Agenda - Council – December 12, 2012

Report - Standing Policy Committee on Infrastructure Renewal and Public Works – November 26, 2012

Item No. 2 Comprehensive Strategy to enhance the protection of our Urban Forest from Dutch Elm Disease

STANDING COMMITTEE RECOMMENDATION:

On December 5, 2012, the Executive Policy Committee concurred in the recommendation of the Standing Policy Committee on Infrastructure Renewal and Public Works and submits the following to Council:

1. That the City of Winnipeg formally approach the Province of Manitoba to request that buffer areas be re-instated in the Richot and Springfield municipalities including Elm bark beetle control.

2. That the City of Winnipeg request the Province of Manitoba to cost-share "Scenario 2: Full Enhanced Management Strategy" by providing additional funding in the amount of $1,900,000.

3. That the additional funding requirements for "Scenario 2: Full Enhanced Management Strategy" be referred to the 2013 operating and capital budget process and that the new cost sharing agreement be subject to Provincial commitment.

4. That the Proper Officers of the City be authorized to do all things necessary to implement the intent of the foregoing.

Report - Standing Policy Committee on Infrastructure Renewal and Public Works – November 26, 2012

DECISION MAKING HISTORY:

EXECUTIVE POLICY COMMITTEE RECOMMENDATION:

On December 5, 2012, the Executive Policy Committee concurred in the recommendation of the Standing Policy Committee on Infrastructure Renewal and Public Works and submitted the matter to Council.

STANDING COMMITTEE RECOMMENDATION:

On November 26, 2012, the Standing Policy Committee on Infrastructure Renewal and Public Works concurred in the recommendation of the Winnipeg Public Service and submitted the matter to the Executive Policy Committee and Council.

Also, on November 26, 2012, Wendy Land and Bonnie Dickie, Trees Action Group (TAG), submitted a presentation dated March 13, 2012 and November 26, 2012, in support of enhancing the protection of our Urban Forest from Dutch Elm Disease.

ADMINISTRATIVE REPORT

Title: **COMPREHENSIVE STRATEGY TO ENHANCE THE PROTECTION OF OUR URBAN FOREST FROM DUTCH ELM DISEASE**

Critical Path: **Standing Policy Committee on Infrastructure Renewal and Public Works – Executive Policy Committee – Council**

AUTHORIZATION

Author	Department Head	CFO	CAO
D. Domke	B.W. Sacher, P. Eng.	M. Ruta	D. Joshi, COO

RECOMMENDATIONS

That the City of Winnipeg formally approach the Province of Manitoba to request that buffer areas be re-instated in the Richot and Springfield municipalities including Elm bark beetle control.

That the City of Winnipeg request the Province of Manitoba to cost-share "Scenario 2: Full Enhanced Management Strategy" by providing additional funding in the amount of $1,900,000.

That the additional funding requirements for "Scenario 2: Full Enhanced Management Strategy" be referred to the 2013 operating and capital budget process and that the new cost sharing agreement be subject to Provincial commitment.

REASON FOR THE REPORT

On March 5, 2012, the Standing Policy Committee on Infrastructure Renewal and Public Works made a recommendation that the Winnipeg Public Service report back to Standing Committee in 180 days with a comprehensive strategy, outlining potential options and their associated costs, to enhance the protection of our urban forest from Dutch elm disease.

IMPLICATIONS OF THE RECOMMENDATIONS

A continued Dutch elm disease (DED) loss rate of over 2% annually may result in disease pressure where the City of Winnipeg can no longer effectively manage DED. If this occurs, Winnipeg may lose its elm canopy which would result in a significant increase in the costs for tree removal and tree planting. Winnipeg's boulevard and park American elm trees alone are estimated to be valued at over $806 million. The loss of American elm trees would result in a loss of significant environmental, economic, and social benefits. The quality of life for Winnipeg's residents would be diminished without these trees.

A number of individual recommendations are provided in the attached Comprehensive Strategy to Enhance Dutch Elm Disease Management in the City of Winnipeg (Appendix 1). The first recommendation is for the City of Winnipeg to formally approach the Province of Manitoba to re-instate the buffer area management in the Richot and Springfield municipalities.

The second recommendation is for the City of Winnipeg to request that the Province of Manitoba cost-share equally (50/50) in an enhanced DED management strategy. This Provincial funding is to be new incremental funding in addition to the current cost sharing agreement with the City of Winnipeg for DED management (presently, the Province funds $1,000,000 of the program or 27% of the total DED program based on operating budget).

