

IMPLEMENTING A TREE PRUNING CYCLE INTO THE
CITY OF THUNDER BAY, ONTARIO



by
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ABSTRACT

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Several cities in Ontario and across Canada were contacted regarding their tree pruning programs. Of the ten from Ontario that responded, seven had a cyclical tree pruning program. Annual budgets ranged from \$50,000 up to \$2.2 million with an average being \$739,000. Pruning cycles ranged from five-to-ten years. Most pruning was conducted year round and most cities relied on both city staff and contractors. Most of the cities started up a cyclical tree pruning program in order to reduce maintenance costs and improve tree health. The downsides when reported were mainly the cost of the program, inconsistent pruning standards from staff and contractors, and dealing with complaints from residents. However, the benefits far outweighed the costs and it is recommended that Thunder Bay should adopt a cyclical tree pruning program as recommended in the Urban Forest Management Plan for Thunder Bay (Davey Resource Group, 2011).

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INTRODUCTION

Tree pruning cycles can be an important element of a city's urban forestry program. Tree pruning can help the overall structure of the tree by preventing breakage that could kill the tree or damage property or people. By looking at other cities and how they implement pruning cycles to their municipal trees, it can allow for a better understanding of how to incorporate it into a city's urban forestry program. Through this present research, it is hoped that it can provide the City of Thunder Bay with the resources and understanding of how to implement a pruning cycle in this city.

The importance of this subject is that tree pruning is beneficial for the trees and for the city itself. Having continuous good pruning practices increases the lifespan of the tree and allows for the correction of future problems. The city also benefits from tree pruning cycles because it can decrease the overall cost of maintaining city trees. By working proactively rather than reactively, it is possible to cut some of the costs of replanting, removals, contracting, and stump grinding.

The data were collected from cities across Canada that currently had a tree pruning cycle program in place. The data collected included the financial cost of having a tree pruning cycle, who was contracted for the pruning, how long the program had been running, reasons for starting the program, and the disadvantages of starting the program. The focus of this study was to look at the economic benefits that tree pruning cycle programs could have for a city and the benefits they had on tree health by looking at the life span of trees, hazards, insects/pests, and overall structure.

LITERATURE REVIEW

Urban Forestry

Urban Forestry is the management and care of trees in urban centres (Miller, 1997). These can consist of street trees, park trees, and trees on public land which are managed by urban foresters employed by municipalities. Trees on private land are managed by homeowners, business owners, or tree care specialists known as arborists that are hired by the previous two.

Urban Forestry programs provide sustained planning, maintenance, protection, and care of urban forests and green spaces in cities and provide economic, environmental, and social benefits for the city and its citizens (Deneke, 1993). These benefits include carbon sequestration, storm water mitigation, air pollution control, wildlife habitat, reduction of energy costs, increased property values, improved mental and physical health, and providing an aesthetically pleasing urban landscape (Craig & Depratto, 2014; GreenBlue Urban, 2016; FAO, 2016; McPherson *et al.*, 1999; Miller, 1997; Ngaio *et al.*, 2015; Price, 2003).

In order to obtain maximum benefits from the urban forest, it is essential for municipal governments to properly maintain urban trees. Trees need to be selected and planted in appropriate planting spots (*e.g.* small stature trees under hydro lines), be of the appropriate hardiness for the specific hardiness zone, and be kept healthy by a routine pruning maintenance program (Miller, 1997). By keeping trees pruned and in a healthy state, trees can contribute substantially to urban landscapes over a longer period of time than without maintenance.

Tree Pruning

Pruning has been referred to as “one of the best and worst maintenance practices performed on trees” (Purcell, 2015). When done well, it can be very beneficial to trees. When started at an early age, tree pruning can ensure the occurrence of a single leader, rather than multiple leaders, which could result in the presence of included bark and eventual splitting (Gilman, 1997). Pruning helps to remove injured, wounded, dead, or broken branches that can be conduits for infection by fungi and insect pests. Branches that are crossing over and rubbing against each other can be removed to prevent such wounding from occurring (Gilman, 1997; Government of Canada, 2015). Branches that are infected with decay fungi or cankers can be selectively removed to help improve the health of a tree. Overall, regular pruning over the life of a tree can significantly enhance its health and thus its lifespan (Ryder and Moore, 2013).

