ST. JOHN'S URBAN FOREST MANAGEMENT MASTER PLAN

Master Plan Report

EDM
ENVIRONMENTAL DESIGN AND MANAGEMENT LIMITED

Diameter:04
Height:02
Trunk Condition:1
Crown Condition:2

Prepared for:
City of St. John's

Prepared by:
EDM • Environmental Design and Management Limited

In association with:
Peter Kuntz, R.P.F.
The Bristol Group

October 2006

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EXECUTIVE SUMMARY

The City of St. John's Urban Forest Management Master Plan has been undertaken to improve the management of public trees in St. John's. The EDM • Environmental Design and Management team was selected to undertake this work on the basis of our proposal of April 19, 2005. The project consists of three key components:

- Consultation of the public and stakeholders
- Completion of an inventory of public trees in St John's
- Preparation of a 5-year Operational Plan and a 20-year Management Plan to guide the care and development of the urban forest in St. John's.

Early in the project, the consulting team prepared the following Vision Statement to guide preparation of the Management Master Plan:

> *St. John's shall aim to be a City of Nature through thoughtful public policy and private cooperation. The City should embark on a long-term Management Plan to cultivate a diverse, attractive, and sustainable urban forest. The Plan should ensure conservation of built heritage, and development of an efficient and vibrant urban environment in the context of healthy natural open spaces.*

The City of St. John's has inventoried trees in the past and has a well-established inventory form with data coding procedures. Past inventories, however, have been stored in hard copy and have become out-of-date, with the exception of 3,556 records collected in 2003 and stored it in the database program Tree Manager for Windows. EDM geocoded these Tree Manager records as part of the current assignment and incorporated them in the overall Tree Inventory. The past inventory form was reviewed in Phase 1 of this project and deemed to be satisfactory for the current inventory by City staff and the consulting team. The inventory form documents the species, size, and condition of each tree.

In the past, surveyors referenced trees to civic addresses or in relation to specific facilities (e.g., in a particular park). An important part of the methodology for this assignment was the use of the City's Geographic Information System (GIS) for storage of Tree Inventory data. GIS records data in a geographic (i.e., mapped) framework. Items such as trees can be correctly positioned on a map along with other relevant data such as the location of roads and buildings, utilities, and similar features.

To facilitate data collection for GIS, EDM and the City supplied surveyors with personal digital assistants (PDAs). EDM loaded PDAs with relevant data from the City of St. John's GIS (i.e., street network, watercourses, aerial photography, etc.) necessary to allow surveyors to identify their location. The file also included tree locations identified through interpretation of aerial photography by OSI Geomatics Ltd. of Vancouver as the key component of a separate consulting assignment

conducted during the spring and early summer of 2005 as EDM got the Urban Forest Management Master Plan and related Tree Inventory under way. Surveyors working for EDM effectively field truthed the location coordinates specified by OSI, adjusting locations, deleting incorrect locations, and adding trees where they were missed. Corrected locations provided by EDM are accurate within ± 3 meters (10 feet) for individual trees.

The inventory did not account for all trees in St. John's. The Tree Inventory was only intended to collect information on public trees. Public trees are defined in the St. John's Tree Regulation as trees partially or wholly located within a public right-of-way, or on municipally owned land, or overhanging such lands. Data collection covered all of what is generally regarded as the "old City," or the lands within the City boundary before amalgamation in 1991 plus the former Towns of Wedgewood Park and the Goulds. Bowring, Bannerman, and Victoria Parks as well as some, but not all, of the smaller parks in the City were inventoried.

The following six issues related to the St. John's Urban Forest were initially reported in the Issues Brief provided at the close of Phase 1 and further detailed in the Tree Inventory Report based on Tree Inventory data:

- *Elm Spanworm* – The Elm Spanworm has had considerable impact on deciduous trees in St. John's over the past four years. Insect damage is the most common type of damage to trees in the city. In St. John's, the Spanworm is the dominant insect pest.

- *Non-Native Species* – Native trees are a minor component of the urban forest in St. John's. Although Newfoundland has only 21 intermediate to large native tree species, the Tree Inventory identified 170 separate species in the St. John's Urban Forest. In total, native species account for 11,610 trees or barely one-fifth of all public trees inventoried.

- *Species Diversity* – Notwithstanding issues with non-native species, St. John's supports relatively few tree species in any quantity. The top five species (i.e., Sycamore Maple, Norway Maple, White Birch, White Spruce, and Mountain Ash) account for 64 per cent of public trees in the inventory; the top 20 take in over 86 per cent. In addition, trees are generally of similar age (about 50 years old).

- *Stormwater Management* – Tree management, has an important role to play in the effective control of stormwater. Infill of wetland areas should be avoided. Developed sites must be replanted, and new trees should be nurtured and maintained. This must be addressed through effective regulation and public education.

- *Development Regulations* – Many contacts suggested that provisions for

incorporation of trees in new development are inadequate. Several noted that higher density development, which is preferred in the central area of the city and is encouraged by the Municipal Plan, does not provide space for tree planting on site. Many added that requirements for tree preservation and replacement are generally lacking for residential development. For commercial development, for which the City of St. John's Commercial Development Policy sets specific landscaping requirements, contacts pointed out that procedures are lacking to ensure that trees are nurtured after initial planting.

- *Snow Clearing* – According to many contacts, snow clearing equipment imperils trees in St. John's. Better procedures are needed to plant trees out of harm's way and/or to protect them from snow clearing and snow dumping. The City is, in fact, reserving the first 4 feet of land past the sidewalk in front of each property for snow storage (i.e., no walls, furniture, or other obstructions are permitted in the area). Explicitly identifying instances of plow damage will facilitate the monitoring of the success of this practice as well as to identify areas where circumstances make trees more vulnerable.

The Management Plan is offered to guide the maintenance and improvement of the Urban Forest in St. John's for the next 25 years. It establishes the principles for operations over this period consistent with the Vision for the St. John's Urban Forest. As such, it is prepared as a collection of policies by which St. John's Council and staff are to be guided.

Although the Tree Inventory, at this point, records only public trees in St. John's, much of the discussion and many of the recommendations following apply more broadly. Included in our recommendations, in fact, are initiatives to expand the Tree Inventory in several steps to include all trees within the City.

The Operational Plan sets out the broad program of the City of St. John's to implement the policies of the foregoing Management Plan during the first five years of its application. It is, therefore, applicable to the period 2007 to 2012. Its implementation should begin on approval of this document.

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1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

The City of St. John's Urban Forest Management Master Plan has been undertaken to improve the management of public trees in St. John's. The EDM • Environmental Design and Management team was selected to undertake this work on the basis of our proposal of April 19, 2005. The project consists of three key components:

- Consultation of the public and stakeholders
- Completion of an inventory of public trees in St John's
- Preparation of a 5-year Operational Plan and a 20-year Management Plan to guide the care and development of the urban forest in St. John's.

This Master Plan Report consolidates all work completed for the Master Plan. It incorporates key contents from the Issues Brief submitted by EDM at the conclusion of Phase 1 and the Tree Inventory Report produced from Phase 2. It adds the 5-year Operational Plan and a 20-year Management Plan that are the final components of the project.

The Master Plan project began in mid-May 2005. The original project schedule anticipated that work would be complete by January 2006; however, fieldworkers hired by EDM ultimately surveyed a considerably larger number of trees than was expected when the project began. Whereas guidelines in the project Terms of Reference suggested that the inventory might require collection of data on 26,000 public trees in the city, the survey crew engaged by EDM ultimately collected data on roughly 48,000 trees. This extended our timeline by months but was necessary to ensure thorough coverage of the urban forest.

1.2 PROJECT PROCESS

To address the requirements of the TOR, our proposal set out a three-phase Project Plan. The three phases of the project are as follows:

- PHASE 1 – Issues Identification
- PHASE 2 – Tree Inventory Review
- PHASE 3 – Operational and Management Plan

At the conclusion of each phase, the Project Plan called for the submission of a document for review by the Steering Committee at the close of each phase (see **Table 1.1** for a summary of project steps and their dates of execution). The Issues Brief concluded Phase 1. It summarized key issues related to the growth and management

of the urban forest in St. John's as well as a Vision for its future developed through a Public Visioning Session held on June 16, 2005.

At the June session, participants identified the following important benefits of trees:

- Provide bird habitat
- Filter pollution
- Control flooding
- Prevent erosion
- Important as part of larger areas watersheds
- Provide shade
- Act as buffers between land uses and between land uses and natural areas
- Wind breaks
- Control litter
- Reduce noise
- Increase property values
- Make people feel good
- Improve aesthetics
- Critical to historical character of the streetscape.

Among the important considerations that they identified for the Management Plan were the following:

- Conservation of existing trees
- New planting (appropriate to climate, etc.)
- Developer requirements
- Conservation of trees/lack of
- Tree diversity important to control insect infestation
- Colour/texture
- A century plan that considers what trees will look like over time.

Based on participant input, the consulting team prepared the following Vision Statement to guide preparation of the Management Master Plan:

> *St. John's shall aim to be a City of Nature through thoughtful public policy and private cooperation. The City should embark on a long-term Management Plan to cultivate a diverse, attractive, and sustainable urban forest. The Plan should ensure conservation of built heritage, and development of an efficient and vibrant urban environment in the context of healthy natural open spaces.*

The Tree Inventory Report was submitted in March 2006 following completion of the Tree Inventory and compilation of the data collected. It expanded on the Issues Brief by providing a profile of the urban forest derived from the Tree Inventory along with insights derived from inventory data in relation to previously identified issues. The report was reviewed and approved by the Management Master Plan Steering Committee in April 2006. EDM and The Bristol Group presented it to the public through a two-day Open House Session on April 19 and 20.

This document, which combines previous work with the Management and Operational Plans as noted above, is the final output of the project. The consulting team presented it at a final Public Session held in conjunction with a final one-day Open House open to all interested members of the public in St. John's on October 26, 2006.

Milestone	Date/Expected Date	Status
PHASE 1 – Issues Identification		
Project Initiation	May 15, 2005	☑
Initial Project Meeting	May 25, 2005	☑
Public Visioning Session	June 16, 2005	☑
PHASE 2 – Tree Inventory Review		
Tree Inventory Begins	June 29, 2005	☑
Issues Brief Submitted	July 12, 2005	☑
Tree Inventory Complete	December 29, 2005	☑
Master Plan Report Approved	March 15, 2005	☑
Tree Inventory Public Information Session	April 19 -20, 2006	☑
PHASE 3 – Operational and Management Plans		
Management and Operational Plans	May 26, 2006	☑
Forest Management Master Plan Final Report	September 12, 2006	☑
Public Open House and Final Presentations	October 26, 2006	☑

Table 1.1: St. John's Urban Forest Management Master Plan, Project Milestones

1.3 REPORT ORGANIZATION AND PURPOSE

Chapters 2 and **3** of this report summarize work completed in Phases 1 and 2 of the project. **Chapter 2** provides an overview of the St. John's Urban Forest based on analysis of Tree Inventory data. **Chapter 3** summarizes issues identified in Phase 1 and previously reported in the Issues Brief with elaboration based on Tree Inventory data and our review of the Tree Inventory Report with City staff, the Steering Committee, and the public.

Additional components based on analysis in Phase 3 are presented in the final two chapters. **Chapter 4** is the 20-year Management Plan establishing the framework for maintaining and upgrading the urban forest in St. John's. **Chapter 5** provides the Operational Plan that will guide the immediate and short-term actions of the City of St. John's to begin working toward Management Plan objectives.

2.0 FOREST PROFILE

2.1 TREE INVENTORY

The Tree Inventory was undertaken by a seven-person team consisting of six students from the Forestry program at the College of the North Atlantic in Corner Brook and team leader Shawn Howlett. Mr. Howlett is an experienced forester living in the St. John's area who had done previous inventory work for the St. John's Department of Public Works and Parks.

EDM engaged the team. Immediately after their hiring, EDM partners, Philip van Wassenaer and Peter Kuntz, trained the surveyors in tree identification and problem assessment. Inventory work commenced on completion of training in June 2005 and concluded at the end of December 2005.

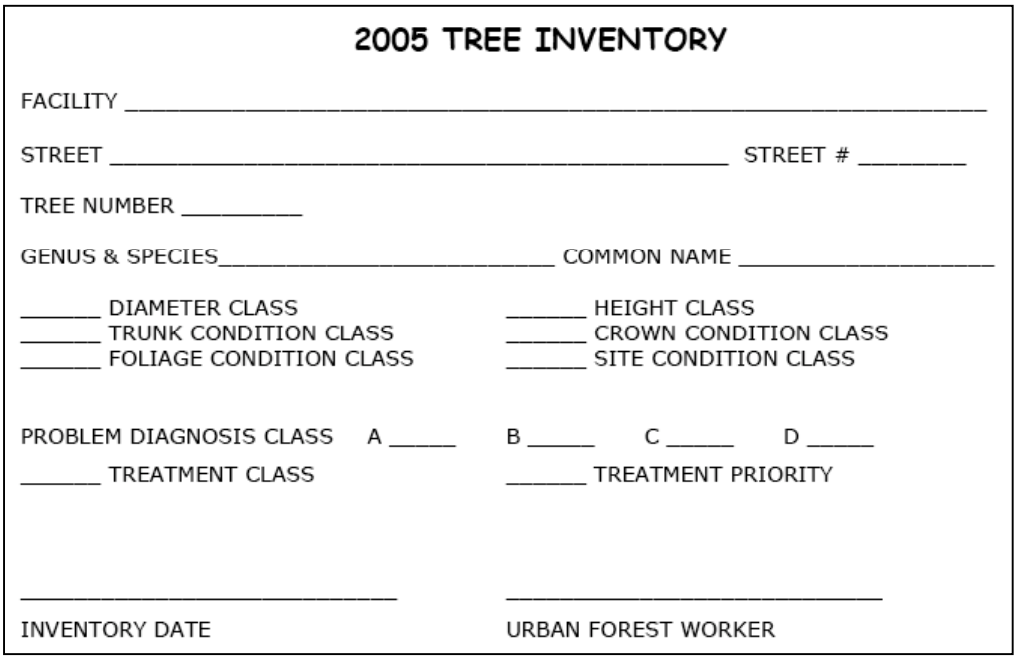
2.1.1 Data Description

The City of St. John's has inventoried trees in the past and has a well-established inventory form with data coding procedures. Past inventories, however, have been stored in hard copy and have become out-of-date, with the exception of 3,556 records collected in 2003 and stored it in the database program Tree Manager for Windows. EDM geocoded these Tree Manager records as part of the current assignment and incorporated them in the overall Tree Inventory. The City and others have also inventoried trees in Bowring Park, Bannerman Park, and the grounds of Government House, as well as the trails managed by the Grand Concourse Authority. Related information was provided to EDM by the Grand Concourse Authority and provides a good overview of vegetation in each location; however, data is not in a format that can be used for the City inventory.

The past inventory form was reviewed in Phase 1 of this project and deemed to be satisfactory for the current inventory by City staff and the consulting team. The inventory form documents the species, size, and condition of each tree (See **Figure 2.1**).

2.1.2 Application of GIS

In the past, surveyors referenced trees to civic addresses or in relation to specific facilities (e.g., in a specific park). An important part of the methodology for this assignment was the use of the City's Geographic Information System (GIS) for storage of Tree Inventory data. GIS records data in a geographic (i.e., mapped) framework. Items such as trees can be correctly positioned on a map along with other relevant data such as the location of roads and buildings, utilities, and similar features (see **Figure 2.2**).



2005 TREE INVENTORY

FACILITY _____

STREET _____ STREET # _____

TREE NUMBER _____

GENUS & SPECIES_____ COMMON NAME _____

_____ DIAMETER CLASS
_____ TRUNK CONDITION CLASS
_____ FOLIAGE CONDITION CLASS
_____ HEIGHT CLASS
_____ CROWN CONDITION CLASS
_____ SITE CONDITION CLASS

PROBLEM DIAGNOSIS CLASS A _____ B _____ C _____ D _____

_____ TREATMENT CLASS
_____ TREATMENT PRIORITY

_____ _____

INVENTORY DATE URBAN FOREST WORKER

Figure 2.1: Tree Inventory Form

Users, consequently, can physically view the urban forest. In particular, the urban forest data layer in the City's GIS will allow City staff to view the distribution of specific species, problems, and management requirements. In addition, the context provided by other GIS data layers stimulates and facilitates analysis, allowing users to see how features and problems may correlate with other geographic attributes.

2.1.3 Data Collection Procedures

To facilitate data collection for GIS, EDM and the City supplied surveyors with personal digital assistants (PDAs). EDM loaded PDAs with relevant data from the City of St. John's GIS (i.e., street network, watercourses, aerial photography, etc.) necessary to allow surveyors to identify their location. The file also included tree locations identified through interpretation of aerial photography by OSI Geomatics Ltd. of Vancouver as the key component of a separate consulting assignment conducted during the spring and early summer of 2005 as EDM got the Urban Forest Management Master Plan and related Tree Inventory under way. Surveyors working for EDM effectively field truthed the location coordinates specified by OSI, adjusting locations, deleting incorrect locations, and adding trees where they were missed. Corrected locations provided by EDM are accurate within ± 3 meters (10 feet) for individual trees.