Equal cost sharing between the City and the Province for the enhanced DED management program is proposed because census data reports that approximately 60% of Manitoba's population resides in the City of Winnipeg. As a result, Winnipeg's urban forest contributes economic, social, environmental and public health benefits to a significant portion of the province's population. More effective DED management in Winnipeg would not only positively impact the quality of life of the citizens of Winnipeg, it would also increase the success of managing urban forests in municipalities surrounding the City of Winnipeg, as DED can spread to other urban areas and to rural areas further threatening those ecosystems. Moreover, the Province recognizes its responsibility as a key player on environmental action. In fact, the proposed enhanced DED management strategy aligns directly with the Government of Manitoba's eight-year strategic action plan, ***TomorrowNow – Manitoba's Green Plan***. This plan identifies a call to action for stronger invasive species measures including DED management. Enhanced protection of our urban forest from DED plays a role in all of the key priorities outlined in ***TomorrowNow*** including the role of the urban forest in mitigating the impacts of climate change (greenhouse gas reduction) to our communities and quality of life. As a result, equal cost sharing of the enhanced DED management program is recommended.

Combinations of the individual recommendations are bundled into two recommended scenarios for consideration. The first scenario is referred to as **Targeted Enhanced Management Strategy**. This scenario considers the basic DED management practices. In addition to the Targeted Enhanced Management Strategy, the **Full Enhanced Management Strategy** also considers the additional cost for a 2:1 tree planting ratio for 5 years and the cost for the delivery of a tree planting program, administered by Trees Winnipeg, to replace elm trees lost to DED on private property. The additional funding for each of these scenarios is proposed from the operating and capital budgets and the Provincial cost-share contribution as follows:

- **Scenario 1: Targeted Enhanced Management**:

Activity	Total Cost of Activity	Capital Budget	Operating Budget	Provincial Cost-Share Contribution
a. Elm Inventory Update	$100,000	$50,000	-	$50,000
b. Increased Surveillance/Rapid Removal Pilot	$900,000	-	$450,000	$450,000
c. Enhanced Elm Bark Beetle Control	$200,000	-	$100,000	$100,000
d. Tree Replacement Ratio 1:1	$1,000,000	$500,000	-	$500,000
TOTAL	**$2,200,000**	**$550,000**	**$550,000**	**$1,100,000**

Items a. and d. would be partially funded in the capital budget for $550,000 in 2013 and for $500,000 from 2014 to 2017. Items b. and c. would be partially funded from the operating budget on an on-going basis. The total Provincial contribution would be $1,100,000 in 2013 and $1,050,000 from 2014 to 2017.

- **Scenario 2: Full Enhanced Management**:

Activity	Total Cost of Activity	Capital Budget	Operating Budget	Provincial Cost-Share Contribution
a. Elm Inventory Update	$100,000	$50,000	-	$50,000
b. Increased Surveillance/Rapid Removal Pilot	$900,000	-	$450,000	$450,000
c. Enhanced Elm Bark Beetle Control	$200,000	-	$100,000	$100,000
d. Tree Replacement Ratio 2:1	$2,000,000	$1,000,000	-	$1,000,000
e. Subsidize Private Property Tree Planting	$600,000	$300,000	-	$300,000
TOTAL	**$3,800,000**	**$1,350,000**	**$550,000**	**$1,900,000**

Items a., d., and e. would be partially funded in the capital budget for $1,350,000 in 2013, and for $1,300,000 from 2014 to 2017. Items b. and c. would be partially funded from the operating budget on an on-going basis. The total Provincial contribution would be $1,900,000 in 2013 and for $1,850,000 from 2014 to 2017.

HISTORY

Dutch elm disease was first detected in Winnipeg in 1975. Since that time, the City of Winnipeg has actively managed an integrated DED management program with additional funding from the Province of Manitoba. No other city in North America, the size of Winnipeg and with a dense population of elms, has maintained such a program.

The City of Winnipeg program has been the most successful DED management program in North America in that Winnipeg maintains the largest elm population in any North American city, currently estimated to be approximately 140,000 elms. At the onset of DED in Winnipeg, our elm population was estimated at 275,000 trees. The success of the City's program is due to the fact that it has been maintained as an integrated program including buffer area management (Province), sanitation (disease surveillance, removal of diseased and declining trees, firewood monitoring and disposal), elm bark beetle control, tree health care, preventative fungicide injection of high value trees, reforestation and public education have been shown to have a significant impact on preserving the elm canopy.