Pruning should always begin within the first few years of a tree being planted. The smaller the wound, the quicker and more successful will be the callusing over to seal the wound. The usual steps for pruning a branch include the classic three-step process (Brown, 1995; Gilman, 1997; Harris *et al.*, 2004; Prendergast and Prendergast, 2017). The first step is an undercut made several centimetres out from a branch collar. The second step is an overcut made a short distance further out. This will remove the majority of the weight of the branch to ensure that there is no tearing or ripping of bark on the main stem. The third step is removal of the remaining stub at the branch collar, leaving the latter intact. This will ensure that proper callusing and sealing of the wound will occur. Flush cuts and leaving stubs behind should never be done. This allows for the entry of pathogens which results in decline of the tree and potential structural failure in the future.

When no pruning is done, several problems can arise over the lifespan of a tree (All Seasons Tree Service, 2021). Multiple leaders may arise resulting in the occurrence of V-shaped crotches with included bark. These are weakly attached and during storms may result in breakage on the main stem causing significant damage and injury to the tree as well as to nearby property (*e.g.* houses, cars, utilities, people). Entry into the wounds by decay and canker-causing fungi can result in further structural damage down the road.

Pruning Cycles

Tree pruning is important to city foresters and arborist in terms of public safety, aesthetics, and overall health of the tree (Healy, n.d.; Luley, *et al.*, 2002; Miller and Sylvester, 1981). The frequency that the tree needs to be pruned is based on a few factors, *i.e.* species, growth rate, tree age, location, number of municipal trees. However, one constant in determining an appropriate pruning-cycle length is the municipal urban forestry budget. The larger the budget, the more frequent that the trees can be pruned (Sivyer, 2009).

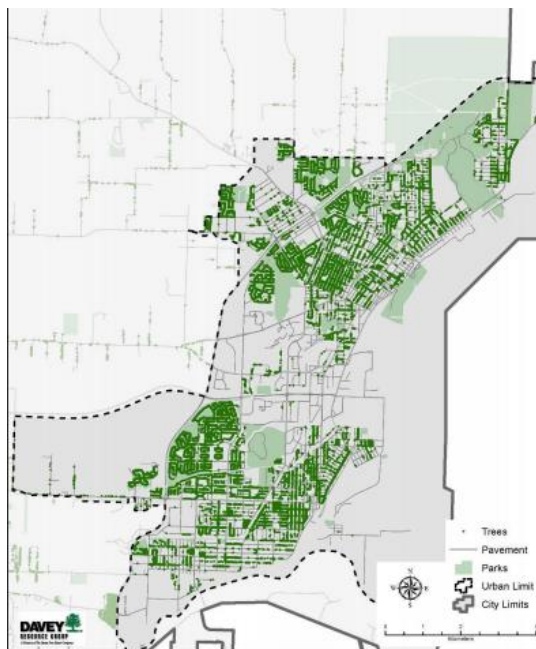
Structural pruning of newly-planted trees should be done twice within the first ten years to correct the form of the tree (City of Guelph, 2012). For mature trees, there should be an annual inspection for any current or future hazards that need to be corrected. Routine pruning can occur every five years or so afterwards to keep the crown of the tree in a healthy and structurally sound state. A common method of cycle pruning is to do it in blocks where there is a predetermined area that will be pruned. It will minimize travel and notification time and educate the public about the tree-management program.