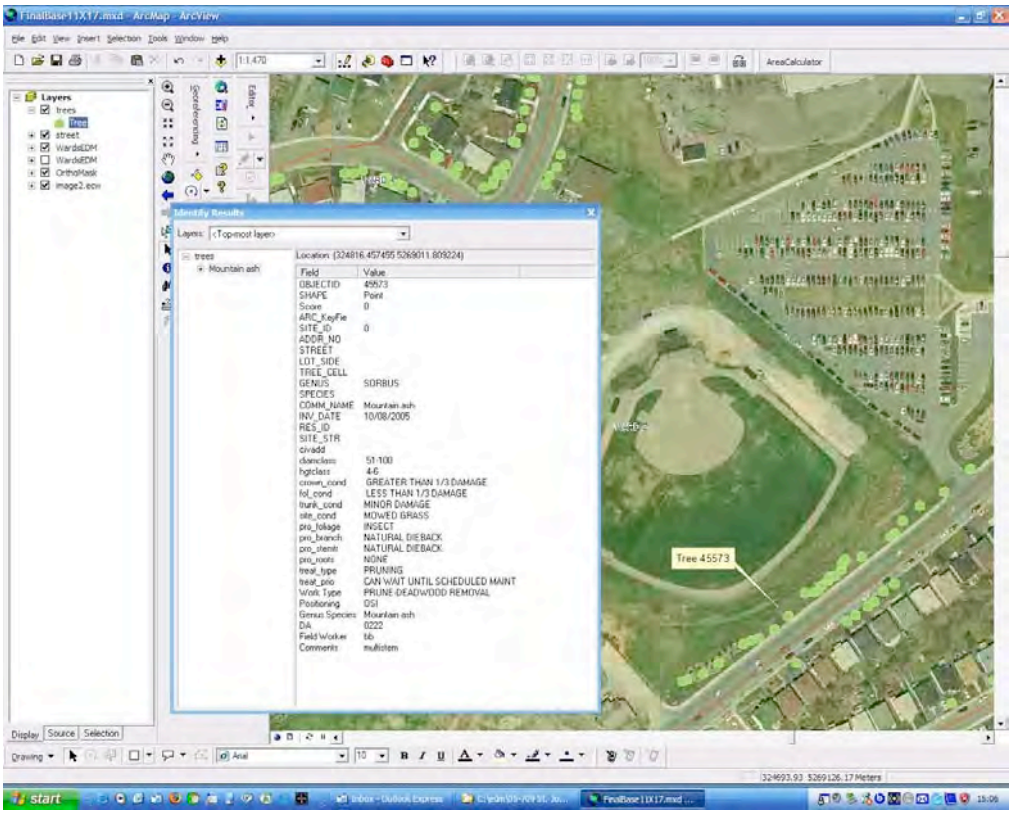


Figure 2.2: Sample GIS Display with Data Record

PDAs were also equipped with a data entry module corresponding to the existing tree data entry form. When on site, fieldworkers field checked existing data, including GPS coordinates, and completed all remaining data. As noted, they also identified additional trees not recorded by OSI and entered all required Tree Inventory data.

At the conclusion of each week, EDM uploaded field data from the PDAs used by surveyors for verification, quality control, and review. Approximately monthly over the course of the project, EDM transferred this data to the St. John's Information and Corporate Services Department for input to the City's ARCView GIS. EDM monitored data quality and progress through this process, and documented results in monthly submissions to the client.

With the complete inventory implemented in GIS the City can assess the distribution and health of its trees much more effectively. The inventory will also be a very important management tool, allowing City staff to maintain ongoing records of tree condition and care. Analysis of Tree Inventory data will also provide a basis for

formulating the Urban Forest Operational and Management Plans required as the ultimate outputs of this assignment.

2.1.4 Tree Records

The inventory did not account for all trees in St. John's. The city has many areas that are still in a natural or semi-natural state including Pippy Park and extensive areas of undeveloped land and watershed extending to the south and west of the current urban area (see **Figure 2.3**). The Tree Inventory was only intended to collect information on public trees. Public trees are defined in the St. John's Tree Regulation as trees partially or wholly located within a public right-of-way, or on municipally owned land, or overhanging such lands. Data collection covered all of what is generally regarded as the "old City," or the lands within the City boundary before amalgamation in 1991 plus the former Towns of Wedgewood Park and the Goulds. Bowring, Bannerman, and Victoria Parks as well as some, but not all, of the smaller parks in the City were inventoried. Trees on private lands not classified as public trees were not inventoried.

As noted above, 3,556 trees were inventoried and recorded in Tree Manager in 2003. EDM incorporated these tree records in the current database with tree data collected by our field crew in 2005. As noted in **Chapter 1**, the number of public trees that we expected to count in the area to be inventoried was 26,000. The overall urban forest, therefore, was expected to consist of about 30,000 trees.

The final count was 53,335 trees or 78 per cent more trees than anticipated. In part this is attributable to the fact that the definition of public trees requires interpretation in the field. Given that the effort of resurveying areas is considerable relative to the consequences of including trees that may not be public trees under the City's definition, surveyors erred toward inclusion rather than exclusion of trees.

Nonetheless, more trees were identified than were expected. This speaks to the overall vitality of the urban forest in St. John's and to the need for an accurate record of its elements, features, and extent. It is also a testament to the perseverance of the survey team, particularly our team leader Mr. Howlett and surveyor Tim Giannou, who completed the Tree Inventory work well after the beginning of winter in the area.

In future, it may well be desirable to inventory additional tree categories. Municipal parklands that were not inventoried in 2005 are obvious candidates. It would also be beneficial to inventory trees associated with the Grand Concourse and, possibly, the East Coast Trail. Areas where trees are denser, such as the lands abutting the East Coast Trail and the lands of Pippy Park, may be better suited to stand classification than detailed inventory.

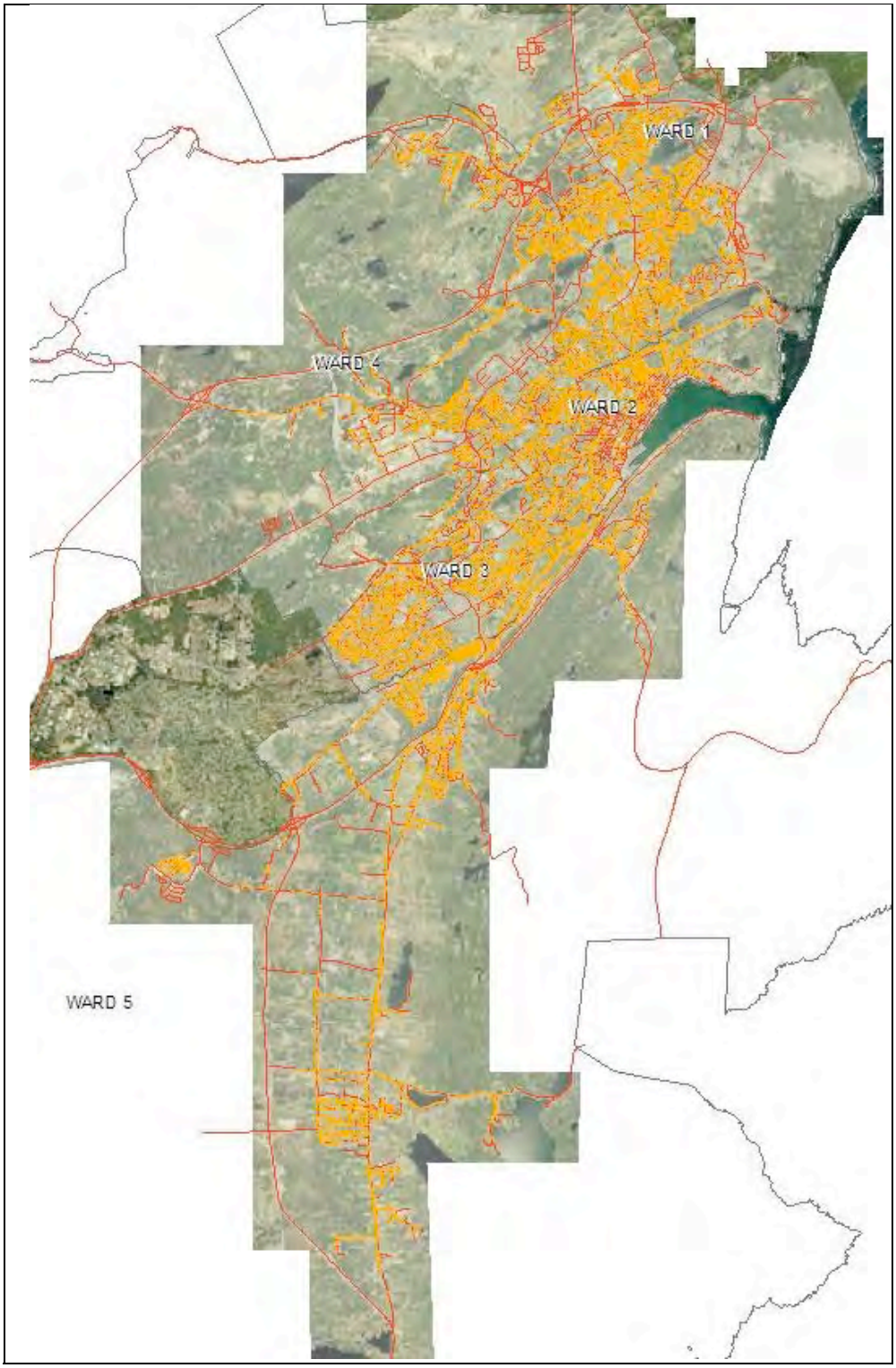
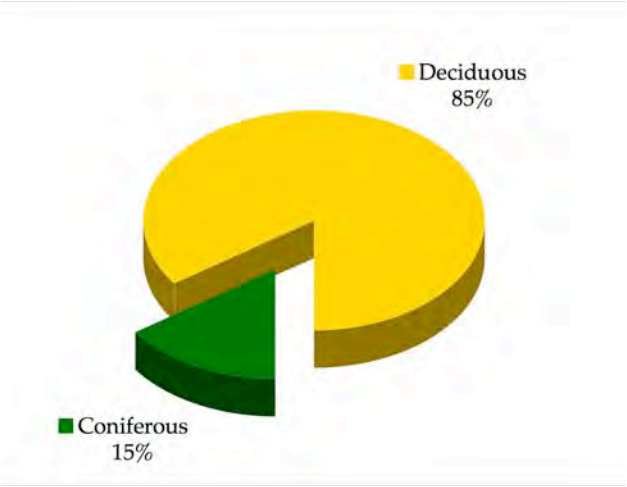


Figure 2.3: St John's Urban Forest, Tree Inventory, 2005

Wherever trees are inventoried, regardless, it would be desirable to maintain the data structure employed for the current inventory in whatever form it may evolve. The City may, therefore, wish to work with organizations such as the Grand Concourse Authority and the East Coast Trails Association to expand its records of trees within the city. This could go so far as to involve homeowners in the identification of trees on their specific properties; perhaps, through a municipal Internet portal providing support for tree identification and measurement.

2.2 URBAN FOREST PROFILE

According to the Forest Resources section of the Newfoundland and Labrador Department of Natural Resources Web site, the province has only 21 native tree species. The most prevalent of these species are coniferous. The most common is the Balsam Fir, which predominates on the West Coast and in intermittent forested areas of the Northeast Avalon Peninsula. Deciduous trees are a minor factor in Newfoundland forests, although DNR notes that "White Birch and Trembling Aspen are significant components of mixed wood and hardwood stands on better forest sites throughout the island."[1]



Type	Number of Trees	% of Sub-total
Coniferous	8,092	15.2%
Deciduous	45,004	84.8%
Sub-total	*53,096*	*100.0%*
Not specified	239	
TOTAL	**53,335**	

Figure 2.4: Forest Mix, St. John's Urban Forest

In addition, the short growing season, uneven terrain, and poor soils in Newfoundland are challenging for trees. Trees tend to grow slowly and do not attain the size found in forests of the Maritimes and southern portions of Quebec and Ontario. Nevertheless, DNR suggests Balsam Fir in Newfoundland will grow to 20 to

[1] Government of Newfoundland and Labrador, "Forest Resources – Forest Types," http://www.nr.gov.nl.ca/forestry/ourforest/forest_types.stm

24 meters at 70 to 100 years of age, while hardwoods "may reach heights of 22 meters at 80 years."[2]

Family	Count	%
Coniferous		
Cedar	488	0.9%
Fir	897	1.7%
Pine	1,963	3.7%
Spruce	4,128	7.7%
Tamarack	433	0.8%
Total	*7,909*	*14.8%*
Deciduous		
Apple	1,017	1.9%
Ash	4,156	7.8%
Aspen	641	1.2%
Beech	392	0.7%
Birch	5,107	9.6%
Cherry	1,130	2.1%
Chestnut	553	1.0%
Elm	710	1.3%
Golden Chain Tree	757	1.4%
Hawthorn	187	0.4%
Larch	119	0.2%
Lilac	813	1.5%
Linden	1,095	2.1%
Maple	26,733	50.1%
Oak	272	0.5%
Poplar	960	1.8%
Willow	241	0.5%
Total	*44,883*	*85.2%*
Other	543	1.0%
TOTAL	**53,335**	**100.0%**

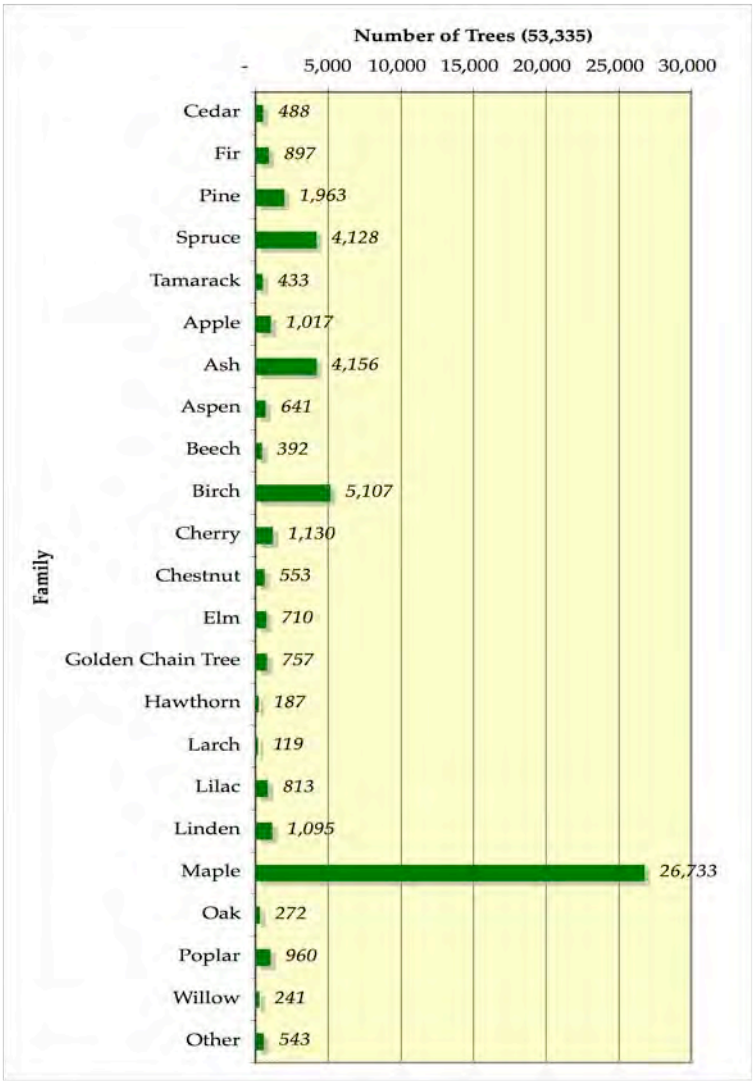


Figure 2.5: Trees by Family, St. John's Urban Forest, 2005

[2] See: http://www.nr.gov.nl.ca/forestry/ourforest/forest_types.stm. For the most common species in Newfoundland, maximum heights do not differ greatly from the norm. Height norms listed by Atlantic Forestry Service for balsam fir, which is a widespread and hardy northern species, as well as for white birch are similar to the ranges cited for Newfoundland (p://www.atl.cfs.nrcan.gc.ca/index-e/what-e/publications-e/afcpublications-e/maritimetrees-e/maritimetrees-e.html).

The urban forest can be expected to differ from the natural forest. Trees in an urban environment are generally cultivated for specific purposes. Particularly along streets, property owners and municipal government grow trees to provide shade, shelter, and screening for privacy. Deciduous species are strongly preferred for these purposes.