Approximately $69 million has been spent to date managing DED and preserving our still significant elm population. Average annual cost over the 37 years has been $1.91 million. Without a long-term integrated disease management program, Winnipeg would have had as few as 10,000 elms remaining by 1992 and almost no elms remaining by 2002, at a cumulative cost of removal alone of approximately $130.8 million by 1992. This rapid loss of elms is based on theoretical loss rates of 18%, experienced in major cities that did not actively manage DED. Over the past 37 years, the average annual loss rate due to DED in Winnipeg is 1.38%; however individual annual loss rates have fluctuated considerably over this time. The incidence of disease has steadily increased over the past 5 years and in 2011, the loss rate due to disease increased to the highest yet at 3.46%.

These more recent substantial increases in elm losses in Winnipeg have generated a great deal of public concern over the future of our elm population and our urban forest, particularly as emerald ash borer is threatening the existence of our ash tree population. The heightened public concern has demanded a review of the current status of our DED program with

recommendations for improvements to more effectively preserve our elm population and urban forest.

The City of Winnipeg has partnered in DED research with the University of Manitoba and the Province of Manitoba for many years. Most recently, the City partnered with the U of M and the Province in additional elm bark beetle research and, at the behest of the City, research into more targeted surveillance and removal practices. Rapid removal research was conducted in 14 Manitoba communities from 2004 to 2010, primarily to identify to what degree this targeted sanitation practice could reduce the incidence of disease, and thereby compensate for the logistical difficulties in practicing rapid removal.

Historically, the City of Winnipeg's sanitation practices have focused on fall/winter removal of infected and declining elms. The majority of removals occur in the fall and winter following the summer surveillance season, as this period has a lower volume of other urban forestry operations (i.e. tree planting, customer service requests), less damage is incurred by heavy equipment on frozen ground, and many areas cannot be accessed in summer months in that the wood cannot be hauled away efficiently or burned unless the ground or waterways are frozen and there is snow cover.

In a rapid removal regimen, all elms showing symptoms of DED in June and early July are identified and removed by end of August. Elm trees expressing disease symptoms after July are removed during the fall and winter. The intent of rapid removal is to remove early symptomatic trees, used as brood trees by the elm bark beetle in June and July, before a new generation of "infected" beetles emerges. This earlier removal reduces the number of beetles capable of infecting elms in the following spring.

The research showed that elm loss rates due to DED were significantly reduced by half over the 5-year period. It should be noted that rapid removal in the small research communities was feasible as they have relatively small elm populations ranging from 46 to 1,426 elms and few trees to remove, and these communities were not associated with river systems as is Winnipeg.

FINANCIAL IMPACT

Financial Impact Statement

Date: October 23, 2012

Project Name:

First Year of Program **2013**

Comprehensive strategy to enhance the protection of our urban forest from Dutch elm disease.

	2013	2014	2015	2016	2017
Capital					
Capital Expenditures Required	$ 2,754,000	$ 2,652,000	$ 2,652,000	$ 2,652,000	$ 2,652,000
Less: Existing Budgeted Costs	-	-	-	-	-
Additional Capital Budget Required	$ 2,754,000	$ 2,652,000	$ 2,652,000	$ 2,652,000	$ 2,652,000
Funding Sources:					
Debt - Internal	$ 1,404,000	$ 1,352,000	$ 1,352,000	$ 1,352,000	$ 1,352,000
Debt - External	-	-	-	-	-
Grants (Province of MB Cost-Sharing)	1,350,000	1,300,000	1,300,000	1,300,000	1,300,000
Reserves, Equity, Surplus	-	-	-	-	-
Other -	-	-	-	-	-
Total Funding	$ 2,754,000	$ 2,652,000	$ 2,652,000	$ 2,652,000	$ 2,652,000
Total Additional Capital Budget Required	$ 13,362,000				
Total Additional Debt Required	$ 6,812,000				
Current Expenditures/Revenues					
Direct Costs	$ 1,100,000	$ 1,100,000	$ 1,100,000	$ 1,100,000	$ 1,100,000
Less: Incremental Revenue/Recovery	604,000	602,000	602,000	602,000	602,000
Net Cost/(Benefit)	$ 496,000	$ 498,000	$ 498,000	$ 498,000	$ 498,000
Less: Existing Budget Amounts	-	-	-	-	-
Net Budget Adjustment Required	$ 496,000	$ 498,000	$ 498,000	$ 498,000	$ 498,000

Additional Comments: Total cost for the Scenario 2: Full Enhanced Management is $3.8M in 2013, and $3.7M in 2014-2017, of which 50% is proposed to be funded through a provincial cost-share agreement. The $100,000 reduction in cost between 2013 and 2014-2017 relates to the Elm Inventory Update which is completed every 5 years.

