planting conditions are suitable for the long-term retention of trees in our community, and
- Tree planting is supporting access and equity for all segments of the community's population.

Strategy 2.1: **Plant more trees.**

This plan comes with a commitment for the Municipality to plant 25,000 net new trees over the next 25 years. Rates of net new tree planting will be reviewed with each review of the UFMP. While Urban Forestry has achieved net new planting rates in the past five years, these rates have not met the commitments of the 2013 Urban Forest Master Plan or targeted specific neighbourhoods identified in that document for planting. The actions under **Strategy 2.1** support increasing rates of tree planting on both private and public property.

▼ 'Ball and burlap' planting stock ready for installation, peninsular Halifax.

> **INDICATOR(S):** Net new trees planted annually.
>
> **TARGET(S):** 1,000 net new "ball and burlap" trees per year in the HRM's parks and streetscapes.

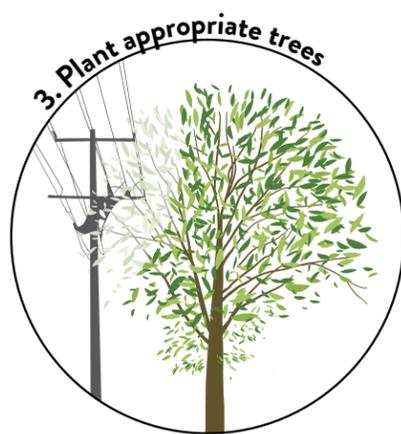|	
2.1 A	Continue to support the Municipality's tree giveaway program, growing it if and when demand outpaces program capacity.
2.1 B	Explore opportunities to work with major institutional land owners (e.g., health authority, university, school boards, religious establishments) toward identifying opportunities for tree planting on institutional use.
2.1 C	❗ Plant 1,000 net new trees per year in the HRM's parks and streetscapes.
2.1 D	❗ Create a spatial layer to document where opportunities for tree planting and parkland reforestation exist and consider identifying areas with high need for shade such as along sports fields.
2.1 E	Continue to explore opportunities to support tree planting initiatives through grant funding.
2.1 F	Explore opportunities to partner with the Province toward developing the Provincial Forest Nursery as a local source of container, bare root and/or calliper planting stock.
2.1 G	Explore opportunities for tree planting in parking lots through facility design.
2.1 H	Prioritize use of native planting stock in ornamental plantings interfacing with natural areas (e.g., parks, interface subdivisions) to support native biodiversity, including birds.

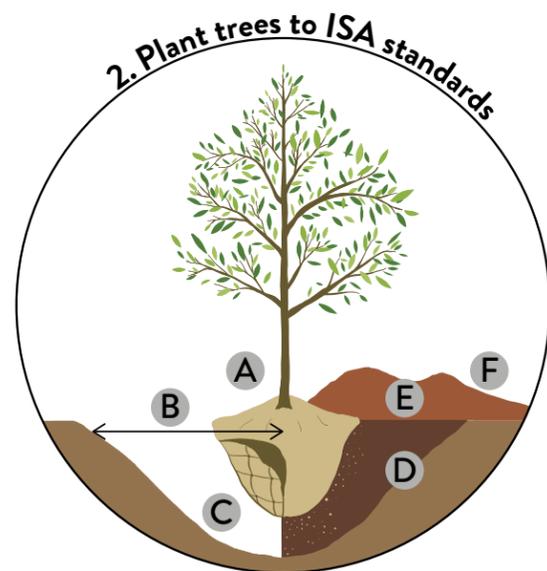❗ **quick start actions**   ❗ **priority actions**

How can you contribute?

### 1. Swap grass with drought tolerant ground cover
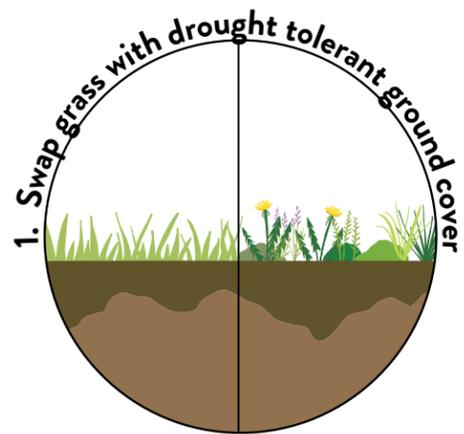
Grass removes moisture from the ground, reducing the supply to other organisms, including trees. Opting for a non-invasive alternative to grass preserves soil health around trees.

2. Plant trees to ISA standards

A. Visible trunk flare above ground
B. Planting hole should be 2-3x the size of the root ball
C. Remove burlap or wire baskets from the top and sides of the root ball to prevent constriction of roots
D. Fill in the hole and apply gentle pressure (with your foot) to the surface of the now covered root ball
E. Mulch with 2-3 inches of coarse wood chips; make sure to not pile up against the trunk
F. Avoid fertilization unless required by soil test

3. Plant appropriate trees

Selecting suitable trees ensure the proper growth of trees while also maintaing the safety of the surroundings. Small to medium trees can be planted close to powerlines.

4. Monitor tree health
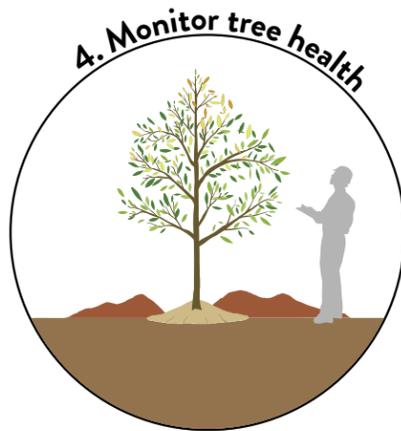
A. Watch for foliage and stem damage.
B. Contact International Society of Arboriculture (ISA) certified arborist if you notice issues.
C. Report tree health to HRM's online services (www.halifax.ca/home/online-services/trees)

5. Prune and maintain trees to promote good structure

Tree pruning can help promote good structure and avoid structural problems from developing as tree ages. There are various pruning techniques to achieve desired purposes that can be found in the ISA guideline.

Strategy 2.2: **Bridge gaps in access to the urban forest and its benefits.**

Despite ample urban forest resources in HRM, not all residents benefit equally from trees and green spaces. As HRM continues to grow and maintain the urban forest, equity must play a larger role in the delivery of urban forest management services.

The Plan has identified several urban forest enhancement districts (UFEDs) and several more equity-centered management districts (ECMDs) (**Figure 2-17**). Urban Forest Enhancement Districts (UFEDs) are areas where tree canopy is low, despite high concentrations of equity-deserving individuals. This contrasts ECMDs, which are areas characterized by high concentrations of equity-deserving individuals, but are also areas where tree canopy is already fairly high. In ECMDs, tree planting is not necessarily the optimal equity-centered management approach, however there may be other management approaches and interventions that could support equitable outcomes in such areas.

Outside of UFEDs and ECMDs, there are several initiatives that HRM can initiate to enhance consideration for equity in urban forest management. The actions under **Strategy 2.2** aim to improve access to urban forest benefits and services.

▼ Halifax Christmas Tree, Grand Parade.

INDICATOR(S):

Net new trees planting in Urban Forest Enhancement Districts (UFEDs).

2.2 A Leverage the Municipality's Social Value Procurement and Supplier Code of Conduct to prioritize proposals and vendors that help bridge discrepancies in access and enjoyment of urban forest benefits, as well as those that work to bridge broader social inequities.

2.2 B ⚠ Prioritize public tree retention whenever possible in relation to other municipal objectives and public and private tree planting in capital design and development projects, particularly in UFEDs (**Figure 2-17**).

2.2 C ⚠ Consider ECMDs in urban forest operations and management (**Figure 2-17**), including but not limited to:
- Prioritizing ECMDs with poor access to trails and parks in future parks and trails development,
- Considering ECMDs through storm response and cleanup activities,
- Prioritizing wildfire resilience programming and activities within interface ECMDs, and
- Prioritizing succession management activities within ECMDs that are also located within a Succession Monitoring and Management Districts.