Notwithstanding the modest representation of hardwoods in the natural forests of Newfoundland, the vast majority of public trees in St. John's are deciduous. Of 53,096 trees in the Tree Inventory for which the tree species was recorded,[3] 45,004 or roughly 85 per cent were deciduous (**Figure 2.4**). The most common types were Sycamore Maple and Norway Maple, which together constitute nearly half the public trees inventoried. Maples as a group, in fact, constitute 50.1 per cent of all public trees.

No other group exceeds 10 per cent of the inventory. The next most common type is Birch of which there are 5,107 (9.6 per cent of public trees recorded), followed by Ash (4,156 or 7.8 per cent). The fourth most common group and the predominant coniferous species in the urban forest is spruce (4,128 trees or 7.7 per cent).

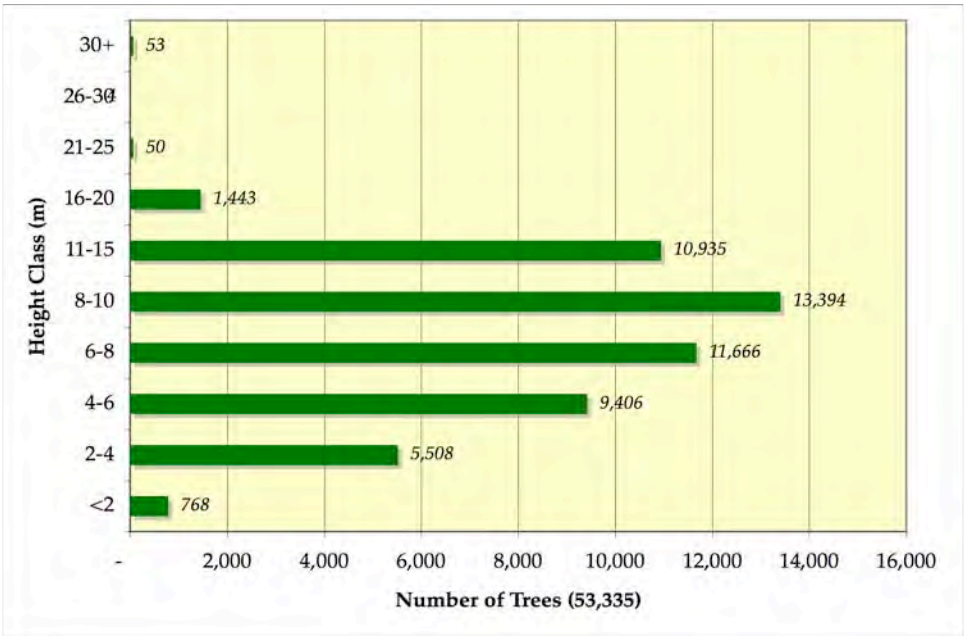
In all, the Tree Inventory identified 171 different species of public trees in St. John's within the broad family groups listed in **Figure 2.5**. Of these, however, there were less than 25 examples of nearly 100 species, which together account for barely 1 per cent of all trees inventoried (see **Appendix A**). By contrast, the top 12 species accounted for more than three-quarters of all public trees (75.6 per cent).

Of the most common forest species in Newfoundland cited by DNR, Balsam Fir ranked as the ninth most common species inventoried (818 trees or 1.7 per cent of public trees), while Trembling Aspen ranked fifteenth (641 trees or 1.3 per cent). White Birch ranked 21st with 439 trees (0.9 per cent) and Black Spruce, which is more common in Central Newfoundland forests in any case, ranked 27th with just 245 trees (0.5 per cent).

Given that the most common public trees are not native, it is not surprising to find that they tend to be smaller than would be expected for the same species elsewhere. Over two-thirds of trees inventoried are between 6 and 15 meters tall. The approximate average tree height is 8 meters. The most common category or mode is 8 to 10 meters, whereas 16 to 20 meters would be expected in Southern Ontario where the growing season is considerably longer and soils are more fertile (**Figure 2.6A**). Data on trunk diameter reinforces this observation The approximate average trunk diameter in the St. John's Tree Inventory is 195 mm with 82.9 per cent of trees falling

[3] Some tree records taken from Tree Manager did not identify the tree species.

between 50 and 300 mm. The mode in St. John's is 100 to 200 mm, whereas 300 to 500 mm would be more likely in Southern Ontario (**Figure 2.6B**).



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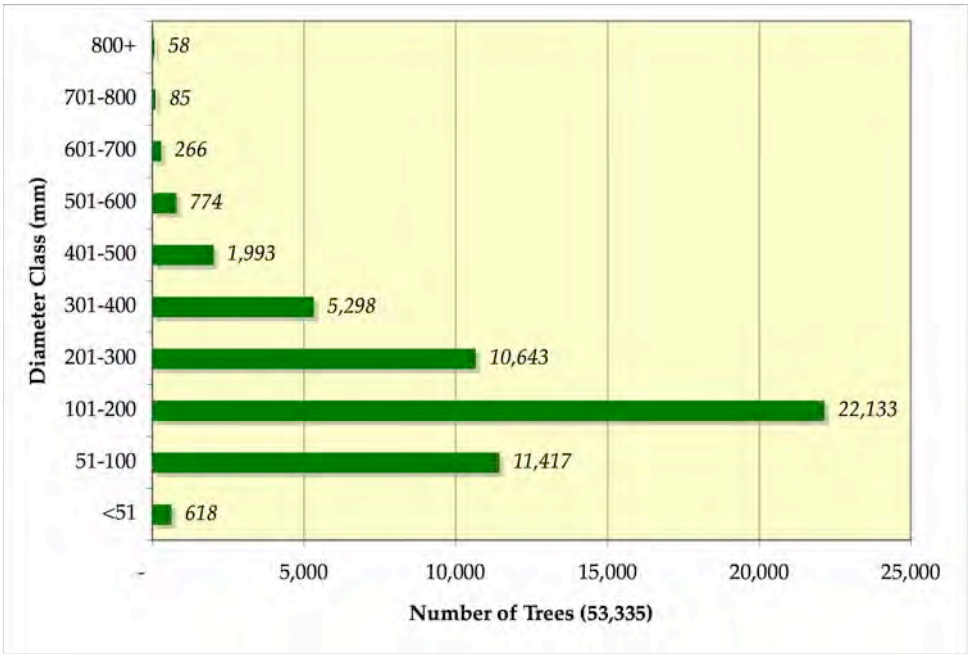
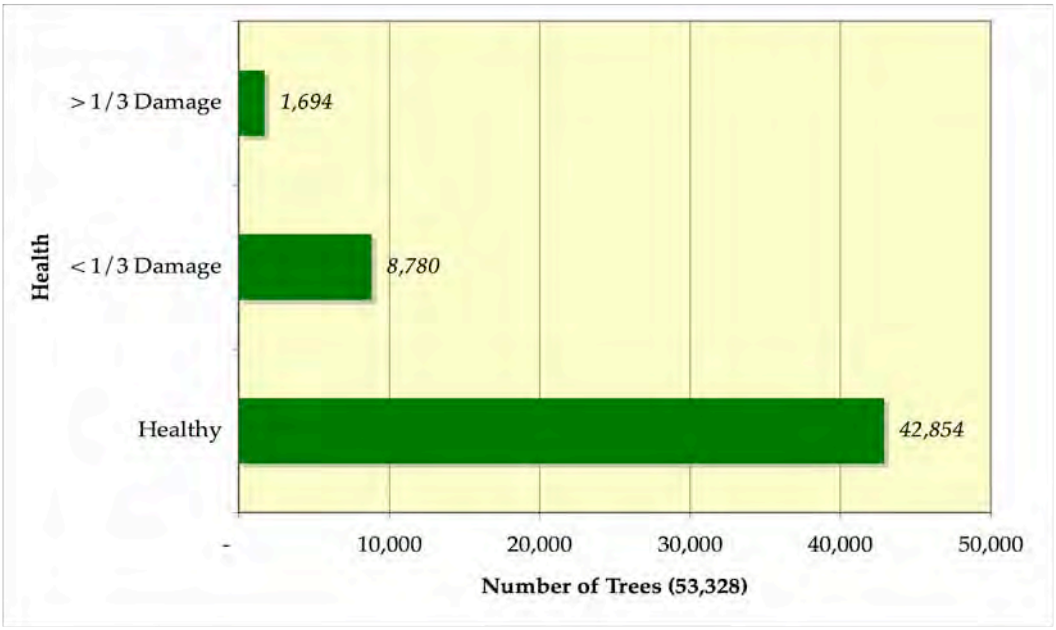


B

Figure 2.6: Height and Diameter Distributions, St. John's Urban Forest, 2005



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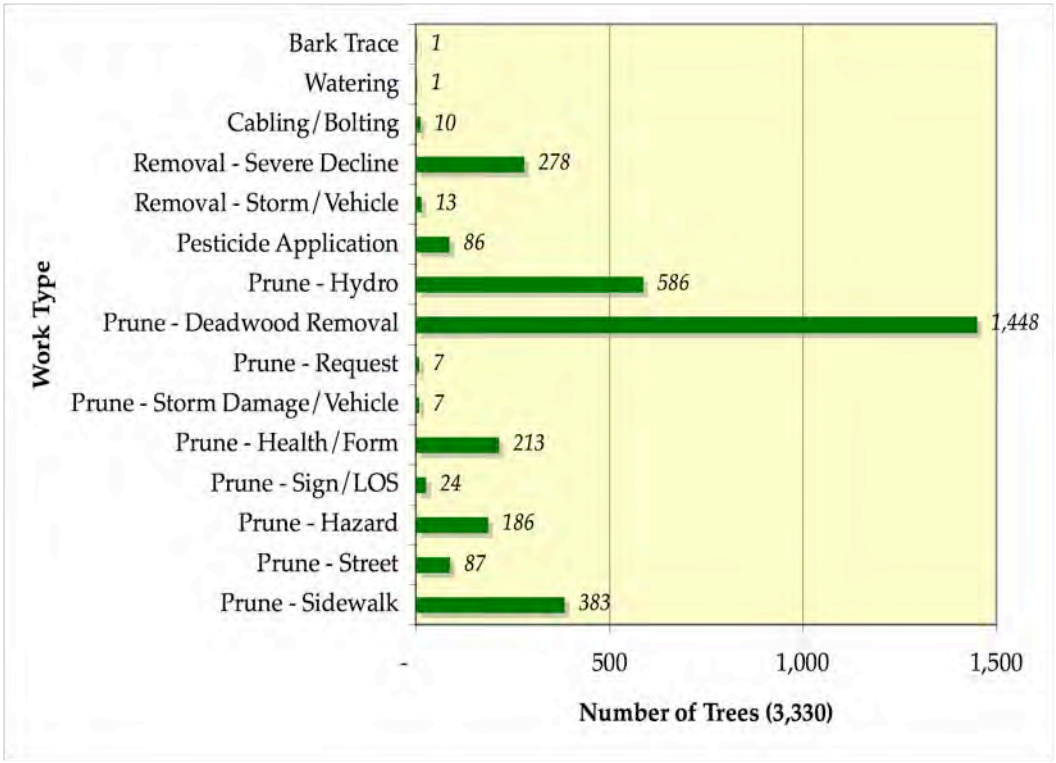


B

Figure 2.7: Tree Health and Work Requirements, St John's Urban Forest, 2005

Another notable feature of these two distributions is the small number of very large trees. Only 58 trees were judged to exceed 30 meters in height and stand significantly apart from the balance of public trees as no trees were found between 25 and 30 meters and only 51 were between 20 and 25 meters. This is echoed in trunk diameter measurements as only 58 trees were measured with trunks in excess of 800 mm. These data suggest that there may well be a role for the City in protecting particularly old and unique trees as Heritage Trees.

Notwithstanding the relatively modest stature of the trees inventoried, indicators of health and maintenance of trees are generally encouraging. As **Figure 2.7A** illustrates, only a very small proportion of trees (3.2 per cent) exhibit significant damage. When less substantial damage is taken into account, however, nearly one-fifth (19.7 per cent) exhibited some degree of damage.

In the judgement of the survey crew conducting the Tree Inventory relatively few trees need specific attention. Data collected for several variables indicate that about 93 per cent of the public trees inventoried do not require treatment. The team deemed only 880 trees (1.7 per cent) to need attention this season and assessed just 96 trees (0.2 per cent) as needing immediate attention (presumably to address unsafe conditions such as potential to fall over or lose branches).

Figure 2.7B provides a summary of detailed work requirements. The predominant work requirement was pruning, which surveyors identified in nine categories. They identified the specific pruning needs of 2,941 trees (5.5 per cent of all trees inventoried). Of these, only 1,448 (1.1 per cent) required deadwooding or the removal of dead limbs. In the opinion of experienced forest management professionals on the consulting team this is a low proportion indicative of generally good forest health and an up-to-date maintenance regime. Small numbers of trees requiring removal or cabling (301 or 0.6 per cent) further reinforced this observation.

Several other indirect indicators attest to the practice of pruning in St. John's. Most notably the second most prevalent type of damage observed by the survey team was wounds and pruning scars to tree stems and trunks (19,113 trees), which includes mechanical damage as well as evidence of pruning. Scars are an expected byproduct of pruning. They reflect healing after pruning and do not influence tree health.

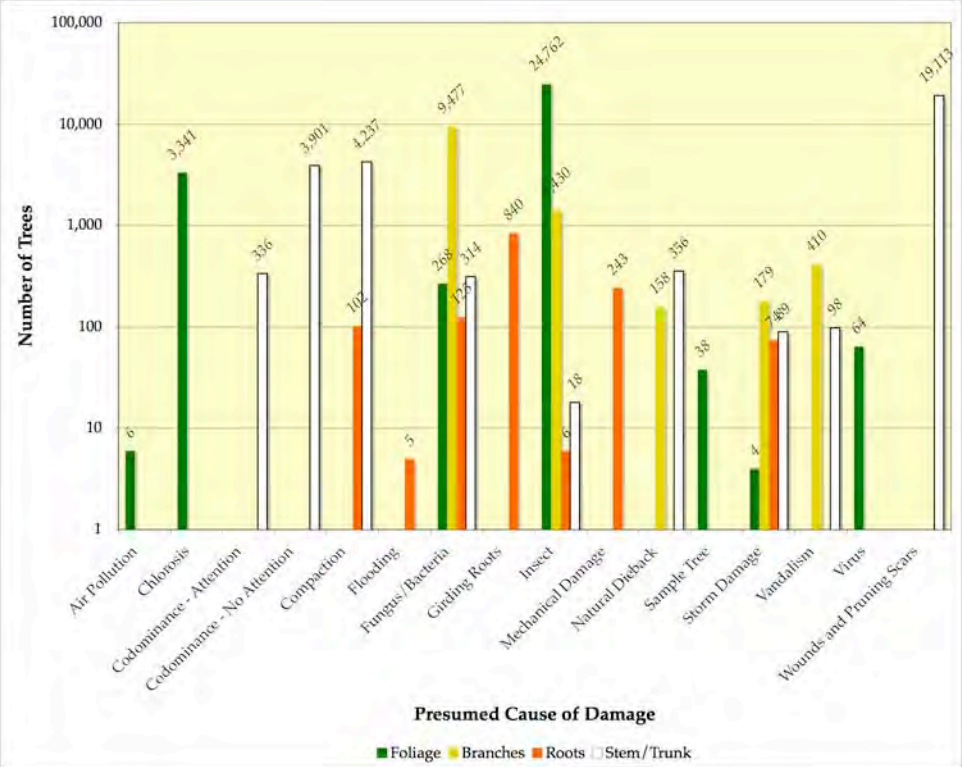
The most common damage found by surveyors, however, was insect damage to tree foliage. This damage is associated with Elm Spanworm, which has plagued the area

for several years. Surveyors also frequently observed insect damage to branches (1,430 trees), which is similarly associated with the Spanworm (**Figure 2.8**).[4]

Other important sources of damage were fungus/bacteria impacts to branches, chlorosis apparent in foliage, and codominant trunks. Chlorosis results from nutrient deficiency, in particular, inadequate iron. It is especially common in maple and birch trees, which are dominant species in the St. John's Urban Forest. It results in pale leaves and is common in trees in poorly drained areas. It is not necessarily critical indicator of tree health, some trees may show severe chlorosis year after year and yet make good growth otherwise.

Codominance is also not a form of damage per se, although it can endanger tree health in some instances. It results when a second trunk diverges early in the growth of a tree. In most cases, codominance has no consequence but for some trees a second stem can result in splitting at the crotch where the second stem diverges. Cabling is the common solution to this type of structural problem. Only 336 of 4,237 codominant stems were judged by the survey team to require such attention.

[4] Opinions differ on the need to treat Elm Spanworm, which is discussed in more detail in **Chapter 3**. In general, the surveying team did not consider the presence of Spanworm to necessitate attention.