The individuals needed to run a standard pruning program are either trained city staff or contracted arborists from arboriculture companies. It is important and necessary to have certified

and trained arborists on each crew (*e.g.* certified by the International Society of Arboriculture), as well as having grounds persons and arborist apprentices to be up-to-date on the newest pruning techniques. This is important to have everyone on the team knowledgeable on current standards to ensure the best pruning cuts are being done.

City of Thunder Bay's Urban Forest

Thunder Bay is located on the northwestern shores of Lake Superior within the transition zone between the boreal forest to the north and the Great Lakes-St. Lawrence forest to the south. Thunder Bay has a population of 109,000 in an area of 323 square km (Davey Resource Group, 2011). An inventory from 2000 had 20,000 street trees spread out over 844 km of roads and 124 parks (Wilson, 2006) (Figure 1). Diversity of tree species was low, with 25% comprised of ash,



Map 1. Inventoried Trees Within Thunder Bay's Urban Limits

Figure 1. The urban forest in Thunder Bay (Davey Resource Group, 2011)

20% silver maple, 15% paper birch, and the remainder being a mixture of lindens, bur oak and conifers. The urban forestry budget in 2011 was \$705,000 (Davey Resource Group, 2011). In 2016, the Emerald Ash Borer was detected in Thunder Bay which has resulted in the slow removal of ash trees from the city's tree canopy resulting in the replacement with a diversity of other tree species. To date, it is estimated that there are 30,000 street and park trees in Thunder Bay. In 2011, an urban forest management plan was developed by the Davey Tree Expert Company of Canada for the City of Thunder Bay (Davey Resource Group, 2011). Among the many recommendations, a high priority was placed on the establishment of a cyclical tree pruning program.

This thesis will examine cyclical street-tree pruning programs in various cities in Canada and draw upon those cities experiences to make recommendations for the implementation of such a program in Thunder Bay.

METHODS AND MATERIALS

A set of questions related to cyclical tree pruning programs (Appendix I) were e-mailed to city forestry departments across Ontario and some cities across Canada, with ten from Ontario responding (see Appendix II). From these responses, an analysis was done to look at the economic feasibility of implementing a similar program in Thunder Bay.

RESULTS

Of the ten cities that responded to the e-mailed questionnaire, only three did not have a cyclical tree pruning program (Table 1 and Figure 2). These cities were Cambridge, Cornwall and St. Catherines which had more reactive tree management.

Table 1 Cities in Ontario with cyclical tree pruning programs

Cities	Tree Pruning Program
Barrie	Yes
London	Yes
St. Catherines	No
Cornwall	No
Hamilton	Yes
Markham	Yes
Guelph	Yes
Toronto	Yes
Waterloo	Yes
Cambridge	No
Ottawa	Yes

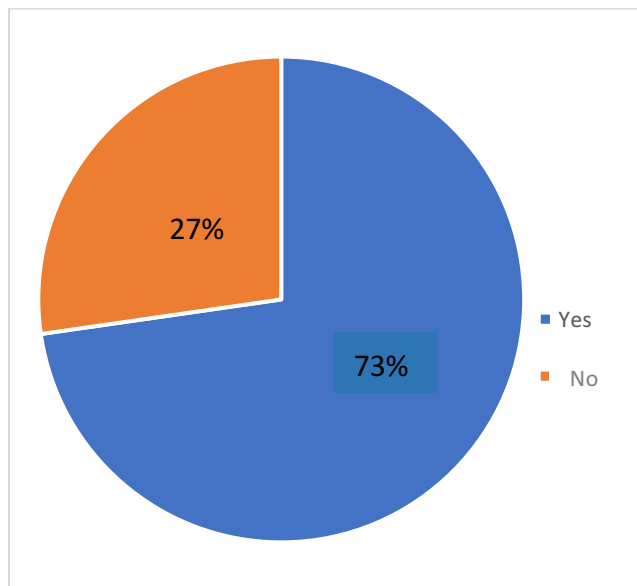


Figure 2 The proportion of cities in Ontario with cyclical tree pruning programs

The cost of each city's annual pruning budget ranged from only \$50,000 in Guelph to a high of \$2,200,000 in St. Catherines, with an average of \$739,048 as shown in Table 2. When contacted, Cambridge, Ottawa, Toronto and Waterloo did not have their current pruning budgets available.