2.2 D Update ECMDs and UFEDs as is warranted through future UFMP review periods (**Figure 2-17**)

⚠ quick start actions   ⚠ priority actions

PRIORITIZING EQUITY IN URBAN FORESTRY

EQUITY FOCUSED ENGAGEMENT

Prioritize partnerships with schools and youth to advance greening and stewardship in low tree equity areas

Centering equity in outreach efforts informs how to make urban forest decision-making, policies and programs more equitable

Food forest can integrate traditional ecological knowledge and be used to raise awareness about biodiversity, food security, nutrition, and African Nova Scotian/Canadian and Indigenous ways of knowing.

Provide community education on tree planting and care to promote stewardship

EQUITY FOCUSED PLANNING

Prioritize creation of greenspace in areas of low tree and greenspace equity

Prioritize tree retention in areas of low tree equity

Invest in technology and creative redesign to retrofit trees into low equity areas (e.g. convert underutilized road ends, install bumpouts, use soil cells etc.)

Establish public realm design standards to accomodate large canopy trees when the private realm cannot

Prioritize low equity areas for public land tree planting and restoration

Fewer trees means fewer urban forest benefits, less access to nature and lower urban forest biodiversity

High impervious cover absorbs heat, making urban areas hotter than surrounding rural areas, which creates an urban heat island effect

Heat dome deaths are associated with lower greenness within 100 metres than typical weather deaths. (Henderson, 2022).

People over 65 are the most vulnerable to impact of heat

High impervious cover means water runs over the pavement, picking up pollutants and carrying them through drains into natural waterways instead of filtering them through the ground

Low canopy cover means less shade to cool people, streets and buildings

Higher health care costs are associated with areas of low vegetation (Van Den Eeden et al., 2022)

Prioritize incentives, such as grants and subsidies, for tree planting and care in low tree equity areas

Establish planting programs for private property in low tree equity areas

IMPACTS OF LOW TREE EQUITY

EQUITY FOCUSED PLANTING

Sources
Henderson, S. et al. (2022). Analysis of community deaths during the catastrophic 2021 heat dome: Early evidence to inform the public health response during subsequent events in greater VAncouver, Canada. Environmental Epidemiology. Vol. 6.

Van Den Eeden, S. et al., (2022). Association between residential green cover and direct healthcare costs in Northern California: An individual level analysis of 5 million persons. Vol. 163

Strategy 2.3: **Ensure planting standards are supporting long-term tree growth.**

The Municipality can support tree planting standards that broadly support the planting of any trees on public property by ensuring planting standards meet best practices in tree planting. This can include use of emerging technologies like soil cells to improve soil volumes in tight urban areas, ensuring setbacks to buildings and utilities will not lend to future conflicts with nearby trees, and ensuring urban design thoughtfully integrates trees into street sections, plazas, and parks.

As HRM's population density increases in urban areas, extensive foot traffic can cause soil compaction and compromise the health of existing trees, leading to calls for hardscaping such areas. Surface treatments that accommodate foot traffic while maintaining existing tree roots and permeable surfaces may need to be explored in order to protect mature trees in heavy foot traffic areas.

The actions under **Strategy 2.3** outline the steps the Municipality will take to ensure that new trees on public land are planted in conditions that support their full life-cycles and overall health.

INDICATOR(S):
Average tree dbh (diameter at breast height) at removal.

2.3 A Continue to explore new surface treatments and design solutions that may reduce pedestrian-tree conflicts in high-traffic areas.

2.3 B Ensure all new trees are inventoried, and all trees entering the inventory through development, facilities, and capital construction are reviewed by an urban forestry delegate to confirm that stock and establishment standards are met before being added to the registry.

2.3 C Establish standards for tree planting in Parks' assets that are aligned with the specifications detailed through the Red Book (e.g., soil volumes).

2.3 D Consider future climate hardiness informed by climate projections for the Halifax Region to inform species selection.

2.3 E Work with local researchers to evaluate the effectiveness of and recommend updates to new municipal design guidelines requiring soil cells and confirm whether they provide measurable advantages to tree growth over the use of structural soils.

▲ Soil cell installation along Argyle street.

3. Maintenance

Objective: **HRM's tree assets are managed in accordance with best practices and planned service levels are achieved.**

Few aspects of urban forest management are as important as proper maintenance. Maintenance is a sweeping objective and encompass most activities we undertake to improve the health or longevity of trees and forests in HRM.

Modern urban forest management programs that subscribe to industry best practices undertake periodic, proactive tree care for each ornamental tree under a community's care. This is often a relatively small resource investment as compared to the costs of reactive maintenance, and is widely acknowledged to extend tree life-cycles, and reduce premature mortality. For example, proactive pruning can resolve structural issues in trees before they become severe and are more likely to result in failure or otherwise require the removal of the tree.

Within HRM's municipal forested areas, the focus of maintenance shifts from the individual tree to the entire forest ecosystem. Despite owning over 5,000 hectares of forested land, HRM currently lacks a program to guide and administer proactive forest management. Activities that amount to forest management occur and include invasive species removal, risk management, trails development and maintenance, and tree planting. While these activities do occur within HRM's forested areas, they are at present ad hoc, not informed by any coordinated management approach, targeted in their scope, implemented across varied departments with varied intents and responsibilities, and not subject to any form of a prioritization scheme.

The strategies to achieve this objective are to:

- Enhance tree care practices,
- Formalize a municipal risk management approach, and
- Establish a sustainable forest management program.

● **quick start actions**   ● **priority actions**

Strategy 3.1: **Enhance ornamental tree care practices.**

Ornamental tree care practices are the keystone to all modern urban forest management programs. Pruning is foundational to any tree care program. Tree pruning is a tree care practice where certain parts of a tree, typically branches, buds and roots are removed to improve the tree structure, appearance, or to direct new, healthy growth. Pruning can also help to control the size of a tree and provide clearance for foot traffic, vehicles, or overhead utilities. HRM currently targets a seven-year grid pruning target. Current resourcing levels are only sufficient to achieve roughly a nine-year cycle. Other common tree care elements include watering and young tree 'training', and integrated pest management. HRM has an existing Integrated Pest Management Strategy and existing tree watering programs are considered to be sufficient. The actions under **Strategy 3.1** covers these critical program elements.

INDICATOR(S):

Grid pruning cycle.

TARGET(S):

Seven years.

3.1 A ❗ Achieve a seven-year grid pruning cycle for all ornamental trees in both streets and parks.

3.1 B ❗ Establish a three-year cyclical maintenance program for all newly planted ornamental trees for the first 10 years of their life, and integrate this work into HRM's cyclical pruning program.

3.1 C Implement, expand, and improve HRM's Integrated Pest Management Strategy to ensure invasive species of concern such as hemlock woolly adelgid and emerald ash borer are monitored, treated, and controlled, while also working to prevent the introduction of new invasives.

3.1 D Formalize a process for increased monitoring and gradual replacement of ornamental trees within SMMDs (**Figure 2-17**). Update SMMDs as is warranted through future UFMP review periods.

3.1 E Work with utility providers toward the establishment of best practices/terms for clearance pruning around utility assets.

▲ Tree worker in a bucket truck.

Strategy 3.2: **Formalize a risk management process.**

Risk management is an asset management convention through which an asset manager commits to measures which mitigate risk associated with an acceptable level. Risk management commonly involves formal monitoring requirements, formalized risk thresholds, and specific treatments given different risk exposures and tolerance.