Vertical scale is logarithmic

Cause	Foliage	Branches	Roots	Stem/Trunk	TOTAL
Air Pollution	6				6
Chlorosis	3,341				3,341
Codominance - Attention				336	336
Codominance - No Attention				3,901	3,901
Compaction			102		102
Flooding			5		5
Fungus/Bacteria	268	9,477	125	314	10,184
Girdling Roots			840		840
Insect	24,762	1,430	6	18	26,216
Mechanical Damage			243		243
Natural Dieback		158		356	514
Sample Tree	38				38
Storm Damage	4	179	74	89	346
Vandalism		410		98	508
Virus	64				64
Wounds and Pruning Scars				19,113	19,113
TOTAL DAMAGED	**28,483**	**11,654**	**1,395**	**24,225**	
NO DAMAGE	**24,852**	**41,681**	**51,939**	**29,109**	

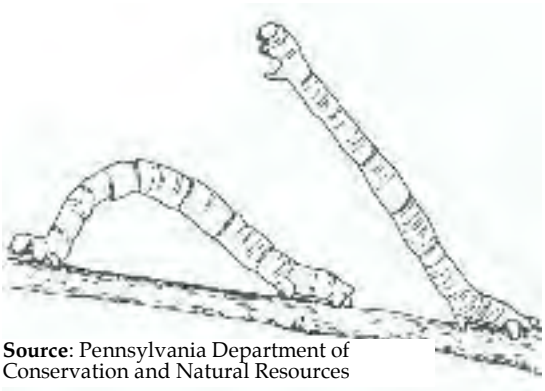
Figure 2.8: Presumed Causes of Damage, St. John's Urban Forest, 2005

3.0 CURRENT ISSUES

As noted in **Chapter 1**, a variety of key issues were identified in Phase 1 of this project. The primary basis for this identification was interviewing of knowledgeable stakeholders and public consultation. The six issues discussed following were initially reported in the Issues Brief provided at the close of Phase 1 and further detailed in the Tree Inventory Report based on Tree Inventory data.

3.1 ELM SPANWORM

The Elm Spanworm (**Figure 3.1**) has had considerable impact on deciduous trees in St. John's over the past four years. As the damage summary in **Figure 2.8**, above, illustrates, insect damage is the most common type of damage to trees in the city. In St. John's, the Spanworm is the dominant insect pest.



Source: Pennsylvania Department of Conservation and Natural Resources

Figure 3.1: Elm Spanworm

Spanworm eggs hatch into hungry worms at the larva stage in June and July (see **Figure 3.2**). The worms defoliate their host trees and then pupate. Their droppings also discolour sidewalks, siding, and other property creating visual pollution and associated devaluation. Although the consequences of spanworm infestation are very unattractive, defoliation does not have major long-term consequences for healthy trees. The trees should survive and thrive in most cases.

Spanworm attacks deciduous trees. They have thrived in the maple trees, which the Tree Inventory found to constitute roughly half of the urban forest in St. John's. In particular, it has been attracted to Sycamore Maples and Norway Maples, the two most common species in the urban forest. Notwithstanding that the two species constitute 48 per cent of the public trees inventoried, they accounted for 61.2 per cent of trees judged to exhibit insect damage according to our survey crew. **Table 3.1** lists the six leading species subject to insect damage based on Tree Inventory findings. All six are deciduous species and, together, they account for 77.9 per cent of all trees exhibiting insect damage, although they constitute 63.5 per cent of trees surveyed.[5]

[5] Insect damage, which is not Spanworm infestation in all cases, is widespread. Of 171 species identified in the survey of public trees, examples

	Month											
	Ja	F	M	A	M	Ju	Jl	A	S	O	N	D
Egg	✓	✓	✓	✓	✓				✓	✓	✓	✓
Larva						✓	✓					
Pupa							✓	✓				
Adult								✓	✓			

Source: City of St. John's

Figure 3.2: Life Cycle of the Elm Spanworm

All of these trees species are among the most common in St. John's. The leading species most evidently prone to insect damage measured by the ratio between its percentage share of insect damaged trees to its percentage of all trees is the Silver Poplar (1.6:1). The second and third most vulnerable species are Norway Maple and Sycamore Maple (1.4:1 and 1.3:1, respectively). By contrast, Mountain Ash (0.5:1) and Crimson King Maple (0.7:1) appear to be relatively resistant. Coniferous species are not affected by the Spanworm and account for only 1.2 per cent of all insect damage or a ratio of just 0.08:1.

Species	Insect Damage	% of Insect Damage	Total Trees	% of Total	Rank Among All Species
Sycamore Maple	8,749	35.3%	14,412	27.1%	1
Norway Maple	6,411	25.9%	9,561	18.0%	2
White Birch	2,263	9.1%	4,394	8.3%	3
Mountain Ash	712	2.9%	2,880	5.4%	5
Silver Poplar	585	2.4%	798	1.5%	12
Crimson King Maple	563	2.3%	1,630	3.1%	6
Sub-total	19,283	77.9%	33,675	63.5%	
All others	5,474	22.1%	19,421	36.6%	
TOTAL	**24,757**	**100.0%**	**53,096**	**100.0%**	

Table 3.1: Six Species Most Subject to Insect Damage, St. John's Urban Forest, 2005

It is also worth noting that a number of species that are lightly represented in the urban forest are even more prone to damage than these common trees. In total, 28 different species exhibited insect damage to more than 85 per cent of the examples surveyed. In 24 cases all examples showed insect damage. These include nearly all

of 130 showed evidence of insect damage. This included a leading native species, White Birch, over half of which showed evidence of insect damage.

varieties of crab apple, several minority species of maple, and various other species, none of which is represented by more than 100 examples in the survey.

Spanworm is widespread in the St. John's Urban Forest, although some areas appear to have been spared to date. Mapping of insect affected trees with significant damage to foliage (i.e., more than one-third of the tree crown) shows a heavy concentration in the east end, particularly in the area around the old Memorial Arena, which is noticeable as a cluster of blue dots on **Figure 3.3** in relation to orange dots identifying trees with no damage or minor damage. It has not apparently extended west from that point to any great degree, as many fewer instances of insect damage are apparent along Elizabeth Avenue and the areas immediately flanking its corridor (i.e., Prince Philip Drive and Empire Avenue). On the other hand, the pest appears to have migrated west along Portugal Cove Road and its impacts are apparent along the roadway and to the east and west on Newfoundland Drive and Mount Scio Road.

A second very noticeable concentration is a swath extending south around the edge of the Downtown to Bowring Park. The Downtown itself exhibits relatively little damage largely because its tree population is thin. On the other hand, the impacts of insect infestation are very apparent through the residential areas uphill from the Downtown, and along the roadways extending southwest from the end of the harbour such as Topsail Road and Waterford Bridge Road. The two roads lead to Bowring Park, where the cluster of blue dots on **Figure 3.3** appears to be even more concentrated than in the vicinity of Memorial Stadium.

The Elm Spanworm exists elsewhere in North America but apparently is not currently as invasive in any other location. It has thrived in St. John's because of the relatively small number of species and their generally uniform age (about 50 years old) as well as the absence of local predators, which control the pest in other areas. The problem seems to be resolving itself as the spanworm becomes acclimatized to the Northeast Avalon and the public becomes aware of defences against infestation. In the opinion of many experts in St. John's, the spanworm will eventually dissipate. It is, however, a characteristic pest and may be supplanted by another pest or disease, given the nature of the tree population in St. John's.

The City has produced a brochure, which is posted on its Web site,[6] explaining the worm and its life cycle. The brochure also identifies a variety of strategies for control, including spraying with insecticide and banding of trees to prevent the migration of worms up their trunks. The long-range solution to controlling the spanworm, according to the brochure, is appropriate tree management involving inspection, mulching, fertilizing, and pruning.

[6] See: http://www.stjohns.ca/csj/PubDetails?id=210

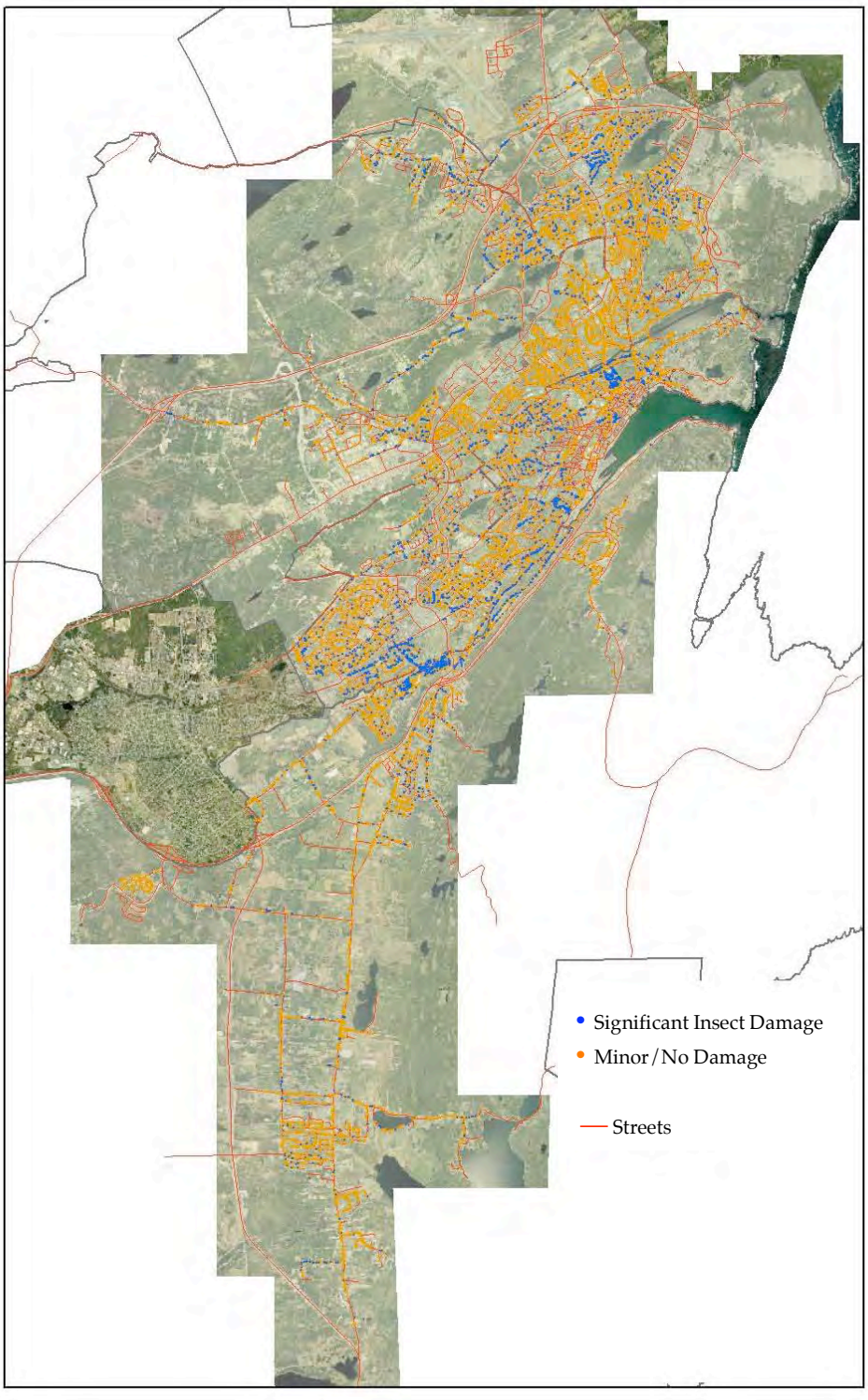


Figure 3.3: Distribution of Insect Damaged Trees, City of St. John's, 2005

3.2 NON-NATIVE SPECIES

As noted in **Chapter 2**, native trees are a minor component of the urban forest in St. John's. Although Newfoundland has only 21 intermediate to large native tree species, the Tree Inventory identified 170 separate species in the St. John's Urban Forest, acknowledging that many are represented by less than ten examples.

Eighteen of the 21 species identified by DNR as native to the Province of Newfoundland and Labrador were found in the St. John's Urban Forest (**Table 3.2**). The most common are the White Birch and White Spruce, which rank as the third and fourth most common species among public trees. Pin Cherry and Balsam Fir are also well represented and rank among the top ten urban species. In total, though, native species account for 11,610 trees or barely one-fifth of all public trees inventoried.

Some of the additional species that have been introduced to the area are not well suited to the harsh climate of the Northeast Avalon Peninsula. They tend to be under-sized, struggle to survive, and attract pests and disease. Others, however, have thrived too well and have become invasive – supplanting native trees. The two most common species, Sycamore and Norway Maple, are examples of this. If anything, the introduction of inappropriate species is accelerating because of a general interest in exotic species and the presence of national/international retail chains marketing garden products that are sold across Canada.

Common Name	Count	%	Rank
American Mountain Ash	436	0.8%	22
Balsam Fir	818	1.5%	10
Balsam Poplar	130	0.2%	38
Black Ash	186	0.3%	32
Black Spruce	245	0.5%	27
Common Choke Cherry	67	0.1%	50
Eastern White Pine	36	0.1%	68
Jack Pine	61	0.1%	52
Mountain Alder	14	0.0%	83
Mountain Maple	-	0.0%	-
Mountain White Birch	-	0.0%	-
Pin Cherry	927	1.7%	8
Red Maple	244	0.5%	28
Red Pine	61	0.1%	52
Showy Mountain Ash	4	0.0%	110
Speckled Alder	-	0.0%	-
Tamarack	433	0.8%	23
Trembling Aspen	641	1.2%	16
White Birch	4,394	8.2%	3
White Spruce	2,909	5.5%	4
Yellow Birch	4	0.0%	110
TOTALS	**11,610**	**21.8%**	

Table 3.2: Native Newfoundland Species in St. John's Urban Forest, 2005

The Parks Services Division of the Department of Public Works has produced *The Urban Forest: A Management Guide to Tree Selection*[7] to assist professional and amateur gardeners to select and locate appropriate species. The guide identifies roughly 200 species that are suited to the area, documenting the specific roles to which each is best suited (e.g., for use as street trees, to stabilize soil, to provide privacy, etc.). It also documents the relative tolerance of each species to compaction, wind, salt, and drought, and provides an overall rating of the tolerance of each. The Management Master Plan presented in **Chapter 4** should be a valuable tool to ensure appropriate planting and to monitor the status of native versus non-native species.[8]

3.3 SPECIES DIVERSITY

Notwithstanding issues with non-native species, St. John's supports relatively few tree species in any quantity. The top five species (i.e., Sycamore Maple, Norway Maple, White Birch, White Spruce, and Mountain Ash) account for 64 per cent of public trees in the inventory; the top 20 take in over 86 per cent. In addition, trees are generally of similar age (about 50 years old).

Knowledgeable stakeholders believe that the small number of species and similar age of trees encouraged the Elm Spanworm infestation and have exaggerated its impacts. Certainly, the Spanworm has struck hard at the two most common species, the Sycamore and Norway Maple, as noted above. These features make the urban forest in St. John's vulnerable to future problems.

The solution to this problem is to introduce tolerant non-native species. The Tree Guide is available to assist with this process. Expansion of the urban forest should emphasize the encouragement of existing tolerant species and strategic introduction of tolerant non-native species. Renewal of tree stock must also be appropriately staged so that areas are planted on an ongoing basis to ensure a range of young through matures trees in each area. Again, the Management Master Plan will be a valuable tool in this process.

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7 City of St. John's Department of Public Works, Parks Services Division, *The Urban Forest: A Management Guide to Tree Selection*, undated.

8 Exotic nursery trees are continuously changing with new and improved varieties and cultivars. Also, as the city develops and matures, the microclimate evolves to make it more suitable for other trees to grow and mature. The Urban Forest guide is a recommended list of trees suitable to the environmental conditions now prevailing in St. John's, it can never be entirely complete for any length of time. Local nurseries and home gardeners are continuously growing new plants adapted to local conditions.

3.4 STORMWATER MANAGEMENT

There is a widespread perception that flooding has increased in St. John's over the past decade. This is, possibly, a function of increased levels of precipitation and specific violent weather events.[9] Many contacts contend, however, that flooding has been exacerbated by the removal of trees and ground cover in the course of development.

Most certainly, the removal of trees can increase erosion and flooding. The solution lies in effective stormwater management planning. Tree management, furthermore, has an important role to play in the effective control of stormwater. Infill of wetland areas should be avoided. Developed sites must be replanted, and new trees must be nurtured and maintained. This must be addressed through effective regulation and public education.

The City of Seattle has made impressive strides in this area. City Public Utilities staff have recognized that piped stormwater facilities deliver excessive quantities of sediment and hydrocarbon bearing water to local watercourses. They also recognize that the rush of stormwater does substantial damage to natural channels impacting important wildlife habitat.