Table 2 Pruning budget in Ontario cities

Cities	Budget (\$)
Barrie	110,000
London	1,800,000
St. Catherines	2,200,000
Cornwall	130,000
Hamilton	500,000
Markham	383,333
Guelph	50,000
Toronto	unknown
Waterloo	unknown
Cambridge	unknown
Ottawa	unknown
Average	739048

Figure 3 shows each city's average pruning cycle length. The shortest pruning cycle length was in Guelph at 5 years, and the longest was in Waterloo at 10 years. The average pruning cycle length among these cities was 7.75 years.

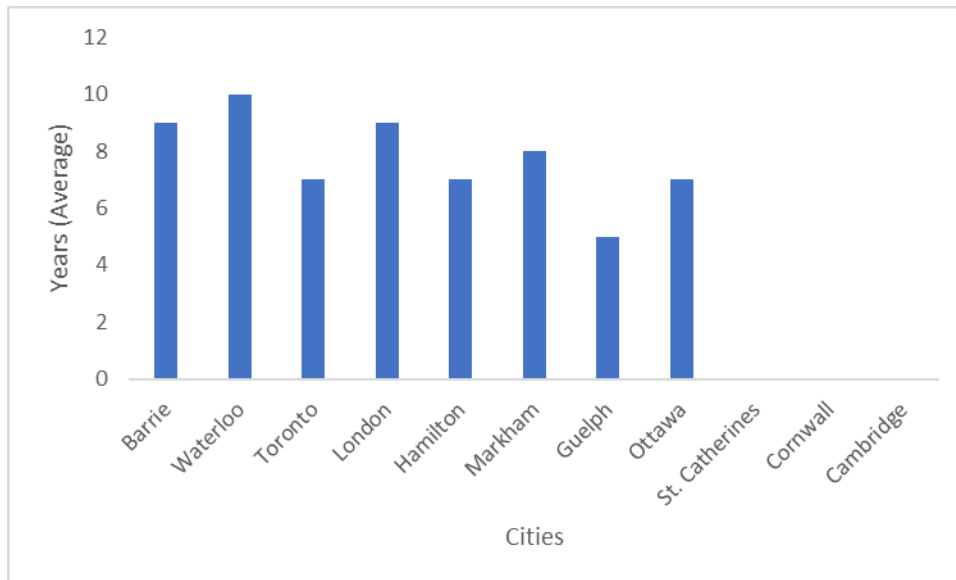


Figure 3 Each city's average pruning cycle length

Concerns for having a tree pruning program in cities was quite variable as seen in Table 3. Cornwall and Guelph felt it was the cost of running such a program, while St. Catherines felt that it was balancing tree maintenance complaints from home owners while still following the planned cyclical pruning program. Others did not feel there were any negative aspects to a cyclical pruning program (London, Markham, Toronto).

Table 4 shows the time of the year that the ten cities pruned their trees. Most cities pruned all year round which increased the productivity of their tree pruning program. Barrie pruned during the fall or early winter while Waterloo pruned during the winter months when the trees were dormant.

Table 3 The disadvantages of having tree pruning programs

Cities	What are the cons of the pruning program?
Barrie	The resident expectations of what a city tree should look like. Due to mandatory setbacks and clearances from roads, signs, sidewalks, driveways, street lights residents can often be unhappy with the change if the tree was a long period between pruning.
Waterloo	10 year cycle is quite long. Text book is 3 to 4 years cycle
Toronto	No significant cons
London	None at this time
St. Catherines	If we were to have one I believe a con would be trying to balance the complaint driven work with the proactive work.
Cornwall	\$\$\$ and staff needed
Hamilton	It is difficult to design a grid program where contractors are properly held accountable for both trimming quality and working efficiently through the day. It is also difficult to give homeowners proper notification and we have a lot of battles with them over the city's right to trim trees in front of their houses to city specs. Finally, even with established specs it is difficult to get consistent pruning, whether with our own crews or contractors. There is so much grey area in terms of trimming styles for different arborists.
Cambridge	NA
Markham	None
Guelph	Not consistently implemented because of lack of resources (staff, time and funding)