Where trees exist amongst people and property in our neighbourhoods and can fail, there is an inherent risk in their presence. The Municipality has a social obligation to ensure that the risk associated with its trees and forested parks is appropriately managed. Note that tree risk management does not imply the elimination of tree-related risks, but rather that the risk associated with trees is managed at an acceptable level. Differing from many of its peer communities, HRM currently has no formalized tree risk management process in place. The actions under **Strategy 3.2** detail the procedural changes the Municipality will undertake to formalize its urban forestry risk management processes over the coming 25 years.

INDICATOR(S):

Record tree condition ratings through HRM's ornamental tree inventory.

3.2 A Formalize operational procedures for risk inspection frequency, mitigation priority, mitigation time frames, qualifications, and documentation.

3.2 B In consultation with the municipality's legal team, formalize a risk management policy encompassing all urban forest asset classes (e.g., ornamental trees and forested parks).

▲ A tree down in the wake of Hurricane Juan. September 2003. Credit: Peter Duinker.

❗ **quick start actions** ❗ **priority actions**

Strategy 3.3: **Practice sustainable forested areas management.**

HRM is home to well over 5,000 ha of forested municipal parks. Canopy cover in HRM's (municipal, provincial, and federal) parks network makes up almost one tenth (**Table 2-1**) of the Municipality's canopy cover in the urban core. Beyond canopy cover, forested lands foster countless more social, cultural, and ecologic values.

The Municipality's forested parks face numerous contemporary threats including climate change, invasive species, wildfire, urban encroachment, and fragmentation. HRM has no reason to expect the pressures to subside in the years ahead. At present, the Municipality has limited coordinated approach in place to guide the management of its forested parks. HRM must work to ensure that coordinated direction and resourcing is available to support these features and their sustainable management. Without forested areas, HRM would not be as nice a place to live. The actions under **Strategy 3.3** sets out a path for HRM to establish a sustainable forested areas management program.

INDICATOR(S):

Funding dollars per ha of forested area under HRM's management.

3.3 A At the next Green Network Plan update, formalize priorities and objectives in managing the Municipality's naturalized parks as a system, considering both ecologic and human uses.

3.3 B Coordinate with the province and private landowners to ensure fuel management activities on municipal land is supplemented, where possible and justified, by fuels management activities on abutting private or crown land, and vice versa.

3.3 C Develop technical standards for forest trail construction and maintenance to ensure low impact to forest ecosystems.

3.3 D Identify an assessment framework supporting individual natural park health and function.

3.3 E Undertake natural park assessments to evaluate ecosystem health and park function relative to ecologic and anthropocentric long-term objectives for the park's management.

3.3 F Undertake restoration, afforestation, and/or fuels management activities, prescribed by a suitably qualified individual and aligned with the findings of a recent natural park assessment.

3.3 G Explore opportunities for partnership with First Nations, African Nova Scotians/Canadians, other equity-deserving communities, other nature-based NGOs, and the Province to support community-led sustainable forest management on crown or municipal forested lands.

A CASE STUDY IN FORESTED AREAS MANAGEMENT

Burlington's Woodlot Management Strategy is a 20 year plan to support a proactive approach to the sustainable management of the City's woodlands. The strategy includes:

- Baseline information on the current state of Burlington's woodlands 1-hectare in area and larger.
- A long-term vision for the City's woodlands.
- Management goals, recommendations, and targets.

Together, with the City's 37 individual Forest Management Plans, Burlington's forest management framework provides a structure and clearly identifies resourcing needs to guide the sustainable management of the community's woodlands over the life of the Strategy.

4. Stewardship

Objective: **Leverage partnerships and the community in urban forest management.**

More than 71% of HRM's land base is under private ownership. Given this, HRM's single greatest resource in managing its urban forest is its people. Community members are the residents, assorted property holders and managers that have outsized influence on the maintenance and management of trees within the Municipality.

Stewards are members of HRM's public that are engaged and knowledgeable on urban forest issues. These are individuals that are invested in the urban forest, supporting important messaging, and often directly enhancing program capacities through their own time and resources.

The strategies to achieve this objective are to:

- Develop critical community capacities,
- Support public outreach and education,
- Support research partnerships, and
- Explore opportunities for integration of Indigenous Knowledge and culturally-sensitive management practices.

WHAT WE HEARD

Collaboration is a two-way process that will require HRM to reach out to and involve community members. Indigenous and African Nova Scotian/Canadian engagement participants highlighted the importance of HRM reaching out to and involving their communities in the work to implement this Plan and ensuring the municipality remains responsive to evolving community priorities. By doing so, HRM can contribute to strengthening community connections and addressing historical wrongs that compromised those relationships.

🛈 quick start actions   🛈 priority actions

Strategy 4.1: **Develop community capacities.**

With more than 71% of HRM under private ownership, managing the urban forest is a shared responsibility. For HRM, the development of community capacities to support urban forest management is critical to not only generating broad support for the program, but for meaningfully supporting implementation of this plan as well. The actions under **Strategy 4.1** focus on programming efforts that provide outlets for community members and urban forest stewards to support the Municipality's program, contribute to management, and enhance urban forest outcomes on private and public lands.

INDICATOR(S):

Annual volunteer hours.

	4.1 A	Explore opportunities to work with other HRM business units, non-profit organizers, and community members to deliver community tree planting and invasive removal events.
	4.1 B	Make urban forestry data, including tree canopy mapping and inventory datasets, publicly available and explore ways to use this information to educate and build awareness.
	4.1 C	Establish a citizen monitoring network to allow interested community members to report forest health concerns through a web-mapping application.
	4.1 D ⓘ	Leverage and support the existing community programs and resources toward developing a community network with interest in the management of HRM's forested areas.
	4.1 E	Continue to support volunteer tree planting requests.

A CASE STUDY IN HARNESSING THE POWER OF COMMUNITY

The City of Mississauga's **Garlic Mustard Task Force** (GMTF) utilizes community stewards to reduce the spread of Garlic Mustard in the City's parks and natural areas. The program has only recently been formalized, but has run since 2018. Volunteers are trained by City staff to ensure they understand what Garlic Mustard looks like and how to remove it, as well as to review procedures for working safely outdoors. Volunteers are provided with the necessary supplies and work independently at an (approved) park of their choosing throughout the summer. Volunteers track their own hours, and report on the amount of garlic mustard removed through a volunteer management system.

In 2021, the GMTF was supported by 18 volunteers across 10 parks. Volunteers dedicated nearly 200 hours and removed 260 garbage bags of Garlic Mustard. The City invested approximately 40 hours of staff time into program administration and training. In 2022, the number of volunteers enrolled in the GMTF more than doubled, as did volunteer hours.

Strategy 4.2: **Support public outreach and education.**

Community members have expressed a desire for more outreach and education on various aspects of the urban forest and its management. While the Urban Forestry Division has had success in delivering periodic community outreach and education events in the past, programming has been inconsistent, supported only as existing staff capacities can absorb it outside of their regular duties and responsibilities. As a consequence, UFMP engagement revealed gaps in residents' knowledge of urban forest management, as well as in the nuances of HRM's urban forest management program and challenges it faces.

Enhanced outreach efforts and educational programming would develop the public as an urban forestry human resource, expanding the reach of program messaging and offerings, and potentially supporting new stewards. Enhanced communication would foster better dialogue between HRM's Urban Forestry and all residents and community members, ultimately generating greater community support for the implementation of the UFMP. **Strategy 4.2** includes actions that support improved Urban Forestry outreach and educational programming.

INDICATOR(S):

Resident satisfaction with municipal outreach and education programming.

	4.2 A	Explore partnerships with the Halifax Regional Centre for Education toward reaching youth in education and fostering urban forest education and interest amongst student demographics.
	4.2 B	Formalize programming which is inclusive of urban forest education opportunities and stewardship activities.
	4.2 C ⓘ	Ensure that outreach to communities integrate culturally sensitve communication methods.
	4.2 D	Utilize door hangers to notify affected residents of forthcoming planned maintenance on nearby boulevard trees and include brief educational material on the merits of (proactive) tree pruning.
	4.2 E	Leverage marketing materials and the program website to publish news, updates, and educational materials related to the urban forest and the UFMP.
	4.2 F	Continue to work with marketing and public affairs to communicate key initiatives, messaging, and challenges impacting urban forest management in HRM.
	4.2 G	Set up a publicly accessible digital dashboard to provide ongoing updates on trees planted, removed, conditions, and program design/fiscal health.