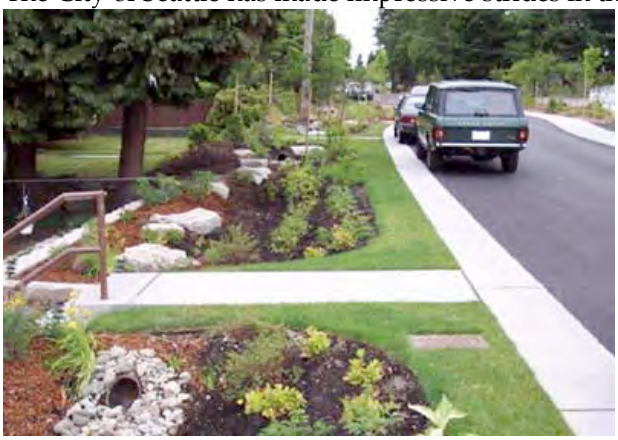


Figure 3.4: Vegetated Drainage Swale, Seattle

To combat this Seattle has encouraged the development of natural drainage systems summarized as follows on the City's Web site:

> Natural Drainage System program goals include infiltration and slowing of stormwater flow, filtering and bio-remediation of pollutants by soils and plants, reduced impervious surface, porous paving, increased vegetation, and related pedestrian amenities.

[9] The year 2001 set many records for precipitation, including the maximum recorded snow depths for January, February, and April. September 10, 2001, was also the warmest September day on record for the city (29.5° C). Very few other records have been set since 1990, although the all-time record for daily snowfall (68.4 cm) was set on April 5, 1999. See: http://www.climate.weatheroffice.ec.gc.ca/climate_normals/results_e.html?StnID=6720&autofwd=1

> These projects use natural features – open , vegetated swales, stormwater cascades, and small wetland ponds – to mimic the functions of nature lost to urbanization.
>
> At the heart of all Natural Drainage System projects are the plants and trees, and the deep, healthy soils that support them. All three combine to form a "living infrastructure" that, unlike pipes and vaults, increases in functional value over time.[10]

The use of trees and vegetation is not only effective in reducing stormwater flow; it is also very attractive, particularly in the verdant environment of the Pacific Northwest (**Figure 3.4**). In St. John's, swales of the type illustrated may also offer an opportunity to reinstate coniferous trees that are better suited to the local climate as the purpose of vegetation in these situations is much more to stabilize soils than to provide shade.

3.5 DEVELOPMENT REGULATIONS

Many contacts suggested that provisions for incorporation of trees in new development are inadequate. Several noted that higher density development, which is preferred in the central area of the city and is encouraged by the Municipal Plan, does not provide space for tree planting on site. Many added that requirements for tree preservation and replacement are generally lacking for residential development. For commercial development, for which the City of St. John's Commercial Development Policy sets specific landscaping requirements, contacts pointed out that procedures are lacking to ensure that trees are nurtured after initial planting.

Review of mapping presented in **Figure 2.3**, above, illustrates the paucity of trees in downtown St. John's. Data on the number and density of trees by land use zone tends to support the assertion that provisions for landscaping in commercial areas are inadequate. As **Table 3.3** shows, public trees are clearly concentrated in residential zones.

Zone	Public Trees	Area (km^2)	Public Trees/km^2
Residential	39,731	27.6	1,438.5
Public	6,683	33.8	197.8
Rural	4,316	263.2	16.4
Commercial	1,248	5.6	222.1
Special	91	135.6	0.7
Industrial	901	12.0	75.3
TOTAL	**52,970**	**477.8**	**110.9**

Table 3.3: Public Trees by Land Use Zone, St. John's Urban Forest, 2005

[10] Seattle Public Utilities, "Natural Drainage Systems Overview," http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/Natural_Drainage_Overview/NATURALDR_200406180834425.asp

Residentially zoned areas of the city have roughly six times more public trees than commercial areas; seven times more than are found in publicly zoned areas; and nearly 20 times more than are found in industrially zoned areas.

City planning staff have produced a thorough Discussion Paper on the subject of development regulation and policy pertaining to trees.[11] In addition to the St. John's Municipal Plan and Development Regulations, which provide policies and regulations that generally regulate development, including certain policies and regulations that are specifically relevant to the maintenance and planting of trees, the paper identifies four major documents that are relevant to tree management:

- City of St. John's Specifications Book, 2002
- City of St. John's Commercial Policy
- Commercial Maintenance By-law of the City of St. John's
- The St. John's Tree Regulation

According to the paper, the Specifications Book establishes detailed requirements for "such landscaping minutia as the quality and depth of topsoils; the application of fertilizer, lime and nutrients; the identification and planting of different types of sods; and the planting of trees and shrubbery."

The Commercial Policy requires developers of commercial property to provide a detailed site plan including landscaping elements such as trees. The Commercial Maintenance By-law follows this up by establishing standards that commercial operators must meet including requirements that lawns, bushes, and trees must be "kept trimmed."

The Tree Regulation was adopted by Council on April 29, 1991 and is specific to public trees. It was implemented, among other reasons, to create the Tree Committee and the position of Municipal Arbourist. It also mandates the preparation of the Management Master Plan, which is contained in **Chapter 4** of this document.

The Discussion Paper acknowledges that regulations and enforcement may be inadequate in some respects. It suggests that Section 8.5 of the Development Regulations, following, provides a basis for implementing more detailed regulations:

[11] Paul Boundridge, "Standards for Trees & Landscaping in St. John's," Discussion Paper for the City of St. John's Tree Committee, May 14, 2005.

8.5 LANDSCAPING AND SCREENING

Landscaping and screening shall be provided in accordance with this section and as provided elsewhere in these regulations.

8.5.1 Landscaped Area and Screen

A 3 m landscaped area or a Screen at least 1.8 m in height shall be provided where a Commercial, industrial, or Public Use adjoins a Residential Use.

8.5.2 Highway Buffers

Public highway Buffers of not less than 10 m shall be required for all major Arterials not providing access to adjoining properties as shown on Map G of Section 3.

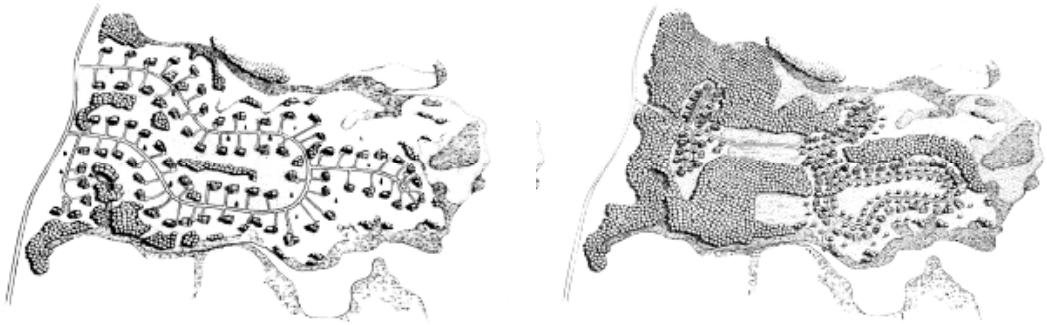
Indeed, there is broader support in the Municipal Plan for provision of buffering between land uses, preservation of trees adjacent to watercourses, and provision of open spaces and trails to preserve, enhance, and provide access to the natural environment. Specific amendments to the outlined policies have, in fact, been recommended by the Tree Committee for several years and would address key concerns with the adequacy of landscaping and the planting of appropriate species.[12]

Contacts also expressed specific concerns with the development of wetlands and the lack of natural open space that has been preserved in the city. Filling of wetlands alters natural storm drainage and may result in increased flooding if the constructed storm drainage network is not adequate. In satisfying the requirement for dedication of land from subdivisions, the City of St. John's has shown a preference, like many other municipal units, to accept cash-in-lieu of land and/or to improve the land accepted for active recreation purposes. Again, the absence of natural land areas may increase demands on human-made stormwater systems as well as eliminating habitat for trees.

Many stakeholders, including some members of City of St. John's staff, have also expressed concern with the amount of open space reserved in new developments. Although regulations require the commitment of 10 per cent of subdivided lands for open space, some contacts asserted that the City often exercises its option to take cash-in-lieu. Several argued further that the City should require a higher percentage of land in many instances, particularly where wetlands and/or valued tree stands are present.

[12] See: Ian Wallace, Chair, City of St. John's Tree Committee, "Proposed Amendment to the St. John's Development Regulations," June 28, 2004.

One approach that is being tried in other jurisdictions is the implementation of "Open Space Subdivisions" in which up to 50 per cent of land is maintained in an essentially natural state in exchange for the allowance of higher density on the balance of the property (**Figure 3.5**).[13] Developers can benefit from this trade off by avoiding sensitive, difficult to develop land and by developing more units with less roadway and associated water and sewer infrastructure. The municipality and taxpayers also benefit from the latter outcome because it reduces the ongoing maintenance responsibility. Stormwater control can also be less expensive to provide and maintain, as well as being more effective and, most important, more natural. In addition, citizens, particularly residents of the new development, enjoy more open space for recreation. Often, the resulting open space, which will often correspond to watercourses and natural channels through the developed area, is well suited to the provision of trail connections.



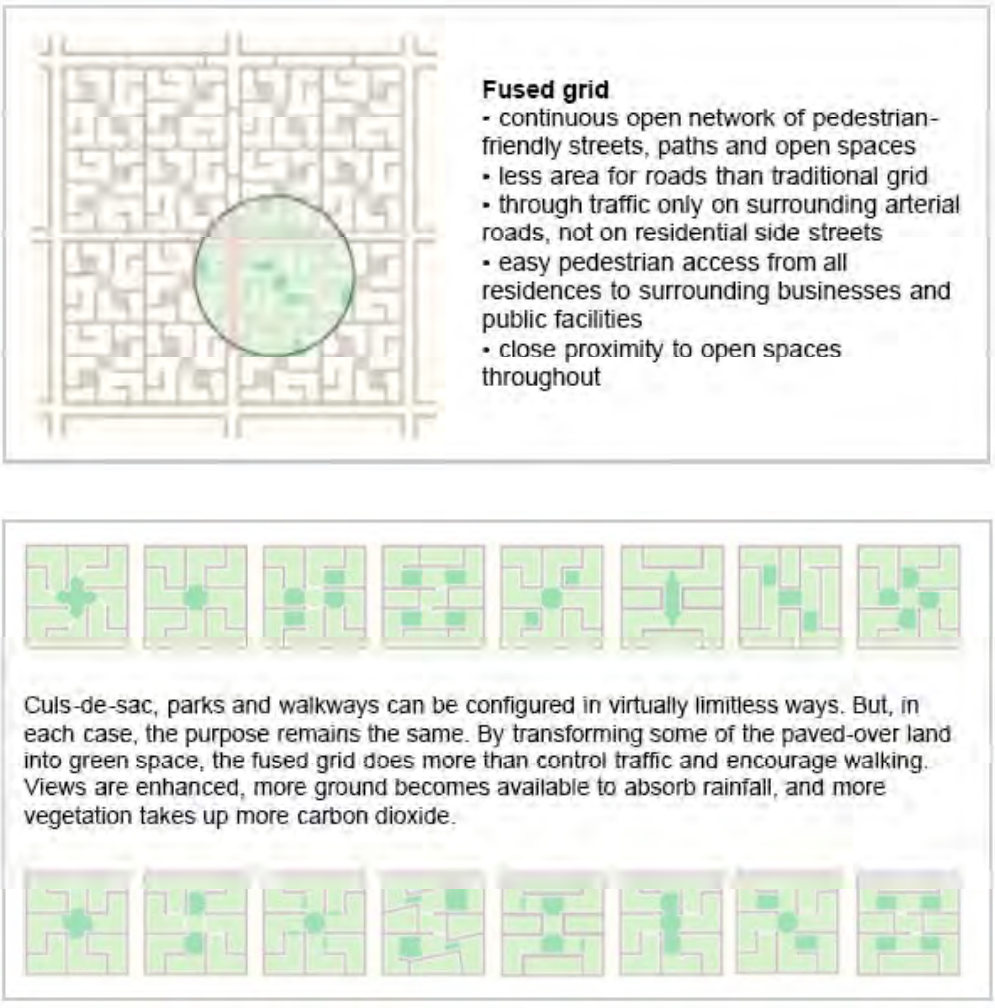
Conventional Subdivision Open Space Subdivision

Figure 3.5: Conventional Subdivision Compared to Open Space Subdivision

A second, more urban-oriented approach that is being promoted by Canada Mortgage and Housing Corporation is the "fused grid" subdivision. The concept, which was developed by Senior CMHC Researcher Fanis Gammenos, essentially involves modification of the conventional grid layout by introducing local parks in

[13] Many Internet sources discuss Open Space Subdivision. Many discuss the costs and benefits of this approach and/or the long-term impacts on property value, which proponents suggest are positive and significant. A good summary of the issues is provided in the brochure "Green Neighbourhoods" available at www.mass.gov/czm/smartgrowth/publications/green_neighbourhoods_brochure.pdf. The brochure also cites the book *Growing Greener: Putting Conservation into Local Plans and Bylaws*, Island Press, 1999, by Randall Arendt, who has been a proponent of the concept since the early 1990s.

central locations within each grid square (see **Figure 3.6**).[14] Traffic is thereby shifted to a collector network surrounding these squares. Cul-de-sacs and crescents thereby meet and join to each other via central "mini-parks" traversable by pedestrians. Although snow disposal is not generally discussed by Mr. Grammenos, these parks could be used as winter show dumps and pedestrian thoroughfares could double as service and emergency vehicle connections.



Source: *Canadian Geographic*, July / August 2005

Figure 3.5: Fused Grid Subdivision Layout

Ironically, although St. John's is oldest city in North America, no significant area within the city, including the downtown, is laid out in a consistent grid format.

[14] Tom Carpenter and Steven fick, "Neighbourhood Fusion," reproduced from *Canadian Geographic*, July / August 2005, http://www.cangeo.ca/magazine/ja05/alacarte.asp

Nonetheless, the principles of the fused grid approach could be adapted to curvilinear street patterns that are required to adapt to the rugged topography of Newfoundland. The key features would be a clear hierarchy of roadways, which is already established in the Municipal Plan, and development of standards for neighbourhood parks that would serve connective as well as recreational objectives. Standards should include provisions for planting to buffer abutting housing, to protect pathways from drifting snow, and to ensure such parklands become an attractive and comfortable feature of the neighbourhoods that they serve.

EDM has acquired zoning and trails data from the Planning Department for assessment against the Tree Inventory data. Monitoring various tree features but particularly tree health in relation to land use, open space, and environmentally valued or sensitive areas will be valuable to assess the implementation of Section 8.5 of the Development Regulations.

3.6 SNOW CLEARING

As all residents know, St. John's receives considerable snow in a typical winter. As noted in a footnote above, the City set a number of records in 2001. Snowfall has been high in other recent years, rendering streets almost impassable and creating monumental snow disposal challenges.

Snow clearing is essential to facilitate business and communication, and to ensure public safety; however, the need to remove and store large quantities of snow threatens trees. According to many contacts, snow clearing equipment imperils trees in St. John's. Tree inventory information, however, does not explicitly recognize the problem as damage to trunks and stems from mechanical equipment is combined with damage from pruning. Together, however, "wounds and pruning scars" were the second most common type of damage to trees identified by the survey crew, evident on 19,113 trees (35.8 per cent of all public trees inventoried). Development of an additional category of damage to identify the impacts of vehicles and ploughs would be advisable as the tree inventory database is maintained and updated.

Assuming snow plowing damages trees as suggested by contacts, better procedures are needed to plant trees out of harm's way and/or to protect them from snow clearing and snow dumping. The City is, in fact, reserving the first 4 feet of land past the sidewalk in front of each property for snow storage (i.e., no walls, furniture, or other obstructions are permitted in the area). Explicitly identifying instances of plow damage will facilitate the monitoring of the success of this practice as well as to identify areas where circumstances make trees more vulnerable.

Some contacts also pointed out that small lots add to this challenge. With increased coverage and reduced frontage, small lots increase run off and decrease the roadside area available for snow storage. Little space, furthermore, is left for planting, including trees. Again, identification of plow damage would allow the City to evaluate this assertion, if a property boundary layer can be added to the existing GIS. Such data, more broadly, would allow the Development and Planning Department to assess best practices in road layout and community design to protect trees.

The City needs to balance the need for snow clearing and the preservation of trees. The two considerations are by no means mutually exclusive. Appropriately placed trees can operate as snowbreaks that reduce road hazards and facilitate clearing. Provision of adequate clearance between the road's edge and newly planted trees will reduce the risk of damaging trees and interfering with snow clearing operations. Snow clearing procedures may also be modified in the interest of preserving valuable trees that offer many other benefits to the community.

4.0 MANAGEMENT PLAN

This Management Plan is offered to guide the maintenance and improvement of the Urban Forest in St. John's for the next 25 years. It establishes the principles for operations over this period consistent with the Vision for the St. John's Urban Forest set out in **Section 1.2** above. As such, it is prepared as a collection of policies by which St. John's Council and staff are to be guided. The Operational Plan discussed in **Chapter 5** is intended to set out actions for the initial implementation of this long-range plan.

Although the Tree Inventory, at this point, records only public trees in St. John's, much of the discussion and many of the recommendations following apply more broadly. Included in our recommendations, in fact, are initiatives to expand the Tree Inventory in several steps to include all trees within the City (see **Section 4.4**).