Table 4 Time of the year each city prunes the trees

Cities	What time of the year do the trees get pruned?
Barrie	Fall or early winter
Waterloo	Winter months
Toronto	All year round
London	All year round
St. Catherines	All year round
Cornwall	All year round
Hamilton	All year round
Cambridge	All year round
Markham	All year round
Guelph	All year round

Most of the cities relied both on city staff and contractors to systematically prune their trees all year round as shown in Table 5.

Table 5 Who prunes the city's trees and who gets contracted to prune the trees.

Cities	Who prunes the tree?	Who is contracted to prune the tree?
Barrie	City staff and 75% contractors	Many different companies with 5 year contracts
Waterloo	City staff	NA
Toronto	City staff and contractors	Weller Tree service, Davey, and Ontraio Line clearing
London	City staff and contractors	Have approximately 12 contractors, currently have a 5 year contract with Davey Tree Expert Co
St. Catharines	City staff (10 ISA certified arbourists)	Two different contractor crews
Cornwall	City staff and contractors	Companies that apply with required documents are eligible to bid on tree tenders
Hamilton	City staff (prunes September to April) and contractors (All year)	Asplundh currently, it was Davey before that
Cambridge	City staff and contractors	
Markham	City staff and contractors	Large tree service providers
Guelph	City staff	None contracted

As seen in Table 6, the majority of the cities with active cyclical pruning programs decided to have it in their management plan because it takes on a more proactive rather than reactive approach. The cost savings as well as improved tree health achieved were motivating factors to initiate cyclical tree pruning.

Table 6 Each city's purpose in starting a tree pruning program

Cities	Why did the city start a pruning program?
Barrie	To reduce reactive maintenance costs and practices, create a regular inspection and pruning cycle, reduce liability associated with storm damage (better structural and tree health).
Waterloo	It is the most efficient way to trim a large number of trees and lowers liability according to city's insurance company.
Toronto	Improve tree long term viability, reduce the potential for tree failures and improve productivity
London	To reduce tree damage and proper maintenance, increased health, reduction in cost and service delivery wait times
St. Catherines	N/A
Cornwall	N/A
Hamilton	To be proactive and cut down on both storm damage and service requests; to be more efficient in our work in terms of travel time; from a risk management standpoint to trim all the trees in the city at least once every 10 years
Cambridge	NA
Markham	We recognize the best approach to maintaining health canopy and mitigating risk is a proactive approach.
Guelph	Risk management / promote good tree structure

DISCUSSION

Proactive versus Reactive Pruning

One important thing to look at in terms of forest planning is looking at reactive versus proactive approaches. The reasons some cities such as Thunder Bay take a reactive approach to pruning was mainly due to the cost of implementing a pruning cycle. With this reactive approach, concerns that are dealt with include tree blow down and/or branches breaking off from storm damage, insect/disease damage, wounds, weak limbs, construction, etc. By dealing with concerns when they need to be addressed, we are helping the problem and not fixing the problem. By the time the reactive issues are addressed, the tree may be too distressed, already infected, and/or in rapid decline. With a more proactive approach, you can examine tree limbs that could be weak, and have them pruned to prevent further damage and increase the overall longevity of the tree.