ⓘ **quick start actions**   ⓘ **priority actions**

Strategy 4.3: **Support research partnerships and opportunities.**

There is hardly an urban forest research legacy as impactful as the one HRM fostered with researchers at Dalhousie University for more than 20 years. In fact, HRM's 2013 Urban Forest Master Plan, cutting edge in its time, was the product of this very relationship. The 2013 Urban Forest Master Plan was written by accomplished researchers like Dalhousie's Peter Duinker, as well as varying alumni that have since gone on to work as staff at HRM, with the Province, and across the country. The Urban Forest Master Plan was just the tip of the proverbial iceberg, countless studies, reports of findings, peer reviewed articles, and broad urban forest advancements owe their origins to this relationship. The actions under **Strategy 4.3** are shaped to pay respects to this legacy, and to continue to support and develop the crucial knowledge exchange that has benefited the program and wider profession over decades past.

INDICATOR(S):

Annualized research funding.

TARGET(S):

$50,000.

4.3 A	Continue to capitalize on opportunities for internship and cooperative placements.
4.3 B	Explore opportunities for partnerships with academia toward building climate resilience in the Municipality's forested landscapes.
4.3 C ⚠	Remain open to opportunities to support research partnerships with academia.

▲ Dalhousie University's Dr. Peter Duinker speaking to community members on the value of their trees.

Strategy 4.4: **Explore opportunities for the integration of Indigenous Knowledge and culturally sensitive management practices in urban forest management practices.**

For centuries, Indigenous Peoples have inhabited and cared for lands and ecosystems on which HRM now sits. Their approach to forest management was inherently sustainable, rooted in a profound respect for the land and natural resources. Differing from early European settlers who viewed forests as commodities to be exploited, the Mi'kmaq have always considered the land and its gifts as sacred, and strove for a harmonious coexistence. These enduring values and practices hold significant value for how we manage the urban forest in modern times. Recognizing the importance of Indigenous peoples and their cultural heritage, HRM endeavours to honour their traditions, values, and stewardship. The actions under **Strategy 4.4** are to further explore and support opportunities to integrate Indigenous knowledge and practices into urban forest management.

INDICATOR(S):

PLACEHOLDER

A CASE STUDY IN INDIGENOUS PARTNERSHIP

After years of planning and collaboration between the Village of Pemberton, Lil'wat Nation and the Province of British Columbia, the Spelkúmtn Community Forest (SCF) management plan was finally unveiled spring of 2022. The SCF consists of a nearly 18,000 hectares of forested land and is a partnership between the Village of Pemberton and Lil'wat Nation designed to promote reconciliation, increase community benefits from local resources and amplify local voices in regards to the management of the surrounding forest.

The SCF management plan aims to protect and maintain water quality; protect, restore and enhance wildlife and fish habitat; protect at-risk species; protect and enhance recreation values and uses; and to protect the function and productivity of forest soils, amongst other values.

4.4 A ⚠	Work with First Nations and the Native Council of Nova Scotia to identify opportunities to integrate Traditional Knowledge into forested areas management, and to support ongoing knowledge exchange.
4.4 B	Identify urban sites for the establishment of medicine gardens to support healing while reclaiming and celebrating Indigenous culture.
4.4 C	In consultation with Indigenous communities- explore opportunities to utilize placemaking and dedications to celebrate Indigenous language and culture.
4.4 D	Work with First Nations communities to identify high priority forested stands within the community.
4.4 E	HRM's Office of Diversity & Inclusion facilitate regular (e.g., annual) meetings with First Nations to review UFMP implementation progress, challenges and emerging opportunities for cooperation and partnership in urban forest management.

WHAT WE HEARD

Indigenous community members in HRM need accessible, safe locations for ceremonies and healing gardens, similar to the Halifax Public Gardens.
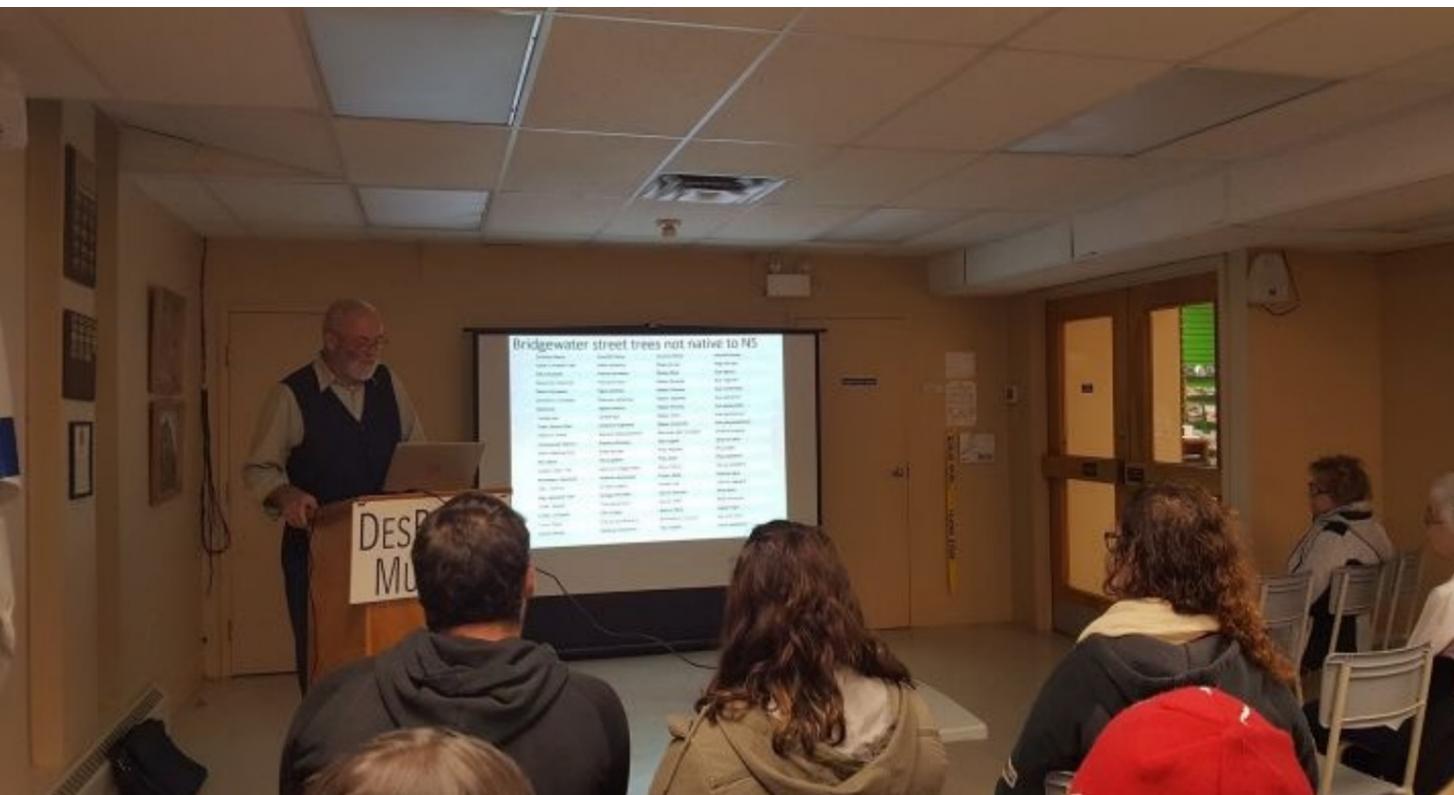
⚠ **quick start actions**   ⚠ **priority actions**

5. Management and Monitoring

Objective: **Program resourcing, governance, and monitoring support gradual implementation of the UFMP.**

The strategies under management and monitoring capture a broad range of program actions targeting administration and vehicles for proper monitoring of this Plan's implementation. One of the shortcomings of the preceding Urban Forest Master Plan was that progress in implementation was not adequately monitored across many program areas, and resources often did not match new and enhanced program areas. Such gaps will continue to create challenges in the full implementation of this plan if not meaningfully resolved.