4.1 FUTURE PLANTING

Ongoing tree planting should address the balance between non-native trees and the need for species diversity. As noted, the St. John's Urban Forest is predominantly comprised of the non-native deciduous species, particularly Norway Maple and Sycamore Maple trees. These species have lately proven very susceptible to the Elm Spanworm, as have many less numerous, non-native species present in St. John's.

Diversification of the city's forest should take these issues into account. Planting should focus on native species or hardy non-native species suited to the local climate. Increased planting of coniferous trees makes sense in this light but should not be over-emphasized. Coniferous trees generally require less maintenance than deciduous trees and should be better suited to the long Newfoundland winters during which they remain more attractive. In this context, they are also more effective to block snow where snowbreaks are required. On the other hand, the shading provided by deciduous trees is not irrelevant and they add variety to foliage as they change over the course of the year.

As well, coniferous trees are susceptible to different varieties of pests and diseases. Apparently, the prevalence of spruce budworm was a motive for encouraging the planting of maple trees in the 1960s. Spruce budworm is still the foremost threat to softwoods in North America and would be a potential concern in St. John's if coniferous trees are substantially reinstated. Planting, therefore, should take into account the need for balance in species composition so as to minimize the prospect of a dominant pest.

Planting should also be undertaken on an ongoing basis. The relatively uniform age of the deciduous trees attacked by Elm Spanworm has been cited as a reason for the impact of the infestation over the past few years. Ongoing planting of varied species through the direct initiative of the City of St. John's and as part of landscaping requirements for new developments should diversify and strengthen the urban forest.

Recommended Policies:

The City of St. John's shall undertake an annual planting program to enhance and diversify the St. John's Urban Forest.

In implementing its annual tree planting program, the City shall monitor the share of coniferous and deciduous trees comprising the urban forest with the objective of achieving an approximately equal mix of the two types.

In implementing its annual tree planting program, the City shall encourage the use of native and hardy non-native species to achieve the objective of the foregoing policy.

4.2 MAINTENANCE PROGRAM

Information presented in **Chapter 3** indicates that the urban forest in St. John's is well maintained. The impact of spanworm aside, data indicates that public trees are generally healthy with few trees in need of immediate attention and very few requiring removal. Data also provide evidence of extensive pruning.

The Department of Public Works and Parks should maintain this good level of performance. The Tree Inventory should be a major assist to this objective. It should allow department staff to identify maintenance needs and activities, and program maintenance work. It is important, therefore, for maintenance and updating of Tree Inventory data to be integrated with fieldwork by department staff.

Recommended Policies:

The City shall maintain a program of continuous tree maintenance with the objectives of maintaining the health of all trees within the City and remedying or eliminating as expeditiously as possible any tree that may present a hazard to the health of other trees or wildlife, or to humans.

The City shall record all maintenance work as it is conducted and incorporate changes to records and new records in the Tree Inventory database as soon as practical on completion of such work.

The City shall compile an annual record of all tree maintenance work executed and of the condition of the Urban Forest for the purpose of monitoring the growth, health, and other features of the Urban Forest.

4.3 PEST CONTROL

The Elm Spanworm is currently the most prominent issue for urban forest management in St. John's. Some citizens have argued for proactive response; however, contemporary management practice accepts such infestations as part of natural processes. Forest fires, insect infestations, and similar problems are common in natural forest stands and, with due consideration to human health and convenience, are now accepted as essential to the process of forest renewal.

With this view, infestations are to be expected. When they occur, they need to be managed and their more obnoxious impacts mitigated. Over reaction should be avoided. Pesticides are appropriate in some situations. Stem plugs have, for example, been employed with some success to control the Spanworm. Pesticides may, however, be a threat to human and animal health if not properly employed.

Most experts, therefore, regard pesticides as a last resort. The Department of Public Works and Parks strictly limits its use of chemicals. Although many municipalities in Canada have banned pesticides and the Supreme Court of Canada recently upheld the right of the Town of Hudson, Quebec, to enforce such regulation, the *City of St. John's Act* does not provide the requisite statutory authority. This has to be granted by the Provincial Government. Currently, the Department of Public Works and Parks limits itself to use of a fungicide on the Lawn Bowling Green at Bowring Park, and selective application of pesticides to control wasps in the interest of public safety. The department also encourages limited and responsible use of pesticides by others.[15]

The best long-range approach to pest control is diversification as discussed in **Section 4.1**. As most pests require suitable hosts, a diversity of species will prevent the wide spread of specific pests. Varied age will also promote resistance and ensure at least some of the forest stock can survive.

It is also important to educate the public on effective means of pest control. The City provides a good array of material on its Web site. Currently, the Pest Control page provides links to information on 16 common pests ranging from insects to rodents, as

[15] See City of St. John's, "Pesticides," http://www.stjohns.ca/cityservices/environment/pesticides.jsp.

well as a discussion of pesticide regulations and use.[16] Maintenance of this link and communication of additional information on integrated pest management and responsible pesticide use should be an ongoing commitment for the City and the Department of Public Works and Parks.

Recommended Policies:

The City of St. John's should avoid the application of pesticides as a means of controlling or eliminating pests in the urban forest, and should discourage their use by other organizations and citizens.

The City should continue to provide information in brochures, on its Web site, and through other means to explain alternative approaches to controlling and eliminating pests by non-chemical means.

4.4 URBAN FOREST DATABASE

For the Tree Inventory to remain an effective support tool, it is vital that it be regularly updated. Public Works and Parks field staff need to be familiarized with the data available and its interpretation. Ideally, they should be equipped with PDAs with GIS database and data entry modules similar to those used by the inventory field crew. With appropriate devices field staff can update data as they work. This could include adding tree records and/or correcting data as required to improve the quality of information.

Preceding analysis in this report notes some data items that should be added or enhanced. Additional detail on the likely causes of damage to trees would, for example, be useful. While foliage damage is most probably caused by spanworm in the current situation, it would be beneficial to have more definitive indication in the database. In future, other causes may arise and it is conceivable that more than one pest may impact the urban forest at the same time. More detailed data will be required to distinguish between causes in such circumstances and/or to monitor the progress of pests and similar challenges in terms of intensity and geographic distribution.

It would also be beneficial to expand the urban forest database over time. The current inventory covers public trees. Public trees are an obvious priority given that the City is responsible for their maintenance. The progress of pests and the presence of public hazards are not, however, confined to public trees. As suggested above, it would

[16] The City of St. John's page http://www.stjohns.ca/cityservices/animalcontrol/pests.jsp links to the page http://www.env.gov.nl.ca/env/env/final/pests.html on the Newfoundland and Labrador Department of Environment Web site.

ultimately be desirable to incorporate all trees within the city into the Tree Inventory database.

In addition to parks not inventoried through this project, the Grand Concourse, the East Coast Trail, and publicly used trails should be recorded either by individual trees or by stand classification. Stand classification would be appropriate for Pippy Park, which is the largest contiguous forested area within the city.

Obtaining and maintaining information on trees located on private property would also be valuable. Currently, *The St. John's Tree Regulation* exercises no control over private trees other than trees rooted on private land that overhang public land (i.e., which are, therefore, public trees) and trees deemed to be a public nuisance.[17] Municipal units elsewhere in Canada, however, are extending their authority to protect privately owned trees in the public interest.[18]

In the absence of the necessary legislative authority in Newfoundland and Labrador, incorporation of trees on private property into the Tree Inventory would be beneficial to monitor their health and interaction with public trees, as well as to help enforce nuisance provisions of *The St. John's Tree Regulation* applicable to trees on private land.[19] Privately owned trees can be identified from the same aerial photography that provided data points for the inventory of public trees for this assignment; however, the City will require the cooperation of landowners to obtain the detailed information recorded for public trees.

Regardless of the areas inventoried, data maintenance is an ongoing commitment. Data that is not regularly updated will quickly become ineffective. If a program cannot be established to ensure that data remain reliable, it is best not to introduce such data to the database.

In addition to regular updating through field staff, data integrity will be encouraged by regularly summarizing the data. This should be done in support of the annual report required from the Tree Committee under the Tree Regulation. The data contained in the inventory is ideal to address the reporting requirements stated in Section 15(e) of the regulation as follows:

(e) to report yearly in writing to the Council on its activities and on the state of the tree program by: outlining the extent of planting, protection,

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[17] *The St. John's Tree Regulation*, Sections 20-21, pp. 12-13.

[18] Colin Beckingham, "Whose tree is it?," *Landscape Trades*, April 2006, Vol. 28, no. 3, p. 9.

[19] *The St. John's Tree Regulation*, Sections 22-26, p. 13.

> preservation, maintenance and removal of public trees during the year; stating whether the City achieved a net gain or net loss in the number and quality of public trees during the year; outlining the extent to which trees planted in previous years have survived and have maintained a satisfactory rate of growth and state of health during the year; stating the probable causes of any significant loss or of less than optimal growth of such trees; and making recommendations as to remedies for or methods of preventing loss, poor health, or poor growth of such trees.[20]

Clearly, an annual summary of Tree Inventory data identifying year-to-year changes in tree numbers and health would address this requirement. The Tree Inventory, in fact, will support more detailed monitoring of important factors such as the proportion of coniferous and native tree species, and the distribution of new trees and tree health problems.

Recommended Policies:

The City of St. John's shall maintain the Tree Inventory database as a component of its regular maintenance program.

The City shall produce an annual summary of the Tree Inventory database to address the requirement of Section 15(e) of The St. John's Tree Regulation *and to monitor the following:*

- *The number and distribution of new trees added and existing trees lost from the Urban Forest*
- *The relative proportions of coniferous and deciduous trees*
- *The relative proportions of native and non-native tree species*
- *The presence and distribution of infestation, disease, and other tree health issues*
- *The change each of the foregoing over the preceding year and over other intervals (e.g., 5 years, 10 years) as may be supported by the Tree Inventory database.*

The City should review the data structure employed for the Tree Inventory database annually to determine the need to add or modify data fields and, if beneficial, the content of fields.

The City should expand the scope of the Tree Inventory database to include all trees on city owned properties.

[20] *The St. John's Tree Regulation*, p. 7.

The City should work with trails organizations and other groups to incorporate trees associated with such facilities in the Tree Inventory database.

The City should facilitate the addition of data for trees on private property to the Tree Inventory database through assistance to private landowners.

The City should provide public access to the Tree Inventory database through its Web site when it is confident that the database is reliable.

4.5 DEVELOPMENT REGULATIONS

Varied concerns were raised with respect to development regulations in the city and their implementation. Broadly, some stakeholders, including members of City staff are concerned that not enough open space is reserved through the subdivision dedication process, planting in association with development is inadequate, and associated stormwater management systems are often ineffective. Many of the same stakeholders also expressed concern with higher density housing forms, particularly narrow lot housing, because yard areas do not provide sufficient area for planting and street dimensions hinder snow clearing and storage, thereby placing trees at risk.

The City of St. John's Tree Committee, in a memo dated June 28, 2004, indicated that its members considered the Development Regulations "to be the most appropriate vehicle for implementing improved municipal standards for landscaping," because the regulations are familiar to "a broad range of City staff, private citizens, contractors and members of the development community."[21] This particular memo was accompanied by the amendments to the Development Regulations referenced in **Section 3.5**, above.

The document did not identify municipal plan policy or plan policy amendments that would provide a foundation for such amendments. A suggested, policy could be added to Part III, Section 1 of the plan dealing with Urban Form. This section of the plan reinforces the importance of maintaining a compact city. If, however, high density is to be achieved, planting and landscaping are required to buffer developments from each other, to control stormwater flow, and to soften the appearance of more intense development. In Part III, Section 1 a policy such as the following will have City-wide effect and should apply to residential and non-residential land use:

[21] Ian Wallace, "Proposed Amendment to the St. John's Development Regulations," June 28, 2004, p. 2.

Planting and Landscaping
To mitigate the impacts of increased density the City shall ensure planting and landscaping of all lands proposed for development that are not required for buildings, vehicle access, or parking.

The previously proposed amendments to the Development Regulations, which are reproduced in **Appendix B** to this document, would follow from this new policy as well as existing policies such as those requiring land use buffers. The amendments add definitions to Section 2, and expand and add to current Section 8.5 of the Development Regulations, which is presented in **Section 3.5** also. Additional wording addresses the following:

- Elaboration of the purposes for landscaping and screening
- Tighter specification of landscaped areas and screens
- Specification of Tree Planting and Landscaping requirements
- Establishment of the role of the Municipal Arborist in approval of planting and landscaping.

Planting and landscaping specifications address residential and non-residential areas. They include standards for the number and size of trees required on properties being developed. The proposed amendment also includes a list of recommended species for planting. The list emphasizes hardy species suited to the local climate.

The recommended amendment addresses several important issues raised in the course of research and consultation for this assignment. The only modification to the proposal that we would suggest based on information gathered would be to increase the required proportion of coniferous trees in new planting from 1/3 to 1/2 of all trees (see subsections (1) (B)(v) and (2)(B)(v) of proposed Section 8.5.4) so as to reflect the overall objective for increasing the proportion of coniferous trees in the urban forest. With this adjustment, we would urge the immediate adoption of the proposed amendment.

Additional amendments might also be considered based on further study by City planning and engineering staff. As suggested in **Section 3.5** above, the City may wish to consider developing a policy framework to encourage Open Space Subdivision in appropriate areas. Examination of the costs and benefits of small lot or narrow frontage subdivisions would also be beneficial to find a compromise that will encourage density while facilitating snow clearing in an environment that will allow the incorporation of greenery. This might include consideration of open spaces reserved for snow dumping, wider median strips between sidewalk and curb for tree planting and snow storage, incorporation of drainage swales in place of conventional

curb and gutter, and/or encouragement of new approaches such as the fused grid subdivision.

Recommended Policies:

The City shall amend the Municipal Plan and Development Regulations to ensure the provision of planting and landscaping as a component of all development projects

The City shall encourage the planting of trees and other vegetation appropriate to local climate and conditions.

The Municipal Arborist shall approve species to be planted in accordance with the provisions of City of St. John's Development Regulations.

The City of St. John's shall amend the Municipal Plan and Development Regulations from time to time consistent with the overall objectives of both documents so as to encourage the growth and enhancement of the Urban Forest.

The City of St. John's shall investigate means to encourage street and subdivision design approaches that will provide sufficient open space for snow clearing and storage, parks and trails, and planting of trees to augment and enhance the Urban Forest.

4.6 OTHER CONSIDERATIONS

The St. John's Tree Regulation has been in place for more than 15 years. It provides an excellent and, to date, largely effective framework for management of the urban forest. The regulation, in fact, addresses several issues raised by research and in the course of consultations for this assignment.

For example, the issue of designating heritage trees was raised in our second round of consultations. Part (7) of Section 9 of *The St. John's Tree Regulation* empowers the Municipal Arborist to recognize and designate "historic trees" as follows:

7) Outstanding or Historic Trees. The arborist may designate individual trees or groups of trees as outstanding trees on the basis of species, age, size, historic importance or any combination of these factors. With the owner's consent, the arborist may identify such trees by a plaque or other suitable method and should make every effort to provide them with full care and protection.

This capacity has not been significantly exercised to date. As noted above, St. John's has only a small number of very large and, therefore, very old public trees. Review of these trees, which are now readily locatable through the GIS layer generated by the

Tree Inventory, could identify those of particular botanic and/or historic interest. The placement of plaques or similar devices as part of a formal heritage tree program as suggested by Section 9 (7) would draw attention to the urban forest and its cultural relevance.

Of course, trees on private property are of equal interest as potential candidates for heritage designation. They might be identified through the same type of approach, if and when private trees are incorporated in the Tree Inventory. A shorter term solution with valuable secondary benefits, however, would be to solicit property owners to identify trees on their lands meeting parameters that would suggest designation (i.e., height or similar growth characteristics). Advertising for such public involvement in the newspaper and/or on the City's Web site would no doubt help to raise public awareness further.

In general, provisions of the Tree Regulation that foster public awareness and involvement should be implemented vigorously. These include continuation of the Tree Committee, the sponsorship of Arbor Day by the City, and augmentation of public information on trees and the urban forest. With respect to Arbor Day, some stakeholders commented tat the celebration should have a higher profile. Funding may be available through the Environment Canada Green Fund that could be applied to enhance related events. It may also be beneficial to consider alternative approaches to Arbor Day plantings such as concentrated planting in prominent locations that may draw more attention in the long-run.

Recommended Policies

The City shall foster the preservation of trees deemed to be historic either by virtue of their age or by their association with historic personages or events through establishment of a Heritage Tree Program.

The City shall pursue all cost-effective means to increase public awareness of the Urban Forest and its contribution to the character and health of the St. John's community including advertising, provision of information, annual sponsorship of Arbor Day, and direct provision of assistance to citizens to protect and enhance trees.

5.0 OPERATIONAL PLAN

The Operational Plan sets out the broad program of the City of St. John's to implement the policies of the foregoing Management Plan during the first five years of its application. It is, therefore, applicable to the period 2007 to 2012. Its implementation should begin on approval of this document.