Disadvantages of a Cyclical Tree Pruning Program

A major concern to introducing a cyclical tree pruning program is the upfront cost of running the program. Some of the costs to tree pruning programs include running city crews and contracting crews for general all-year-round maintenance. Other costs include equipment such as chainsaws, pruning saws, bucket trucks, chipper trucks, stump grinding, insecticides, etc. A proactive cyclical tree pruning program would, however, still be more beneficial than just a reactive tree pruning program. This reduces reactive maintenance costs and practices, reduces the

liability associated with storm damage creating better structure and tree health, and reduces concerns over balancing systematic tree pruning with homeowner-driven complaints. However, you still have to do some reactive pruning for homeowners that are relentless in their complaints. By doing systematic or block pruning it does decrease the number of reactive complaints due to working proactively through proper maintenance by trimming a large number of trees and reducing future damage.

Cost

The annual cost of a cyclical tree pruning program was variable from each city as numerous factors influence the yearly cost. Some of the factors included the number of trees the city had, the number of staff, the time needed to prune each tree, etc. Some of the cities such as London and St. Catherines had larger budgets for their tree pruning programs reflecting a larger city size and thus a larger urban forest compared to cities such as Guelph and Barrie which had much smaller budgets in comparison reflecting a smaller population and a smaller urban forest.

Who should do the Pruning?

Most cities have both city staff and contracted companies pruning their trees. A large and well-established company that is contracted to do pruning is Davey Tree Expert Company. St. Catherines responded by saying that they had city staff who pruned their trees, including 10 that are ISA certified arborists. One concern that had come up was the quality of pruning that got done. With systematic grid pruning, there was a deadline for getting as many trees pruned within the day, month, and year. This created an issue with quantity over quality. This created a quality problem, compromising the potential health and structure of the city trees.

To deal with the quality of pruning concerns, it should be mandatory for ISA certified arborists to be on each crew looking after the grid pruning. This would ensure that each tree is looked at by a specialist who knows what to look for and knows what to do. A common occurrence on city trees are big pruning cuts. This causes great amounts of stress on the tree, leaving it susceptible to insect and disease damage, particularly the entrance of decay fungi. With big pruning cuts, it will likely take years, if ever, for the wound to callus over. There are alternatives, though, such as reducing weight and coming back to reduce the branch over time, thereby, reducing the hazard without full branch removal. Another common issue with pruning street trees is leftover stub cuts, which are very easily avoidable. A solution that would solve these pruning errors which cause unnecessary stress and injury to the tree would be better increased training on where to cut, and what to avoid which would increase the health and longevity of the tree.

Cycle Length

Some cities based their pruning cycle length on tree age, where they are pruned at 5, 10, and 15 years. This is important for the tree during the early growth years, as that is the time for corrective measures for proper structure and form to happen. It is however, important to do tree maintenance for as long as the tree is standing to ensure the tree has adequate form, health, and ensures long-term tree viability. Other cities do their pruning cycles in increments of several years, the average being every 7.75 years. The industry standard is having a five-year cycle as this is the best approach at maintaining tree health and mitigating reactive approaches.

Implementing a Cyclical Tree Pruning Program in Thunder Bay

A cyclical tree pruning program would be an option to consider for Thunder Bay's urban forestry program. When implementing, the budget currently used towards reactive pruning measures can be moved towards proactive pruning but with additional funds required. This will ensure that each tree will get corrective maintenance resulting in good tree structure and a healthy tree canopy. However, it would be difficult to eliminate reactive pruning altogether and thus a balance of both would be required.

CONCLUSION

Tree pruning cycles can be an important element to a city's urban forestry program. Tree pruning can help the overall structure of the tree preventing breakage that could kill the tree or damage property or people. Working proactively rather than reactively can be very beneficial for the city and for the trees. The benefits of a pruning cycle improves the overall structure and health of a tree, the life span of the tree, reduces potential hazards and disease/insect pests. Tree pruning is important to city foresters and arborists in terms of public safety, aesthetics, and overall health of the tree. The best practice is to have tree pruning cycles on a five-year rotation.