Objective five captures actions that support the Municipality in achieving the varied strategies and actions found under the preceding four objectives. Put simply, objective five's strategies and actions are generally enabling, rooted in process and supportive of the applied actions elsewhere in the UFMP.

While enabling in nature, the strategies under part five are no less crucial to the implementation of this plan than those contained to any other objective. Levels of resourcing and robust monitoring measures must be in place to support the actioning of this Plan, or implementation will not be successful.

The strategies to achieve this objective are to:

- Enhance program resources,
- Practice effective program governance,
- Strengthen asset management practices, and
- Support reporting and adaptive management.

WHAT WE HEARD

The evolving needs of **Indigenous people within the HRM** require a flexible plan that aligns with community priorities and fosters meaningful engagement. By continuously developing parts of the Urban Forest Management Plan, Indigenous communities can introduce new voices and initiatives, such as land-back projects, species reclamation, and youth engagement programs, ensuring ongoing collaboration and mutual benefit.

Strategy 5.1: **Enhance program resources.**

Securing adequate resources is essential for the success of an urban forest management program. Currently, the 21-member Urban Forestry Division is responsible for managing an estimated 60,000 municipality-owned trees, responding to service requests, and supporting emergency cleanups post-storm events. As of 2023/24, HRM's program funding is approximately $2 per resident, falling below the average among municipalities of similar sizes.

Moreover, the Urban Forestry team faces increasing demand for tree services, driven by expanding tree planting initiatives and the escalating impacts of climate change and future development. **Strategy 5.1** aims to create sustainability in urban forest programming by assessing the resources required for UFMP implementation and exploring opportunities to secure these resources effectively.

INDICATOR(S):

Program funding per capita.

TARGET(S):

$15 per capita (2050).

5.1 A ❗ Develop new staff capacities within Urban Forestry as required to support increased service levels identified through this plan.	5.1 D ❗ Define levels of service for all asset classes (i.e., ornamental trees, park trees, forested areas), and resource requirement to support operational maintenance.
5.1 B ❗ Create a new position within the Urban Forestry division to lead implementation of the UFMP, urban forest monitoring, associated policy initiatives, and community outreach.	5.1 E ❗ Establish a FireSmart Coordinator role to support FireSmart programming on private lands and to support community education.
5.1 C Create an Education Officer position to support urban forest outreach and education programming, as well as coordinating partnerships with nonprofits, School Districts, Indigenous and African Nova Scotian/ Canadian groups, research institutions and other interested parties.	5.1 F Update the service agreement between Parks and Urban Forestry to reflect changes to levels of service that would result from adoption of the UFMP.
	5.1 G ❗ Establish formal forest management capacity, both staff and fiscal, to support monitoring, contract administration, outreach, and management activities with the Municipality's treed and forested parks.

❗ **quick start actions** ❗ **priority actions**

Strategy 5.2: **Practice effective program governance.**

A CASE STUDY IN GOOD GOVERNANCE

The City of Mississauga has achieved the Forest Stewardship Council® (FSC®) certification (FSC® C018800) for the management of 36 city-owned woodlands through Eastern Ontario Model Forest's (EOMF) group certificate program. Receiving the certification confirms that a forest is being managed sustainably, preserves biological diversity and benefits the lives of local people and workers. The FSC® certification supports the City in maintaining high forest stewardship standards, and provides the public with evidence of the City's management strengths and accomplishments.

Urban forest program governance encompasses the policies, rules, practices, and structures that guide the management and protection of the urban forest. Effective governance is an important ingredient in an accomplished urban forest management program, influencing staff capacity and competency, partnerships, and community support.

Key components of effective governance include integrated planning processes, interdepartmental and inter-agency partnerships, and adequate resourcing. Third-party programs such as Forest Stewardship Council (FSC®) certification can give credence to the broad practices of HRM's urban forest management program, improving public trust and program buy-in. **Strategy 5.2** includes a range of actions to support varied governance supports.

INDICATOR(S):

Hectares of forested area with third-party certification.

5.2 A Continue to support staff professional development and peer networking.

5.2 B Continue to participate in national programs, networks, and events.

5.2 C Undertake periodic community surveys to understand changing public perspectives, including those of targeted communities, on urban forest management and associated strategic priorities.

5.2 D Explore opportunities opportunities for third-party certification and carbon credit programs for the Municipality's forested areas.

5.2 E ❗ Establish an inter-departmental working group with terms of reference identifying staff and departmental leads in implementation. The working group will meet quarterly to share progress, opportunities, challenges, experiences, and concerns.

5.2 F Prepare a financial plan to formalize resource requirements and assign strategic (i.e., departmental) leads for each action item shortly following plan adoption.

5.2 G Explore opportunities for the establishment of a stormwater (canopy) credit adjusted by the percentage of canopy cover on a property.

Strategy 5.3: **Strengthen natural asset management practices.**

Asset management is a methodology used to evaluate the value and needs of physical assets throughout their life-cycle. Municipalities are increasingly adopting asset management principles to plan and budget for necessary investments in the maintenance, renewal, and replacement of public assets. This approach is valuable for budgeting and forecasting asset replacements.

At present, most municipal deployments of asset management frameworks focus primarily on built infrastructure, however there is increasing uptake of some natural asset classes (i.e., ornamental trees) into these systems. By utilizing asset management techniques for the management of HRM's green infrastructure, the municipality can establish the required levels of service to optimize returns (i.e., maximizing benefits and minimizing risks) and allocate adequate resources accordingly. Asset management inputs like an up-to-date tree inventory can also support important municipal processes like succession management, proactive tree maintenance, storm response, and informed species selection.

While HRM does have some natural asset management practices in place, there is a need for a formalized municipality-wide process. This Plan aims to provide guidance for formalizing asset management processes for both urban managed trees and natural areas. **Strategy 5.3** includes data acquisition and process-oriented actions which position the Municipality to readily integrate green infrastructure into an asset management framework.

INDICATOR(S):

Funding per ornamental tree and per hectare of forested area.

5.3 C Formalize standards and thresholds for monitoring, management, and replacement of assets with SMMDs (**Figure 2-12**), as well as a timeline for SMMD delineation.

5.3 D Scale Urban Forestry operating budgets with changes to levels of service and the number of assets under Urban Forestry's care.

5.3 E Link the Municipality's inventory of urban forest assets to CityWorks.

5.3 A Establish a cyclical plot-based inventory of municipally-managed forested areas to capture stand conditions, further develop HRM's natural asset inventory, document ecosystem health concerns (e.g., encroachments, encampments, invasive species), and inform management prescriptions.

5.3 B Maintain and expand the tree inventory to include urban park trees, condition ratings and year planted. Archive retired tree assets to track removals and guide regular maintenance and emergency management through time.

SUCCESS IN ASSET MANAGEMENT

In 2023, HRM contracted the Natural Asset Initiative (NAI, formally the Municipal Natural Assets Initiative) to conduct a pilot project within the Nine Mile River watershed. The watershed spans from the southern portion of Blue Mountain-Birch Cove reserve to Shad Bay. The project will evaluate the benefits that natural assets provide for stormwater management as well as four co-benefits, recreation, carbon storage and sequestration, physical and mental health, and cultural values. The project will provide a model for the municipality to understand what undeveloped lands are contributing, making a clearer business case for municipal planners to enforce stronger development controls and identify strategic lands for conservation.