5.1 MAINTENANCE OBJECTIVES

Analysis of Tree Inventory data suggests that the ongoing maintenance of St. Johns trees has been effective. Although trees were identified for specific pruning requirements, the proportion of the total tree population is very low. In fact, the inventory indicated that about 93 per cent of the trees required no maintenance.

The City currently has two full-time arborists equipped with a bucket truck that allows access to the majority of the urban trees. This crew is dedicated full-time to work on trees. A three–person ground pruning crew augments this pruning crew in the winter when staff can be shifted from other maintenance responsibilities. Several Certified Arborists are also on staff. This mix of staff allows many types of pruning to be accomplished throughout the year.

The highest priority for the pruning crews in the short term will be to alleviate any existing or potential hazards. Pruning crews should immediately target the 96 trees identified for immediate attention and 880 trees identified as requiring work within the season. The sizes of the trees will determine whether the use of the bucket truck is required or if the pruning issues can be addressed from the ground.

The next priority should be to address trees identified as codominant and requiring attention. Codominance is the second most common cause of failures in urban trees. Codominant trees should be treated in one of two ways:

- *Subordination Pruning* – Prune and reduce one of the codominant stems to allow the other to become more dominant. This is most effective for smaller trees and trees where there is no cracking or bark dieback associated with the codominant union, or

- *Mechanical Reinforcement* – Prune to reduce the spreading nature of the two stems and use cables and braces to provide supplemental support to large, weak unions with included bark.

There are limitations to the effectiveness of cabling systems and there are a variety of materials and methods for installing cables. Each situation where supplemental

support may be required should be carefully considered and the proper support system should be specified and correctly installed.

Deadwooding of trees should be an ongoing pruning practice. When large deadwood is identified in public trees its removal should be a priority. The presence of a target for any material that could fall from a tree increases this priority in the interest of public convenience and safety.

The inventory identified a large number of trees that have branches with fungal or bacterial infections. Public Works and Parks staff should target these trees for inspection and potential pruning. Branches with these types of infections will eventually be weakened by the pathogens in the wood and become more susceptible to breakage. Pruning strategies should include reduction of weight at the ends of branches that are seen to be weak. Often, removal of the whole branch can be avoided by alleviating the weight at the end of the branch. This is beneficial because large pruning wounds in the stem of a tree also get infected with pathogens. When the stem becomes infected with fungal pathogens the structural integrity of the whole tree can become compromised.

Once the problem trees identified in the inventory have been addressed, the inspection and maintenance of trees should continue in a similar manner to the past. Larger trees in the inventory should be a priority for inspection, especially trees that have been identified with structural weaknesses such as codominance or fungal infections. Ideally, the City should inspect these trees annually. Trees that have been cabled or braced should have a higher priority for inspection in this context.

As an alternative, the City should consider implementing a systematic or block pruning strategy. If regular pruning is planned in a systematic manner, crews and equipment can work much more efficiently than if pruning is only done by request. The City of Toronto has compared efficiencies of both methods and found planned pruning to be at least twice as productive.[22] Pruning in a block pattern in anticipation of possible hazards and tree health problems, reduces citizen calls for emergency pruning.[23] In addition, the crews often find problems that would not have been reported by residents.[24] The block pruning method can also focus on species that may

[22] Joseph Halstead, "City Tree Maintenance Backlog – All Wards," letter to Economic Development and Parks Committee, City of Toronto. June 22, 1999, http://www.toronto.ca/legdocs/1999/agendas/committees/edp/edp990712/it014.htm

[23] C. J. Luley, S. Sisinni, and A. Pleninger. "The Effect of Pruning on Service Requests, Branch Failures, and Priority Maintenance in the City of Rochester, New York, U.S." in *Journal of Arboriculture*, 2002, Vol. 28:3, pp. 137-143.

[24] Halstead, "City Tree Maintenance Backlog – All Wards."

require more attention, such as trees vulnerable to a common pest like maple trees in St. John's in the case of the spanworm. Through effective block pruning the City can reduce the prospect of falling branches or other hazards thereby reducing its liability.[25]

Notwithstanding these priorities, the City can gain its greatest advantage through pruning of newly planted and immature trees. Future problems can be readily identified and alleviated in young trees. Young trees can respond with vigorous closure of pruning wounds when pruning cuts are made to direct the future growth of trees and regrowth of new branches. Although some structural pruning of young trees may appear to be drastic, in most cases one to two years after pruning the appearance of the trees is no longer an issue. Preferably, each new tree planted in the city should be pruned 2, 5, 10, and 15 years after planting. Pruning trees on this schedule will greatly reduce future pruning and maintenance requirements for maturing and mature trees. Tracking of this type of pruning will be greatly enhanced with the implementation and ongoing maintenance of the Tree Inventory database.

The following actions should be undertaken in **2007**:

- *The City should ensure that all trees identified in the 2005 inventory as requiring immediate attention or attention within the season have been properly addressed*

- *Using the Tree Inventory data, the City should target all trees with codominance problems or branches with bacterial or fungal infections for corrective pruning.*

The following actions are recommended for **2008**:

- *The City should implement an immature tree pruning program to ensure that each newly planted tree is scheduled to be pruned at 2, 5, 10 and 15 years after planting.*

- *The City should use the Tree Inventory database to track and schedule the immature tree pruning program.*

The following action is recommended for the **2007-2009** period:

- *The City should initiate a feasibility study for the implementation of a block*

[25] B. H. McGauley and Best Management Practices Subcommittee, "Urban Forestry – Best Management Practices for Ontario Municipalities." International Society of Arboriculture – Ontario, 2000, p. 32.

pruning strategy that will maximize the efficiencies of tree pruning crews. The Tree Inventory database implemented within the City's GIS system could be applied to initiate and manage the block pruning strategy.

The following actions should be undertaken regularly from **2007 through 2012**:

- *The City should regularly update the Tree Inventory database to record all trees that are planted, removed, or receive maintenance. Ideally, records should be added, deleted, or modified by staff in the field using PDAs for transfer into the permanent database.*

5.2 PLANTING PROGRAM

The implementation of a planting program coincides with one of the main goals of the Management Plan, to enhance canopy cover in the city of St. John's. The planting program should be systematically envisioned and planned to maximize benefits. Planting should be undertaken annually to ensure adequate species and age diversity within the St. John's Urban Forest. At a minimum, each tree that is removed from the City inventory should be replaced. Ideally, new planting will exceed removals so that there is an eventual increase in canopy cover.

The City already has standards in place for the planting of street trees. The standards adequately address important aspects of planting such as spacing and location, species mix, species selection, and stock type and size. On the other hand, the Tree Inventory and related consultations have identified issues with regard to the representation of species in the urban forest and the provision for planting as part of new developments that should be addressed through adjustment of emphases in planting.

The following are key issues that should be addressed as the planting program evolves:

- *Native vs. Non-native Planting* – While the addition of native species is a desirable goal, it should not override the need for shade and other benefits provided by appropriate non-native species. In many instances these non-native trees are better suited to the urban environment, provided they are sufficiently hardy to tolerate the St. John's climate.

  City Public Works and Parks staff should, therefore, focus on planting native trees where space and the growing environment suit these species. In many cases in St. John's appropriate conditions are only present in parks and open spaces. Therefore, in parks and open spaces

native trees should be prioritized. Properly sited native conifers can be particularly effective in shelterbelt plantings to reduce snow drifting, enhance passive open spaces, and aid in stormwater management.

In the downtown core and along many of the streets, conditions are not always ideal for native species. For example, many of the birch trees found to be in poor condition by the survey team were in stressful planting sites. Weakened trees in such circumstances are more susceptible to pests and pathogens. In these stressful growing situations, select non–native species are likely to be more tolerant.

The Street Tree Planting Standards provide a list of official street tree species that City staff have recommended based on careful consideration of their performance in St. Johns. This list can be augmented by other species that prove to be hardy in stressful urban sites. Species that are considered to be invasive to natural areas should however be planted with caution. In many urban areas in North America, remnant natural stands are rapidly being out competed and degraded by highly invasive ground flora, shrub, and tree species.

- *Species Diversity* – Based on the Tree Inventory database two species – Norway Maple and Sycamore Maple – predominate in the St. John's Urban Forest. These trees are found extensively throughout the city and were some of the primary targets for the Elm Spanworm infestation. While both species have obviously thrived in the City, they should be de-emphasized in the future planting programs.

  Many trees of these species in the inventory are actually growing on private land, but have been categorized as public trees because they overhang the public right of way. The City should consider a program that allows and encourages homeowners to remove the weaker individuals of these species and replace them other appropriate trees on the official street tree list. This program would have to be implemented under the guidance of City Public Works and Parks staff to ensure that healthy trees are not unjustifiably removed.

- *Coniferous v. Deciduous Species* – The Tree Inventory found conifers to be under-represented in the St. John's Urban Forest. Adjusting this balance should be a focus of the planting program closely related to the re-establishment of native species.

As noted above, however, coniferous species are not always ideal for street tree planting unless a large setback from the street or sidewalk can be obtained. The lower branches of a conifer present two problems: they are an impediment to sight lines along roadways and in a relatively short period of time they begin to overhang the right of way and require maintenance pruning. Conifer planting, therefore, should be concentrated in open space and parkland areas where they can be used for shelterbelt plantings or where they can be planted in groups or stands. In this way the overall contribution of conifers can be increased without creating future safety and maintenance issues.

- *Planting on Development Sites* – Increased planting of new trees in conjunction with new development will be a key measure to improve the St. John's Urban Forest. Many stakeholders noted in interviews and public sessions that developers in the region typically remove all tree cover before undertaking land development and construction. Although this practice is by no means unique to St. John's, replacement of trees cleared from these sites needs to be a higher priority. At a minimum, at least one street tree should be provided for each new residential structure in these new development sites and subdivisions.

  Siting of these trees is sometimes difficult as lot sizes decrease, and servicing and snow removal or storage requirements compete with tree habitat; however, provision of one tree per lot is hardly onerous. In the short-run, incorporation of trees will enhance the appearance of new development and, therefore, there marketability. In the longer run, the benefits of planting trees accrue to individual homeowners and to the general community in the form of aesthetic enhancements, shade/shelter/snow protection, soil stabilization, and many other factors that contribute to an enhanced environment and increased property value. Nonetheless, some research may be required to provide innovative solutions to balancing the need for trees with the realities of servicing new houses in higher density developments.

- *Locally Grown and Adapted Nursery Stock* – Currently, much of the nursery stock used for planting in the St. John's is obtained from nurseries in Ontario. Much of that stock has actually been raised in operations even farther to the south or west. The result of this practice can be poor survivorship or suitability to the St. John's climate.

  The City should explore opportunities to grow more of its own stock or to contract local nurseries to do so. This may take some time to develop

and implement but would be of tremendous benefit to the City and its tree planting programs. In general, given the relatively small size of the nursery and horticulture sector in Newfoundland, City staff should encourage dialogue on the most appropriate species and planting approaches to ensure a hardy and healthy forest in St. John's.

The following actions should be undertaken in **2007**:

- *The City should ensure that at least one tree is planted to replace each tree removed to address problems identified by the 2005 Tree Inventory.*
- *The City should add a detailed tree planting specification (drawing) to the Tree Planting Standards document.*
- *The City should study the feasibility of implementing a program to remove unhealthy Norway and Sycamore Maples and replace them with alternative approved species identified in the St. John's Tree Specifications.*

The following actions should be undertaken in **2008**:

- *The City should engage in discussions with local growers to determine the feasibility of increasing the supply of locally grown and adapted nursery stock.*

The following actions should be undertaken regularly from **2007** through **2012**:

- *All trees planted in the City should be immediately added to the Tree Inventory database.*
- *The City should apply the Tree Inventory database to track the survivorship and long-term health of new plantings.*
- *The City should constantly increase species diversity by planting a variety of native and hardy non-native species.*
- *The City should focus on native tree plantings in its parks and open spaces.*

5.3 POLICY AND STANDARDS

Key changes to the City of St. John's Development Regulations have been before the Tree Committee since 2004. We understand they are awaiting adoption subject to the assessment of through this Management Master Plan process. Our conclusion based on our review and consultation in the course of this project is that the

recommendations contained in the Tree Committee report of June 2004 are an appropriate response to several key issues in St. John's. Their implementation should not be further delayed.

In addition, further investigation of subdivision and planning approaches that will encourage tree maintenance and planting should be undertaken. Many ideas are worthy of consideration and several have been put forward in preceding chapters. A thorough assessment of potential initiatives taking into consideration the specific circumstances of Newfoundland and St. John's is however required before proceeding. Such a study could be undertaken by City staff or qualified consultants dependent on available resources and funding.

The following actions should be undertaken by **2007**:

- *The City shall amend the Municipal Plan to add the following proposed policy in Part III, Section 1:*

  Planting and Landscaping
  To mitigate the impacts of increased density the City shall ensure planting and landscaping of all portions of property proposed for development that are not required for buildings, vehicle access, or parking, and that cannot be left in their natural state.

- *The City shall adopt the amendment to the St. John's Development Regulations recommended by the Tree Committee in June 2004 (**Appendix B**) except that subsections (1) (B)(v) and (2)(B)(v) of proposed Section 8.5.4 shall require that at least 1/2 of all new trees planted shall be coniferous trees.*

The following action is recommended for **2008**:

- *The Tree Committee shall establish criteria for designating Heritage Trees.*

- *The City shall formally initiate a Heritage Tree Program by identifying at least five trees that meet the criteria for designation of Heritage Trees and recognizing, through a plaque and/or other means, the special place of these trees in St. John's.*

The following action is recommended for the **2008-2009** period:

- *The City should undertake a study of alternative development approaches to encourage the retention and/or planting of trees in new development, and/or facilitate the maintenance and preservation of trees after development, and make*

the most effective use of trees to stabilize land, control stormwater, control the movement of snow, and otherwise mitigate the negative impacts of development and climate.

The following action is recommended for the **2010-2011** period:

- *The City should implement the recommendations of the foregoing study as expeditiously as possible through amendment of the Municipal Plan, Development Regulations, Tree Regulation, and other regulations and bylaws as appropriate to ensure their effective application.*

The following actions should be undertaken annually from **2007 through 2012**:

- *The City shall monitor the following features of the St. John's Urban Forest:*
  - *The number and distribution of new trees added and existing trees lost from the Urban Forest*
  - *The relative proportions of coniferous and deciduous trees*
  - *The relative proportions of native and non-native tree species*
  - *The presence and distribution of infestation, disease, and other tree health issues*
  - *The change in each of the foregoing over the preceding year and over other intervals (e.g., 5 years, 10 years) as may be supported by the Tree Inventory database.*

5.4 DATABASE DEVELOPMENT

Expansion and refinement of the Tree Inventory database is important to provide the framework for planting and maintenance programs, and to provide information for effective management of the urban forest. During the 2007 to 2012 period, a data entry and enhancement program should be firmly established. Requirements for regular use of Tree Inventory data in annual programming will help to ensure that such processes are adhered to and are effective. Over time, the Tree Inventory will, hopefully, be expanded to include all trees within the limits of the City of St. John's and the necessary steps toward this goal should be initiated on adoption of this Management Master Plan.

The following actions should be undertaken by **2007**:

- *The City shall equip appropriate field staff with the Parks Services Division with electronic devices suitable for updating the Tree Inventory in the field.*

- *Pursuant to the preceding recommendation, the City shall update the Tree*

Inventory daily.