Total capital costs are expected to be $2.7M plus $54,000 in interest & administrative expenses in 2013, and $2.6M plus $52,000 in interest & administrative expenses in 2014-2017. Expected provincial contribution for the capital component is $1,350,000 in 2013 and $1,300,000 in 2014-2017.

Total additional operating costs are expected to be $1.1M for 2013-2017, of which a provincial contribution is expected of $550,000 for each year. The balance of the incremental revenue is the interest & administrative recoveries from capital.

The above operating and capital costs are in addition to the annual Dutch Elm Disease Control costs currently included in the Department's budgets.

"Original Signed by D. Stewart, CA"

D. Stewart, CA

Manager of Finance & Administration

CONSULTATION

In preparing this report there was consultation with:
Manitoba Conservation
University of Manitoba
University of Winnipeg
Trees Winnipeg (Coalition to Save the Elms)
Trees Action Group (TAG-Winnipeg), and,
representatives of the private arboriculture industry

SUBMITTED BY

Department: Public Works
Division: Parks and Open Space
Prepared by: Martha Barwinsky, City Forester; Dave Domke, Manager of Parks and Open Space
Date: October 19, 2012

Attachment:
Appendix 1: Comprehensive Strategy to Enhance Dutch Elm Disease Management in the City of Winnipeg

Appendix 1:
Comprehensive Strategy to Enhance Dutch Elm Disease Management in the City of Winnipeg

EXECUTIVE SUMMARY

Since Dutch elm disease (DED) was discovered in Winnipeg in 1975, the City of Winnipeg has been the leader in DED management in North America. To this day, Winnipeg has the largest urban elm population in any city in North America, defining Winnipeg as the City of elms. Over the past 37 years, the elm loss rate due to the disease has averaged 1.38% which is below the target of 2%. But, there has been much fluctuation in annual loss rates over this period. More recently, over the past 5 years, we have seen a trend of increasing disease incidence and subsequent elm loss. In 2011, the elm loss rate to DED reached an all-time high of 3.46%. This increase has generated much public concern demanding greater action to preserve our elm canopy, confirming the value that the citizens of Winnipeg place on our urban forest and its contribution to their quality of life.

At the behest of the City of Winnipeg, recent research studied a focused and scientifically-based practice of rapid removal. The results of this research have shown rapid removal to be highly effective in significantly reducing the incidence of DED. The research also identified that the benefits of rapid removal outweigh its logistical difficulties and costs by reducing tree removals and replacements over the long-term and preserving our valuable elm asset.

Other cities in North America that did not manage DED and lost almost all of their elms, have a broader variety of alternate tree species to grow and maintain an urban forest. Although the City of Winnipeg is increasing the diversity of our urban forest in Winnipeg, we are severely limited by the variety of tree species that will grow and thrive here due to our climatic conditions. With the ever-increasing threat of other invasive pests to our urban forest, such as emerald ash borer, it is that much more important to preserve our native American elm in our urban landscape. There is no replacement for the elm.

The City of Winnipeg has proven that we can successfully manage DED. However, recent trends in increasing disease incidence, heightened public concern, and new research identify that improvements to our program may be necessary to be more effective in protecting our urban forest from DED. The potential risks associated with maintaining the current level of practice for DED management are listed below:

- continued loss rate of over 2%, risk that disease pressure may reach a threshold where we can no longer manage DED and Winnipeg could lose our elm canopy,
- reduce Winnipeg's ability to maintain a diverse urban forest, leaving it at higher risk of significant losses of canopy cover due to other species-specific invasive pests,
- increased costs of removal (if Winnipeg loses control of DED, the estimated cumulative removal cost may be as much as $119 million by 2028),
- increased costs of replacement (estimated to be $50.4 million to replace 84,000 boulevard and park elms),
- loss of valuable asset (estimated current value of $806 million for boulevard and park elms alone), and
- loss of environmental, economic, social benefits and quality of life