❗ **quick start actions** ❗ **priority actions**

Strategy 5.4: **Support reporting and adaptive management.**

Adaptive management is an iterative approach to decision-making and management that allows for flexibility and adjustment in response to changing conditions, uncertainties, and new information. Given the dynamic nature of the urban forest, and the escalating uncertainties brought on by climate change and future development, the success of the UFMP implementation will depend on how well HRM can monitor and adapt to these changes.

Various methods can be deployed to track change in HRM's the urban forest. For example, canopy cover can be tracked to understand changes in canopy extent over time. Forest health monitoring is crucial for early detection of evolving forest health concerns, and can support prompt intervention to prevent irreversible damage. **Strategy 5.1** aims to establish adaptive management approaches, as well as monitoring and reporting mechanisms, to support informed decision-making.

INDICATOR(S):

State of the Urban Forest reporting period.

TARGET(S):

5 years, repeating.

5.4 A	Continue to monitor planting site technologies (e.g., soil cells, permeable pavement etc.) to understand their full life-cycle cost implications and measure the outcomes for the trees planted into them.
5.4 B	Continue to update Municipal Design Guidelines to account for new technologies and best management practices.
5.4 C	Produce a state of the urban forest report on a five-year interval to report on key program metrics and explore urban forest change since the preceding assessment.
5.4 D	Review the Urban Forest Management Plan and Green Network Plan every 5 years, including to accommodate changes to balance urban forest objectives with evolving municipal objectives and to support projects stemming from other municipal plans.
5.4 E	Update LiDAR and high-resolution imagery for the urban core, and produce a new ornamental tree canopy dataset, on a five-year interval.
5.4 F	Utilize the UFMP monitoring framework (**Table 4-1**) to inform ongoing monitoring and adaptive management interventions through UFMP review periods.

A CASE STUDY IN EVIDENCE-BASED DECISION-MAKING AND ADAPTIVE MANAGEMENT

Much in the same way as Point Pleasant serves as the forested jewel of peninsular Halifax, Stanley Park serves as the forested jewel of the City of Vancouver.

Several successive years of drought in combination with a western hemlock looper contributed to an elevated rate of conifer mortality in Stanley Park. In response, the Vancouver Board of Parks and Recreation acquired four-band orthoimagery which allowed forest managers to understand the extent and severity of the decline within the park. This resource, in combination with field-based sampling, provided the evidence the Vancouver Board of Parks and Recreation needed in order to identify appropriate management intervention.

In this image dead and declining coniferous canopy stands out in grey against healthy canopy in red.

▲ Vancouver's Stanley Park. August 2022. CR: Diamond Head Consulting

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Appendices
Annexes

Appendix 1. Sustainable Urban Forest Management Criteria and Indicators

Assessment Criteria	Objective	Indicator for Community Forestry Performance			
		Poor	**Fair**	**Good**	**Optimal**
PLANNING AND PROTECTION					
Awareness of the urban forest as a community resource	The urban forest is recognized as vital to the community's environmental, social, and economic well-being.	General ambivalence or negative attitudes about trees, which are perceived as neutral at best or as the source of problems. Actions harmful to trees may be taken deliberately.	Trees are widely acknowledged as providing environmental, social, and economic services but are not widely integrated in corporate strategies and policies.	Trees are widely acknowledged as providing environmental, social, and economic services and urban forest objectives are integrated into other corporate strategies and policies.	Urban forest recognized as vital to the community's environmental, social, and economic well-being. Widespread public and political support and advocacy for trees, resulting in strong policies and plans that advance the viability and sustainability of the entire urban forest.
Interdepartmental and Municipal agency cooperation on urban forest strategy implementation	Ensure all relevant municipal departments and agencies cooperate to advance goals related to urban forest issues and opportunities.	Little cooperation and conflicting among departments and/or agencies often leading to poor outcomes for trees.	Common goals but limited cooperation among departments and/or agencies and mixed outcomes for trees.	Municipal departments, affected agencies and urban forest managers recognize potential conflicts and reach out to each other on an informal but regular basis.	Formal interdepartmental working agreements or protocols for all projects that could impact municipal trees.
Clear and defensible urban forest canopy assessment and goals	Urban forest policy and practice is driven by comprehensive goals municipality-wide and at the neighbourhood or land use scale informed by accurate, high-resolution assessments of existing and potential canopy cover.	No assessment or goals.	Low-resolution and/or point-based sampling of canopy cover using aerial photographs or satellite imagery – and limited or no goal setting.	Complete, detailed, and spatially explicit, high-resolution Urban Tree Canopy (UTC) assessment based on enhanced data (such as LiDAR) – accompanied by comprehensive set of goals by land use and other parameters.	The City has a complete, detailed, and spatially explicit high-resolution Urban Tree Canopy (UTC) assessment accompanied by a comprehensive set of goals, all utilized effectively to drive urban forest policy and practice municipality-wide and at neighbourhood or smaller management level.
Relative tree canopy cover	Achieve desired degree of tree cover, based on potential or according to goals set for entire municipality and for each neighbourhood or land use.	The existing canopy cover for entire municipality is <50% of the desired canopy.	The existing canopy is 50%-75% of desired	The existing canopy is >75%-100% of desired.	The existing canopy is >75%-100% of desired - at the individual neighbourhood level as well as overall municipality
Municipality-wide urban forest management plan	Develop and implement a comprehensive urban forest management plan for public and private property.	No plan.	Existing plan limited in scope and implementation	Recent comprehensive plan developed and implemented for publicly owned forest resources, including trees managed intensively (or individually) and those managed extensively, as a population (e.g., trees in natural areas)	Strategic, multi-tiered plan with built-in adaptive management mechanisms developed and implemented for public and private resources
Municipal green infrastructure asset management	Integrate green infrastructure assets into the municipal asset management system to support valuing and accounting for natural assets in the City's financial planning to build climate resilient infrastructure.	No recognition of value of natural or human-made elements that provide ecological and hydrological functions (green infrastructure)	Local government recognizes the value of green infrastructure but does not yet have information to include them in an asset management system.	Green infrastructure assets have been partially or fully inventoried and some assets are included in an asset management system, with the intent to ultimately capture all assets in the consolidated financial statements of the municipality.	Green infrastructure assets are inventoried and included in an asset management system and on the consolidated financial statement of the municipality.
Municipal-wide biodiversity or green network strategy	Acquire and restore publicly-owned natural areas in pursuit of meeting municipal-wide biodiversity and connectivity goals.	No or very limited planning and stewardship of natural areas.	Area specific management plans focused on management, restoration, and protection of natural areas.	Municipal-wide urban forest, parks or natural areas strategy guiding management, restoration, and protection of the existing natural areas network.	Biodiversity strategy or equivalent in effect to support management, restoration, and acquisition of natural areas network throughout the municipality.
Municipal urban forestry program capacity	Maintain sufficient well-trained personnel and equipment – whether in-house or through contracted or volunteer services – to implement municipality-wide urban forest management plan	Team severely limited by lack of personnel and/or access to adequate equipment. Unable to perform adequate maintenance, let alone implement new goals.	Team limited by lack of staff and/or access to adequate equipment to implement new goals.	Team able to implement many of the goals and objectives of the urban forest management plan.	Team able to implement all of the goals and objectives of the urban forest management plan.
Urban forest funding to implement a strategy	Maintain adequate funding to implement the urban forest strategy.	Little or no dedicated funding.	Dedicated funding but insufficient to implement the urban forest strategy or maintain new assets as they are added to the inventory.	Dedicated funding sufficient to partially implement the urban forest strategy and maintain new assets as they are added to the inventory.	Sustained funding to fully implement the urban forest strategy and maintain new assets as they are added to the inventory.
Policy or regulations regulating the protection and replacement of private and City trees	Secure the benefits derived from trees on public and private land by enforcement of municipality-wide policies and practices including tree protection.	No or very limited tree protection policy.	Policies in place to protect public trees and employ industry best management practice.	Policies in place to protect public and private trees with enforcement but lack integration with other municipal policy to enable effective tree retention.	Urban forest strategy and integrated municipal-wide policies that guide the protection of trees on public and private land, and ensure they are consistently applied and enforced.
Policy or regulations for conservation of sensitive ecosystems, soils, or permeability on private property through development	Secure the benefits derived from environmentally sensitive areas by enforcement of municipality-wide policies in pursuit of meeting biodiversity and connectivity goals	No or very limited natural areas protection policy.	Policies in place to protect privately-owned natural areas without enforcement.	Development Permit Areas in place to protect privately-owned natural areas with enforcement but lack integration with other municipal policy to enable effective tree retention.	Biodiversity strategy or equivalent and integrated municipal-wide policies that guide privately-owned natural area protection and ensure they are consistently applied.
Internal protocols guide City tree or sensitive ecosystem protection	Ensure all relevant municipal departments follow consistent tree or ecosystem protection protocols for capital design and construction activities.	No protocols guiding City tree or ecosystem protection for capital design and construction activities.	Informal and inconsistent processes followed for City tree or ecosystem protection for capital design and construction activities.	Established protocols for City tree or ecosystem protection for capital design and construction activities but outcomes are inconsistent or sometimes unachievable.	Established protocols for City tree or ecosystem protection for capital design and construction activities are consistently followed and outcomes are successful.