- *The City shall generate an annual profile of the St. John's Urban Forest from the Tree Inventory to monitor the growth, change, and health of the St. John's Urban Forest.*

- *In the course of generating the foregoing profile, the City shall review the data structure and definitions used for the Tree Inventory, and add, update, or correct data to maximize the accuracy and usefulness of the inventory.*

The following actions are recommended for **2007**:

- *Inventory all trees on City-owned lands not covered by the 2005 Tree Inventory.*

The following actions are recommended for the period **2008 through 2010**:

- *The City shall work with the Grand Concourse Authority, the East Coast Trails Association, the Pippy Park Commission, and any similar organizations responsible for significant trails or open spaces to incorporate trees on lands under the control of each organization into the Tree Inventory as individual tree records or as tree stands.*

APPENDIX A: TREE INVENTORY SPECIES SUMMARY

Code	Tree	Count	%	Rank
D010	Sycamore Maple	14,412	27.14%	1
D220	Norway Maple	9,561	18.01%	2
D020	White Birch	4,394	8.28%	3
C007	White Spruce	2,909	5.48%	4
D069	Mountain Ash	2,880	5.42%	5
D003	Crimson King Maple	1,630	3.07%	6
C015	Scots Pine	928	1.75%	7
D054	Pin Cherry	927	1.75%	8
C012	Austrian Pine	861	1.62%	9
C001	Balsam Fir	818	1.54%	10
D166	Ivory Silk Lilac	813	1.53%	11
D128	Silver Poplar	798	1.50%	12
D117	Golden Chain Tree	757	1.43%	13
C010	Colorado Blue Spruce	673	1.27%	14
D021	European White Birch	668	1.26%	15
D053	Trembling Aspen	641	1.21%	16
D044	Japanese Crab Apple	608	1.15%	17
D066	American Linden	605	1.14%	18
D170	Slippery Elm	593	1.12%	19
D016	Common Horse Chestnut	481	0.91%	20
D013	Silver Maple	471	0.89%	21
D064	American Mountain Ash	436	0.82%	22
C006	Tamarack	433	0.82%	23
D176	European Ash	335	0.63%	24
C036	Eastern White Cedar	299	0.56%	25
D067	Little Leaf Linden	279	0.53%	26
C008	Black Spruce	245	0.46%	27
D011	Red Maple	244	0.46%	28
C017	Norway Spruce	212	0.40%	29
D167	Redmond Linden	207	0.39%	30
D178	Apple	204	0.38%	31
D033	Black Ash	186	0.35%	32
D057	White Oak	177	0.33%	33
D028	European Beech	151	0.28%	34
D032	White Ash	146	0.27%	35
D014	Cutleaf Maple	141	0.27%	36
D174	Common Hawthorn	139	0.26%	37
D052	Poplar Balsam	130	0.24%	38
D135	Mazzard Cherry	125	0.24%	39
D027	American Beech	122	0.23%	40
D124	Red Splendour Crab Apple	102	0.19%	41

Code	Tree	Count	%	Rank
D005	Harlequin Maple	97	0.18%	42
D058	Red Oak	90	0.17%	43
C045	Alaska Cedar	89	0.17%	44
D106	Copper Beech	88	0.17%	45
D059	Golden Weeping Willow	87	0.16%	46
C046	Port Orford Cedar	86	0.16%	46
D172	Siberian Elm	78	0.15%	47
D061	Pussy Weeping Willow	72	0.14%	48
D055	Common Choke Cherry	67	0.13%	49
D089	Horse Chestnut	63	0.12%	50
C034	Jack Pine	61	0.11%	51
C013	Red Pine	61	0.11%	51
D090	Serviceberry	60	0.11%	53
C005	European Larch	59	0.11%	54
D065	European Mountain Ash	58	0.11%	55
C037	Canadian Hemlock	55	0.10%	56
C016	Douglas Fir	50	0.09%	57
D071	Manitoba Maple	45	0.08%	58
D158	American Mountain Ash	44	0.08%	59
D100	Cockspur Hawthorn	41	0.08%	60
C029	Japanese Larch	41	0.08%	60
D156	Bebb Willow	40	0.08%	62
D171	American Elm	39	0.07%	63
D189	Golden Alder	38	0.07%	64
D113	Green Ash	37	0.07%	65
D022	Cutleaf Weeping Birch	37	0.07%	65
C014	Eastern White Pine	36	0.07%	67
D139	Mayday	35	0.07%	68
D206	Chuckly Pear	34	0.06%	69
D192	Western Red Cedar	31	0.06%	70
D173	Striped Maple	31	0.06%	70
D031	Weeping Beech	29	0.05%	72
D026	Grey Dogwood	29	0.05%	73
C002	White Fir	26	0.05%	74
D177	Red Ash	24	0.05%	75
D073	Norway Maple	21	0.04%	76
C009	Colorado Spruce	20	0.04%	77
D180	Flowering Crab Apple	18	0.03%	78
D037	Siberian Crab Apple	17	0.03%	79
C039	Western Larch	17	0.03%	79

Code	Tree	Count	%	Rank
D098	Common Hackberry	15	0.03%	81
C047	Western Red Cedar	14	0.03%	82
D193	Alternate Leaf Dogwood	14	0.03%	82
C041	Sitka Spruce	14	0.03%	82
D126	Van Eseltine Crab Apple	13	0.02%	85
C042	Engleman Spruce	13	0.02%	85
C040	Red Spruce	13	0.02%	85
C030	Serbian Spruce	13	0.02%	85
D070	Amur Maple	12	0.02%	89
D131	Lombardy Poplar	12	0.02%	89
D123	Red Jade Crab Apple	11	0.02%	91
D179	Crab Apple	11	0.02%	91
D083	Sugar Maple	11	0.02%	91
D129	White Poplar	11	0.02%	91
D134	Pissard Plum	10	0.02%	95
D088	American Horse Chestnut	9	0.02%	96
D130	Carolina Poplar	9	0.02%	96
C043	Brewers Spruce	9	0.02%	96
D062	Laurel Willow	9	0.02%	96
C048	Black Pine	8	0.02%	100
C049	Lodgepole Pine	8	0.02%	100
D043	Flame Crab Apple	7	0.01%	102
D138	Purpleleaf Mayday	7	0.01%	102
C044	Oriental Spruce	7	0.01%	102
D041	Echtermeyer Crab Apple	5	0.01%	105
D012	Autumn Flame Red Maple	5	0.01%	105
D146	Bradford Pear	5	0.01%	105
D205	Mock Orange Tree	5	0.01%	105
D018	European White Alder	4	0.01%	109
D164	Snowy Mountain Ash	4	0.01%	109
D198	Ginkgo Bilboa	4	0.01%	109
D019	Yellow Birch	4	0.01%	109
D143	Schubert Choke Cherry	4	0.01%	109
D122	Profusion Crab Apple	4	0.01%	109
D175	Downy Hawthorn	4	0.01%	109
D148	Chanticleer Pear	4	0.01%	109
D023	Young's Weeping Birch	3	0.01%	117
D142	Kwansan Cherry	3	0.01%	117
D039	Cheal's Weeping Crab Apple	3	0.01%	117
D181	Crimson Crab Apple	3	0.01%	117

Code	Tree	Count	%	Rank
D048	Sergeant Crab Apple	3	0.01%	117
C050	Spanish Fir	3	0.01%	117
D101	Lavalle Hawthorn	3	0.01%	117
D051	Hop Hornbean	3	0.01%	117
C004	Greenspire Juniper	3	0.01%	117
C024	Spartan Juniper	3	0.01%	117
D072	Black Maple	3	0.01%	117
D001	Hedge Maple	3	0.01%	117
D151	Bur Oak	3	0.01%	117
D204	Nana Berry Tree	3	0.01%	117
D034	Fallgold Ash	2	0.00%	131
D190	Alaska Cedar	2	0.00%	131
D040	Dolgo Crab Apple	2	0.00%	131
D047	Royalty Crab Apple	2	0.00%	131
C025	Blue Haven Juniper	2	0.00%	131
C051	Eastern Larch	2	0.00%	131
D168	Glenleven Linden	2	0.00%	131
D077	Superform Maple	2	0.00%	131
D154	English Oak	2	0.00%	131
D202	Hickory Tree	2	0.00%	131
D188	Mountain Alder	1	0.00%	141
D116	Blue Ash	1	0.00%	141
D115	Summit Ash	1	0.00%	141
D162	Weeping Mountain Ash	1	0.00%	141
D029	Fernleaf Beech	1	0.00%	141
D109	Tricolor Beech	1	0.00%	141
D094	River Birch	1	0.00%	141
D191	Port Orford Cedar	1	0.00%	141
D141	Japanese Weeping Cherry	1	0.00%	141
D127	Amur Cork	1	0.00%	141
D038	Coralburst Crab Apple	1	0.00%	141
D045	Guiding Star Crab Apple	1	0.00%	141
D046	Radiant Crab Apple	1	0.00%	141
D182	Sweet Crab Apple	1	0.00%	141
C022	Golden Threadleaf False Cypress	1	0.00%	141
D194	Flowering Dogwood	1	0.00%	141
D099	Turkish Hazel	1	0.00%	141
D068	Green Globe Linden	1	0.00%	141
D169	Greenspire Linden	1	0.00%	141
D160	Sheridan Hybrid Linden	1	0.00%	141

Code	Tree	Count	%	Rank
D203	Malus	1	0.00%	141
D004	Deborah Maple	1	0.00%	141
D085	Green Mountain Maple	1	0.00%	141
D082	Silver Queen Maple	1	0.00%	141
D147	Capital Pear	1	0.00%	141
D199	Hop Tree	1	0.00%	141
D210	Mulberry Tree	1	0.00%	141
D208	Tulip Tree	1	0.00%	141
D209	Walnut Tree	1	0.00%	141
D060	Babylon Weeping Willow	1	0.00%	141
	TOTAL	**53,096**		

APPENDIX B: PROPOSED AMENDMENT TO THE ST. JOHN'S DEVELOPMENT REGULATIONS

Amend Section 2 (Definitions) by the introduction of the following new terms:

GRASS means natural turf as more specifically described in Division 5 of the *City of St. John's Specification Book*.

LANDSCAPED OPEN SPACE means a portion of a Lot Area which is not Used for Buildings or structures, Parking Areas and driveways, and which consists of grass, flower beds, shrubbery, other forms of natural Landscaping, or a combination thereof decorative stonework, surfaced walkways or similar amenity, and "Open Space" is a separate definition.

LANDSCAPING PLAN means a plan prepared by a suitably qualified person, drawn to a satisfactory scale, clearly depicting the various landscaping elements which are proposed to be developed as part of a development of a Lot; and such Landscaping Plan shall be prepared in consultation with the Municipal Arborist (or designate) and approved by the Municipal Arborist (or designate).

MATURE TREE means a large, woody plant which is over 100 mm in diameter, measured 30 cm above ground level, having one or several self-supporting stems or trunks and numerous branches.

TOPSOIL means Topsoil as described in Division 5 of the *City of St. John's Specification Book* and having an average depth of 150 mm and a minimum depth of 100 mm.

Amend Section 8.5 to read (amended text and new text in italics):

8.5 LANDSCAPING AND SCREENING

8.5.1 Landscaping and Screening - General *[This is presently Section 8.5]*

Landscaping and Screening is for the purpose of achieving the following:

- *Protection of natural features and tree conservation*
- *Stabilization of steep embankments*
- *Screening of unsightly areas*
- *Provision of visual and acoustical buffers between ordinarily non-compatible land uses*
- *Minimization of the visual impact of parking and service facilities from adjacent properties and streets*
- *Reduction of the rate of stormwater runoff into the municipal stormwater sewer system*

- *Enhancement of the appearance of building setbacks and yard areas*

Landscaping and Screening shall be provided in accordance with this Section and as provided elsewhere in these Regulations. *All landscaping shall also conform with the standards set out in Division 5 of the City of St. John's Specifications Book (2002), the City of St. John's Tree Regulations, and the City of St. John's Landscape Design Standards for the Planting of Trees, Shrubbery & Other Assorted Groundcover.*

8.5.2 Landscaped Area and Screen *[This is presently Section 8.5.1]*

A *minimum* 3 m *wide* landscaped area or a Screen at least 1.8 m in height, *or some combination of the two in the form of a raised landscaped earth berm topped with a sufficient number of evergreen trees of suitable maturity with shrubs interspersed*, shall be provided where a Commercial, Industrial, or Public Use *(i.e. a public park, school, or public recreation or spectator facility)* adjoins a Residential Use.

8.5.3 Highway Buffers *[This is presently Section 8.5.2]*

Public Highway Buffers of not less than 10 m shall be required for all major Arterials not providing access to adjoining properties as shown on Map G of Section 3.

8.5.4. Tree Planting/ Landscaping Requirements *[This is new and requires the attention of the Tree Committee]*

General Guidelines:

- *Wherever possible, natural (existing/ native) trees and topographical features should be retained in areas proposed for new development.*
- *New tree plantings should mostly consist of natural/native habitat trees. The planting of aggressive non-native species within or adjacent to woodlands or natural areas is discouraged in order to help safeguard the long-term ecological integrity of these areas.*
- *In order to prevent uniform disease susceptibility and eventual uniform senescence, no single tree species may represent more than 25% of the total tree population with a development.*
- *Wherever space permits, trees shall be planted in groups.*
- *The spacing of plant material (trees &/or shrubs) should account for the ultimate size and form of the selected species and the purpose of the planting.*
- *When possible, the installation of plantings should be completed before the issuance of an Occupancy Permit. To ensure completion of plantings within six (6) months of the Occupancy Permit issuance, sufficient security will be retained by the City of St. John's to complete the work.*

(1) Residential Districts

(A) Where a landscaped area is required, it shall be provided in accordance with a landscape plan and in conformity with the following requirements and standards:

(i) All areas of a site not covered by buildings or parking areas shall be landscaped.

(ii) Existing soft landscaping retained on a site may be considered in fulfillment of the total landscaping requirement.

(iii) In the case of Lots having a Lot Area greater than 500 m²; trees shall be planted in the overall minimum ratio of one (1) tree per 65 m² of landscaped area provided

(iv) Notwithstanding the foregoing; on lots having a frontage of 12 metres or less, a minimum of two (2) trees shall be provided, with a minimum of one (1) tree located in the Front Yard.

(v) The quality and extent of the landscaping established on a site shall be the minimum standard to be maintained on the site for the life of the development.

(B) Soft landscaping shall be provided as follows:

(i) All plant materials shall be of a species capable of healthy growth in St. John's and shall conform to the standards of the Canadian Nursery Trades Association for nursery stock.

(ii) The mixture of trees at the time of planting shall be equivalent to a minimum of 50 percent larger trees.

(iii) The minimum size for deciduous trees shall be:

(a) for smaller deciduous trees, 35 millimetres caliper, except 25 millimetres caliper for flowering ornamental trees, and
(b) for larger deciduous trees, 50 millimetres caliper.

(iv) The minimum size for smaller coniferous trees shall be a height of 100 centimetres, and for larger coniferous trees a height of 200 centimetres.

(v) *Coniferous trees shall comprise a minimum proportion of 1/3 of all trees planted.*

(vi) *Shrubs shall be a minimum height or spread of 600 millimetres at the time of planting.*

(C) *In the event a residential property owner opts not to have trees planted on his/her lot, the trees which would have been planted shall be placed on suitable City public open space land nearest the fore-mentioned residential building lot.*

(2) *Commercial, Institutional, & Open Space Districts*

(A) *Where a landscaped area is required, it shall be provided in accordance with a landscape plan and in conformity with the following requirements and standards:*

(i) *All areas of a site not covered by buildings, outside storage or parking areas shall be landscaped.*

(ii) *Existing soft landscaping retained on a site may be considered in fulfillment of the total landscaping requirement.*

(iii) *Trees shall be planted in the overall minimum ratio of one tree per 35 square metres of landscaped area provided.*

(iv) *The quality and extent of the landscaping established on a site shall be the minimum standard to be maintained on the site for the life of the development.*

(B) *Soft landscaping shall be provided as follows:*

(i) *All plant materials shall be of a species capable of healthy growth in St. John's and shall conform to the standards of the Canadian Nursery Trades Association for nursery stock.*

(ii) *The mixture of trees at the time of planting shall be equivalent to a minimum of 50 percent larger trees.*

(iii) *The minimum size for deciduous trees shall be:*

(a) *for smaller deciduous trees, 50 millimetres caliper, except 35 millimetres caliper for flowering ornamental trees, and*
(b) *for larger deciduous trees, 85 millimetres caliper.*

(iv) *The minimum size for smaller coniferous trees shall be a height of 150 centimetres, and for larger coniferous trees a height of 250 centimetres.*

(v) *Coniferous trees shall comprise a minimum proportion of 1/3 of all trees planted.*

(vi) *Shrubs shall be a minimum height or spread of 600 millimetres at the time of planting.*

(3) *Recommended Species of Trees*

(i) ***Street Trees*** *(Trees on that portion of a lot which abuts a public road)*

Deciduous		***Coniferous***
Acer platanoides	*Phellodendron amurense*	*Abies concolor*
Acer pseudoplatanus	*Prunus sargentii*	*Picea abies*
Aesculus carnea	*Prunus serrulata*	*Picea pungens*
Aesculus hippocastanum	*Pyrus calleryana*	*Pinus nigra*
Betula papyrifera	*Quercus coccinea*	*Pinus sylvestris*
Betula verucosa	*Quercus imbricaria*	
Celtis occidentalis	*Quercus palustris*	
Elaeagnus angustifolia	*Quercus robur*	
Fraxinus Americana	*Quercus rubra*	
Fraxinus mandshuricia	*Sorbus spp.*	
Fraxinus nigra	*Syringa spp.*	
Fraxinus pennsylvanica	*Tilia cordata*	
Malus spp.	*Tilia x euchlora*	
	Tilia x europaea	

No species other than those listed, may be planted without the prior written authorization of the Municipal Arborist.

(i) ***Non-Street Trees*** *(Trees on that portion of a lot which does not abut a public road)*

Any species may be planted provided the prior express written authorization of the Municipal Arborist (or designate) been first obtained.

(3) *Recommended Species of Trees*

Any species may be planted provided the prior express written authorization of the Municipal Arborist (or designate) been first obtained.

(4) *Recommended Species of Shrubs*

Any species may be planted provided the prior express written authorization of the Municipal Arborist (or designate) been first obtained.