Pruning allows for the removal of dead, dying, or diseased branches to prevent an entrance for fungi and insects to enter the tree. Pruning is a valuable tool for maintaining and developing trees, this is an invigorating process which stimulates regrowth in proportion to pruning intensity (Wade and Westerfield, 2020). Light annual pruning is more beneficial than periodical severe pruning as it puts a great amount of stress on the tree.

One efficient method of a cyclical tree pruning program is block pruning where there is a predetermined area that will be pruned. This will minimize travel and notification time and

educate the public about the tree management program. For mature trees there should be an annual inspection of any current or future hazards that need to be corrected. Cyclical tree pruning programs provide the best proactive maintenance to ensure the city trees are getting adequate care to extend their longevity and ensure that they are in the best of health. This would be a great option for Thunder Bay to consider for getting the most out of their urban forestry program. Working reactively, does an incredible disservice to the tree. A proactive cyclical tree pruning program will ensure that Thunder Bay will have a healthy tree canopy, which in turn will improve the annual benefits the city and its citizens receive from their urban forest.

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Appendix I

Questions:	City answers
Do you have a tree pruning program (if not why)?	
When did the tree pruning program start?	
How long is the pruning cycle?	
Why did the city start a pruning program?	
Who prunes the tree?	
Who is contracted to prune the tree?	
What is cycle of Utility vs municipality for pruning structure and form?	
What is the budget for the pruning cycles?	
What time of the year do the trees get pruned?	
What are the cons of the pruning program?	

Cities	Do you have a tree pruning program (if not why)?	When did the tree pruning program start?	How long is the pruning cycle?	Why did the city start a pruning program?	Who prunes the tree?
Barrie	Yes, we have a systematic block tree pruning program.	2014	Approximately 9 years on average, but ranges in areas of the city from 5 to 12 years. Our target is to increase resources to get to a 5-7 year pruning cycle.	To reduce reactive maintenance costs and practices, create a regular inspection and pruning cycle, reduce liability associated with storm damage (better structural and tree health).	Combination of contract (75%) and city arborists.
Waterloo	Yes	1997	10 years	It is the most efficient way to trim a large number of trees and lowers liability according to city's insurance company.	City staff
Toronto	Yes	See program outline	th	Improve tree long term viability, reduce the potential for tree failures and improve productivity	In-house and contractors
London	Yes	1996	Currently on a 8-10 yr cycle moving to a 5 year cycle in-line with industry standard	To reduce tree damage and proper maintenance, increased health, reduction in cost and service delivery wait times	In-house 13 arborist and external contractors (approx.12)
St. Catherines	We currently do not have a proactive tree planting program, the majority of our work orders are complaint driven and there has been a significant backlog for a number of years that we have been trying to tackle.	N/A	N/A	N/A	We have a crew of 10 ISA and Ontario certified arborists
Cornwall	The city of Cornwall does not have a pruning program as we only have a newly hired arborist and a chip truck and chipper which does small pruning and removal jobs when the two staff are free to do the work	N/A	N/A	N/A	City trees are pruned by Parks staff and also under contract from a variety of contractors when needed
Hamilton	We do, we call it our Grid Program.	I don't know the exact year but it has been in place for close to 30 years	The pruning cycle is currently a little over 7 years and our goal is always to get it down to 5	I'd say 3 reasons: to be proactive and cut down on both storm damage and service requests; to be more efficient in our work in terms of travel time; from a risk management standpoint to trim all the trees in the city at least once every 10 years	We have a contractor who trims in grids year round and most of our crews trim in grids from September to April
Cambridge	-yes, but not a block pruning program / pruning cycle (meaning preventative maintenanc	Cambridge has had a forestry division for over 30 years, but has not had a preventative	NA	-N/A, but you can review our urban forest plan for context	-We have in-house crews and contractor crews
Markham	YES	Pruning program has been in place for many years however in 2020 we initiated a new strategy wherein we will be pruning 70% of the street trees over 3 years to "reset the bar"	The program noted above is setting Markham up for an 8 year cycle going forward	We recognize the best approach to maintaining health canopy and mitigating risk is a proactive approach.	Contractors and in-house staff
Guelph	Yes and no...not block / grid pruning.	It's been ongoing for decades	We don't have a block pruning cycle. It's based on the tree age – pruned at 5, 10 and 15 years.	Risk management / promote good tree structure	City Forestry staff