Assessment Criteria	Objective	Indicator for Community Forestry Performance			
		Poor	**Fair**	**Good**	**Optimal**
Standards of tree protection and tree care observed during development or by local arborists and tree care companies	Consulting arborists and tree care companies understand city-wide urban forest goals and objectives and adhere to high professional standards.	Limited understanding or support for tree protection requirements.	General understanding or support for tree protection requirements but large variation in the quality of information and services provided.	General understanding or support for tree protection requirements and generally consistent quality of information and services provided.	Advocacy for tree protection requirements, engagement with City staff on improving processes and standards, and generally consistent quality of information and services provided to high professional standards.
Cooperation with utilities on protection (and pruning) of City trees	All 3rd party utilities employ best management practices and cooperate with the City to advance goals and objectives related to urban forest issues and opportunities.	Utilities take actions impacting urban forest with no municipal coordination or consideration of the urban forest resource.	Utilities inconsistently employ best management practices, rarely recognizing potential municipal conflicts or reaching out to urban forest managers on an ad hoc basis – and vice versa.	Utilities employ best management practices, recognize potential municipal conflicts, and reach out to urban forest managers on an ad hoc basis – and vice versa.	Utilities employ best management practices, recognize potential municipal conflicts, and consistently reach out to urban forest managers and vice versa.
PLANT / GROW					
City tree planting and replacement program design, planning and implementation	Comprehensive and effective tree selection, planting and establishment program that is driven by canopy cover goals and other considerations according to the UFS.	Tree replacement and establishment is ad hoc.	Some tree planting and replacement occurs, but with limited overall municipality-wide planning and insufficient to meet replacement requirements.	Tree replacement and establishment is directed by needs derived from an opportunities assessment and species selection is guided by site conditions, tree health and climate adaptation considerations.	Tree planting and replacement is guided by strategic priorities and is planned out to make progress towards targets set for canopy cover, diversity, tree health and climate adaptation within the timeframe of the strategy.
Development requirements to plant trees on private land	Ensure that new trees are required in landscaping for new development or, where space is lacking, there is an equivalent contribution to tree planting in the public realm.	Landscaping requirements do not address trees on private land.	Developments are generally required to plant trees but the outcomes are often in conflict with public trees and other infrastructure due to space limitations and not connected to meeting canopy cover targets.	Developments are required to plant trees or, where space is not adequate according to soil volume available, provide cash-in-lieu for equivalent tree planting on public land. The requirement is not connected to meeting canopy cover tar-gets.	Developments are required to provide a minimum density of trees per unit measure or, where space is not adequate according to soil volume available, provide adequate cash-in-lieu for equivalent tree planting on public land. Planting density is determined based on meeting a municipal-wide canopy cover target.
Streetscape and servicing specifications and standards for planting trees	Ensure all publicly owned trees are planted into conditions that meet requirements for survival and maximize current and future tree benefits.	No or very few specifications and standards for growing sites.	Specifications and standards for growing sites exist but are inadequate to meet urban forest goals.	Specifications and standards exist and are adequate to meet urban forest goals but are not always achieved.	All trees planted are in sites with adequate soil quality and quantity, and with sufficient growing space to achieve their genetic potential and life expectancy, and thus provide maximum ecosystem services.
Equity in planting program delivery	Ensure that the benefits of urban forests are made available to all, especially to those in greatest need of tree benefits.	Tree planting and outreach are not determined equitably by canopy cover or need for benefits.	Planting and outreach includes attention to low canopy neighbourhoods or areas.	Planting and outreach targets neighbourhoods with low canopy and a high need for tree benefits.	Equitable planting and outreach at the neighbourhood level are guided by strong citizen engagement in identified low-canopy/high-need areas.
Forest restoration and native species planting	Encourage the appreciation of climate suitable native vegetation by the community and ensure native species are widely planted to enhance native biodiversity and connectivity	Voluntary use of climate suitable native species on publicly and privately-owned lands.	The use of climate suitable native species is encouraged on a site-appropriate basis in public and private land development projects.	Policies require the use of climate suitable native species and management of invasive species on a site-appropriate basis in public and private land development projects but are not integrated across all policy or guided by a connectivity analysis.	Policies require the use of climate suitable native species and management of invasive species on a site-appropriate basis in public and private land development projects and through tree bylaw.
Selection and procurement of stock in cooperation with nursery industry	Diversity targets and climate adaptation/mitigation objectives guide tree species selection and nurseries proactively grow stock based on municipal requirements.	Species selection is not guided by diversity targets or climate adaptation/mitigation objectives.	Species selection is guided by diversity and climate adaptation/mitigation but required stock is rarely available from nurseries and acceptable substitutes reduce diversity.	Species selection is guided by targets for diversity and climate adaptation/mitigation and required stock or acceptable substitutes are usually available from nurseries.	Species selection is guided by targets for diversity and climate adaptation/mitigation and required stock is secured ahead of the planned planting year from contract or in-house nurseries.
Ecosystem services targeted in tree planting projects and landscaping	Incorporate ecosystem services objectives into public and private tree planting projects to improve urban tree health and resilience, carbon sequestration, stormwater management and cooling	Ecosystem services not considered in planting projects or intentionally designed into vegetated landscapes	Ecosystem services, such as stormwater interception, occasionally incorporated into City or private land planting projects and landscape designs.	Guidelines in place for planting projects and landscape designs on public and private land to deliver specific ecosystem services.	Ecosystem services targets are defined for the urban forest and policy requires planting project and land-scape designs on public and private land to contribute to meeting targets.
MAINTENANCE AND MONITORING					
Tree inventory	A current and comprehensive inventory of intensively managed trees to guide management, including data such as age distribution, species mix, tree condition and risk assessment.	No inventory.	Partial inventory of publicly-owned trees in GIS.	Complete inventory of ornamental trees and intensively managed park trees in GIS but inconsistently updated.	The municipal tree inventory is complete, is GIS-based, supported by mapping, and is continuously updated to record growth, work history and tree condition.
Knowledge of trees on private property	Understand the extent, location, and general condition of privately-owned trees	No information about privately owned trees.	Aerial, point-based or low-resolution assessment of tree canopy on private property, capturing broad extent.	Detailed Urban Tree Canopy analysis of the urban forest on private land, including extent and location, integrated into a municipality-wide GIS system.	The City has an i-Tree Eco analysis of private trees as well as detailed Urban Tree Canopy analysis of the entire urban forest integrated into a municipality-wide GIS system.
Natural areas inventory	A current and comprehensive inventory of sensitive and modified natural ecosystems and their quality mapped to Provincial standards to provide standardized ecological information to support decision-making.	No inventory of natural areas.	Natural areas inventoried in GIS but not recently updated and attribute information not to a standard that can support decision-making.	Natural areas inventoried in GIS with standard and complete attribute information to support decision-making but not updated in the last 5 years.	Natural areas inventoried in GIS with standard and complete attribute information to support decision-making and updated in the last 5 years.