In summary, the proposed improvements to DED management in the City of Winnipeg are listed below:

- That the City of Winnipeg formally request that the Province of Manitoba reinstate buffer management in the areas of Ritchot and Springfield including elm bark beetle control in all buffers. This activity would not present additional costs to the City of Winnipeg.
- Two scenarios representing different compilations of enhanced practices recommended to improve the protection and preservation of our urban forest from DED. These scenarios are proposed to be funded by the City of Winnipeg and by the Province of Manitoba, with costs proportioned as per the current cost-sharing DED Management Program between the City and the Province (presently the Province funds 27% of the DED program based on operating budget):

- **Scenario 1: Targeted Enhanced Management**:

Activity	Total Cost of Activity	Capital Budget	Operating Budget	Provincial Cost-Share Contribution
a. Elm Inventory Update	$100,000	$50,000	-	$50,000
b. Increased Surveillance/Rapid Removal Pilot	$900,000	-	$450,000	$450,000
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TOTAL	**$2,200,000**	**$550,000**	**$550,000**	**$1,100,000**

Items a. and d. would be partially funded in the capital budget for $550,000 in 2013 and for $500,000 from 2014 to 2017. Items b. and c. would be partially funded from the operating budget on an on-going basis. The total Provincial contribution would be $1,100,000 in 2013 and $1,050,000 from 2014 to 2017.

- **Scenario 2: Full Enhanced Management**:

Activity	Total Cost of Activity	Capital Budget	Operating Budget	Provincial Cost-Share Contribution
a. Elm Inventory Update	$100,000	$50,000	-	$50,000
b. Increased Surveillance/Rapid Removal Pilot	$900,000	-	$450,000	$450,000
c. Enhanced Elm Bark Beetle Control	$200,000	-	$100,000	$100,000
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TOTAL	**$3,800,000**	**$1,350,000**	**$550,000**	**$1,900,000**

Items a., d., and e. would be partially funded in the capital budget for $1,350,000 in 2013, and for $1,300,000 from 2014 to 2017. Items b. and c. would be partially funded from the operating budget on an on-going basis. The total Provincial contribution would be $1,900,000 in 2013 and for $1,850,000 from 2014 to 2017.

Introduction

Since Dutch elm disease (DED) was discovered in Winnipeg in 1975, the City of Winnipeg has been the leader in North America in managing DED and preserving our urban elm forest. To this day, Winnipeg has the largest population of elm trees in any city in North America with approximately 140,000 elms remaining on public and private lands. A key component of the success of Winnipeg's program is the long-term commitment from the City, in partnership with the Province, to integrate a variety of urban forest and pest management practices to slow the spread of the disease. "Our Winnipeg" further confirms this commitment to protect and enhance our urban forest.

The urban forest is a dynamic system undergoing frequent changes, as Winnipeg has experienced with DED. As DED incidence has fluctuated over the past 37 years, more recently in the past 5 years, DED incidence has escalated significantly with a general trend towards increased losses of our elm population over time. These increased losses have recently generated a great deal of public concern over the future of our highly valued elm canopy and urban forest. This heightened public concern has identified that the success of our DED management program cannot be maintained without additional resources.

The purpose of this document is to outline the City of Winnipeg DED management program, identify the current status of the main components of the integrated program and propose improvements to the protection of our urban forest from Dutch elm disease. The objective of enhancing DED management for the City of Winnipeg is to reduce elm losses due to DED to no more than 2% within 5 years. In the preparation of identifying a strategy for an enhanced program, the Urban Forestry Branch has consulted with the following stakeholders: Insect Control Branch, Province of Manitoba, University of Manitoba, University of Winnipeg, Trees Winnipeg, Trees Action Group (TAG) and representatives of the arboriculture industry.

Overview of Dutch Elm Disease in Winnipeg

Dutch Elm Disease

Dutch elm disease (DED) is a fatal disease primarily in American elm trees. It is caused by a fungus that is introduced into the tree mainly by the spring feeding activities of the elm bark beetle, the primary vector of the disease. The American elm is the only elm native to our region and is highly susceptible to DED. Although the DED fungus is primarily spread from tree to tree by the native elm bark beetle, it can also spread between trees via root grafting where roots of adjacent American elm trees come in contact with each other and fuse together.