Cities	Who is contracted to prune the tree?	What is the cycle of Utility vs municipality for pruning structure and form?	What is the budget for the pruning cycles?	What time of the year do the trees get pruned?	What are the cons of the pruning program?
Barrie	Current contracts are with Weller Tree Service, Davey and Ontario Line Clearing	Toronto Hydro focusses on line clearing for their primary lines with future work being largely determined by the frequency of outages. Please contact Toronto Hydro if you require additional information	Currently it is \$110,000 per year.	Year round for ASTM, and commonly June – Sept for NPT	No significant cons
Waterloo	Current contract is 5 years with Davey Tree Expert Co. of Canada	London Hydro works on a 3-5 yr cycle outside our cycle	1,800,000 annually for contract services	Year round	None at this time
Toronto	We generally have 2 contractor crews for the majority of each year to perform tree services as well.	The utility pruning cycle is different here as it used to be based on a time frame such as every 5 years but it is now based on line voltage and how many customers are supplied by each feeder.	Our budget is 2.2M	All year round	If we were to have one I believe a con would be trying to balance the complaint driven work with the proactive work.
London	The city puts out a Pre-qualification document late winter and companies that apply with all required documentation are then eligible to bid on tree tenders for pruning and removal throughout the year.	Pruning of trees for hydro utilities (Cornwall Electric) is contracted out by Cornwall Electric. If a City tree needs to have a full pruning not just due to hydro then it would be contracted out under one of Parks tenders.	The parks overall budget for Forestry is only \$130,000.00 for the year with \$300,000.00 under our Capital acct for Ash removals, planting, and stumping due to EAB	All year	\$\$\$ and staff needed
St. Catharines	Asplundh currently, it was Davey before that	Not sure what Utility's current cycle is, we are not in communication regarding cycles. We have our own specs in terms of road, sidewalk, and building clearance and in terms of pruning structure. They hire contractors to get utility clearances. We may do some of their work sometimes in terms of removing sucker growth, at other times they are ahead of us and might have done some of our work. But generally speaking we don't clear for hydro lines at all and residents who have issues with city trees growing into their hydro lines are told to contact their utility provider.	We don't have a specific budget for in-house grid trimming. The budget for our contractor changes from year to year depending on what the city is willing to spend but roughly it falls somewhere in the \$400,000 to \$600,000 range.	Year round by our contractor, fall and winter by us. Oaks are not pruned from the end of April to the end of September	It is difficult to design a grid program where contractors are properly held accountable for both trimming quality and working efficiently through the day. It is also difficult to give homeowners proper notification and we have a lot of battles with them over the city's right to trim trees in front of their houses to city specs. Finally, even with established specs it is difficult to get consistent pruning, whether with our own crews or contractors. There is so much grey area in terms of trimming styles for different arborists.
Cornwall	-see previous question	utility prunes trees with their own contractors on their own cycle	NA	all year	NA
Hamilton	Large tree service providers	Markham has no involvement or visibility into the pruning cycle of the local utility provider. City tree pruning efforts focus on elevation and deadwood	Approx \$1M / year for 3 years – plus approx. \$150k in additional pruning/removal services.	Year round – more in the winter	None
Cambridge	None contracted.	Utility pruning is done by the Utility companies, not the City. The City does not undertake utility pruning.	Approximately and average of \$50,000 (this varies based on the number of trees pruned every year) – this number is based on 2020 pruning of an estimated 500 trees	All year	Not consistently implemented because of lack of resources (staff, time and funding).
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