Left Page

Assessment Criteria	Objective	Indicator for Community Forestry Performance			
		Poor	**Fair**	**Good**	**Optimal**
Age diversity (size class distribution)	Provide for ideal uneven age distribution of all "intensively" (or individually) managed trees – municipality-wide as well as at neighbourhood level	Even-age distribution, or highly skewed toward a single age class (maturity stage) across entire population	Some uneven distribution, but most of the tree population falls into a single age class	Total tree population across municipality approaches an ideal age distribution of 40% juvenile, 30% semi-mature, 20% mature, and 10% senescent	Total population approaches that ideal distribution municipality-wide as well as at the neighbourhood level
Publicly owned tree species condition	Current and detailed understanding of condition and risk potential of all publicly owned trees that are managed intensively (or individually)	Condition of urban forest is unknown	Sample-based tree inventory indicating tree condition and risk level	Complete tree inventory that includes detailed tree condition ratings	Complete tree inventory that is GIS-based and includes detailed tree condition as well as risk ratings
Maintenance of intensively managed trees	Maintain all publicly owned intensively managed trees for optimal health and condition in order to extend longevity and maximize current and future benefits	Intensively managed trees are maintained on a re-quest/reactive basis.	Intensively managed trees are maintained on a request/reactive basis. Limited systematic (block) pruning and/or immature trees are structurally pruned.	All intensively managed trees are systematically maintained on a cycle determined by work-load and resource limitations. All immature trees are structurally pruned.	All mature intensively managed trees are maintained on an optimal pruning cycle. All immature trees are structurally pruned.
Tree risk management	Comprehensive tree risk management program fully implemented, according to ANSI A300 (Part 9) "Tree Risk Assessment" standards, and supporting industry best management practices	No coordinated tree risk assessment or risk management program. Response is on a reactive basis only.	Some areas within the city are prioritized for risk assessment and management. Little annual budget is available to develop a more proactive inspection program.	Priority areas of the City are inspected on a regular schedule and operational standards and budgets are in place for responding to and managing tree risks within an appropriate timeframe.	A comprehensive risk management program is in place, with all public lands inspected on defined schedules and operational standards and budgets in place for responding to and managing tree risks within an appropriate timeframe.
STEWARDSHIP					
Citizen involvement and neighbourhood action	Citizens and groups participate and collaborate at the neighbourhood level with the municipality and/or its partnering NGOs in urban forest management activities to advance municipality-wide plans	Little or no citizen involvement or neighbourhood action.	Community groups are active and willing to partner in urban forest management, but involvement and opportunities are ad hoc.	Several active neighbourhood groups engaged across the community, with actions coordinated or led by municipality and/or its partnering NGOs.	Proactive outreach and coordination efforts by the City and NGO partners result in widespread citizen involvement and collaboration among active neighbourhood groups engaged in urban forest management
Involvement of large private land and institutional land holders (e.g., schools)	Large private landholders embrace and advance city-wide urban forest goals and objectives by implementing specific resource management plans	Large private landholders are generally uninformed about urban forest issues and opportunities.	Landholders manage their tree resource but are not engaged in meeting municipality-wide urban forest goals.	Landholders develop comprehensive tree management plans (including funding strategies) that advance municipality-wide urban forest goals.	As described in "Good" rating, plus active community engagement and access to the property's forest resource.
Urban forest research	Research is active and ongoing towards improving our understanding of the urban forest resource, the benefits it produces, and the impacts of planning, policy, design and management initiatives.	No urban forest research.	Isolated academic re-search occurs in the municipality's urban forest.	The municipality supports and has input on academic research occurring in its urban forest and knowledge transfer occurs.	The urban forest is a living laboratory - in collaboration with public, private, NGO and academic institutions - integrating research and innovation into managing urban forest health, distribution, and abundance.

Right Page

Assessment Criteria	Objective	Indicator for Community Forestry Performance			
		Poor	**Fair**	**Good**	**Optimal**
Regional collaboration	There is cooperation and interaction on urban forest plans among neighbouring municipalities within the region, and/or within regional agencies.	Municipalities have no interaction with each other or the broader region for planning or coordination on urban forestry.	Some neighbouring municipalities and regional agencies share similar policies and plans related to trees and urban forest.	Some urban forest planning and cooperation across municipalities and regional agencies.	Widespread regional cooperation resulting in development and implementation of regional urban forest strategy.
MANAGEMENT					
Emergency response planning	A response plan guides call-out procedures, resources available and the clean-up response for extreme weather and earthquake.	Response plan not documented or not current.	Response plan is documented and includes call-out procedures, roles and responsibilities but lacks details to prioritize hazards and clean-up.	Response plan includes call-out procedure, roles and criteria for prioritizing tree hazards and removing debris is in place.	A comprehensive response plan is in place and a response drill occurs annually.
Pest and Disease Management	An Integrated Pest Management (IPM) plan guides treatment responses to existing and potential pest, disease and invasive species threats to the urban forest.	No integrated pest management plan and no pest management.	No integrated pest management plan and reactive pest management.	An integrated pest management plan is in place and implemented.	A comprehensive pest management program is in place, with detection, communication, rapid response and IPM practiced.
Waste biomass utilization	A closed system diverts all urban wood and green waste through reuse and recycling	Wood waste from the urban forest is not utilized.	Wood waste from the urban forest is utilized as mulch or biofuel.	Wood waste from the urban forest is utilized as mulch or biofuel and sometimes high value pieces are milled and stored for later use or sold on to local value-added industries.	Low value wood waste from the urban forest is utilized as mulch or biofuel and all high value pieces are milled and stored for later use or sold on to local value-added industries.
Tracking of operational carbon footprints and urban forest carbon-cycle balance	Organization will actively track their operational carbon footprints and their community-wide urban forest carbon-cycle balance and work with community partners to minimize greenhouse gas emissions (GHG) emissions while maximizing carbon sequestration and avoided GHG emissions.	Basic CO2/GHG accounting not considered for urban forestry operations	Basic CO2/GHG accounting and carbon cycle assessment and climate action plan undertaken for urban forestry operations and for the entire community with general goals and objectives to minimize community emissions	Basic CO2/GHG accounting and carbon cycle assessment and climate action plan undertaken with specific goals and objectives for urban forestry and formal policies in place to encourage use of trees and green infrastructure for carbon sequestration and energy conservation in buildings	Basic CO2/GHG accounting and carbon cycle assessment and climate action plan undertaken for urban forestry operations and for the entire community with specific goals and objectives for urban forestry and formal policies in place to encourage use of trees and green infrastructure for carbon sequestration and energy conservation in buildings, and to maximize urban wood and woody biomass utilization.
Species diversity	Establish a genetically diverse population across the municipality as well as at the neighbourhood scale	Five or fewer species dominate the entire tree population across municipality	No single species represents more than 10% of the total tree population; no genus more than 20%, and no family more than 30%	No single species represents more than 5% of total tree population; no genus more than 10%; and no family more than 15%	At least as diverse as "Good" rating (5/10/15) municipality-wide and at least as diverse as "fair" (10/20/30) at the neighbourhood level
Species suitability	Establish a tree population suited to the urban environment and adapted to the overall region	Fewer than 50% of all trees are from species considered suitable for the area	>50%-75% of trees are from species suitable for the area	More than 75% of trees are suitable for the area	Virtually all trees are suitable for the area

Apendix 2. Engagement Summaries

To be added in the final version

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