The DED fungus is believed to have originated from Asia, and was first identified by Dutch scientists in 1921. The fungus was introduced into Canada in the 1940s from crates made from infected elm wood in Europe and shipped to Canada. With no management programs, the disease killed 80% of the elms in Toronto and 90% of the elms in Montreal.

DED was first detected in Winnipeg in 1975. Well before DED was discovered in Winnipeg, representatives from the cities of Winnipeg and Brandon and the Province of Manitoba had been following the progress of DED throughout eastern North America and implemented measures to reduce the impact of the disease in our province. Since 1975, the City of Winnipeg has actively managed an integrated DED program in collaboration with the Province of Manitoba to reduce the spread of the disease and protect our urban forest.

Legislation

DED management was legislated by the Province of Manitoba previously under the DED Act originally enacted in 1982. The DED Act was repealed and DED management is now legislated under the Forest Health Protection Act and Regulations (FHP Act), in force since 2009. The City of Winnipeg Urban Forestry Branch carries out the DED management program via a Cost-sharing Agreement with the Province and as per the requirements of the FHP Act. The City Forester and City Entomologist are appointed as Officers of the FHP Act with the authority to enforce this legislation on all properties in the city of Winnipeg, as delegated by the Minister of Conservation. Also, City of Winnipeg employees are

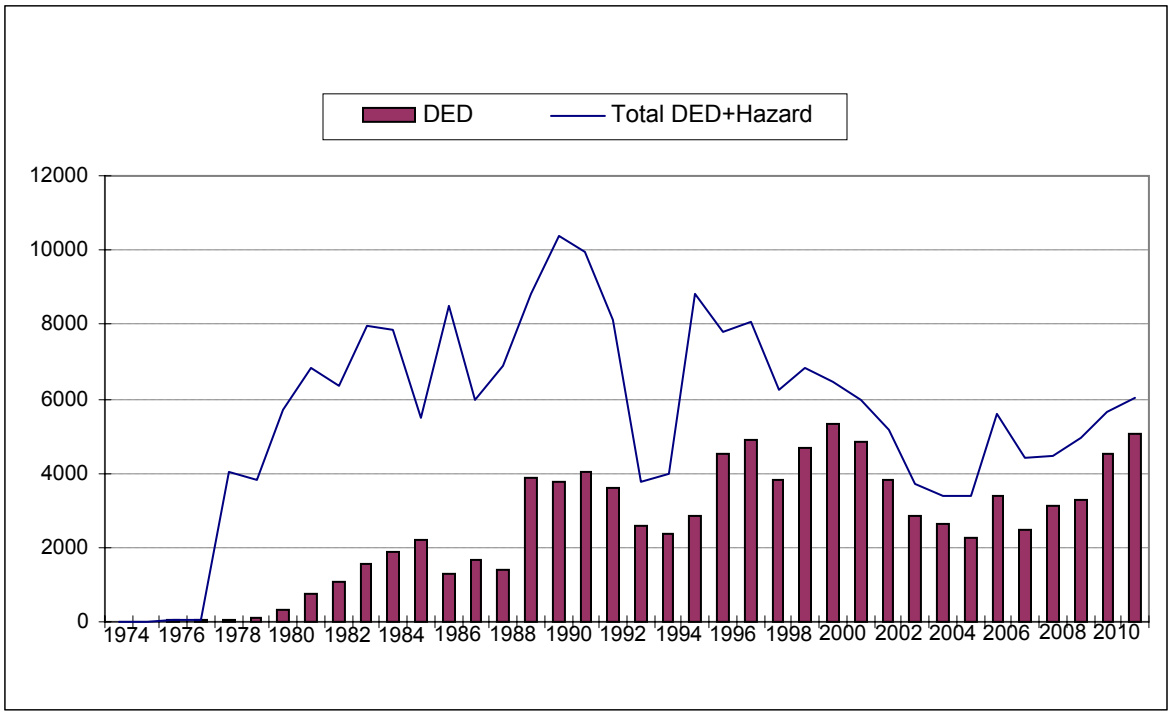
Inspectors of the Act, with the authority to carry out necessary actions as identified in the FHP Act on all properties in the city of Winnipeg, as delegated by the Minister of Conservation.

Elm Losses and Program Costs

At the onset of DED in Winnipeg, our elm population was estimated at 275,000 trees based on an elm tree inventory that was conducted on both public and private properties at that time. Winnipeg currently has an estimated 140,000 elms remaining.

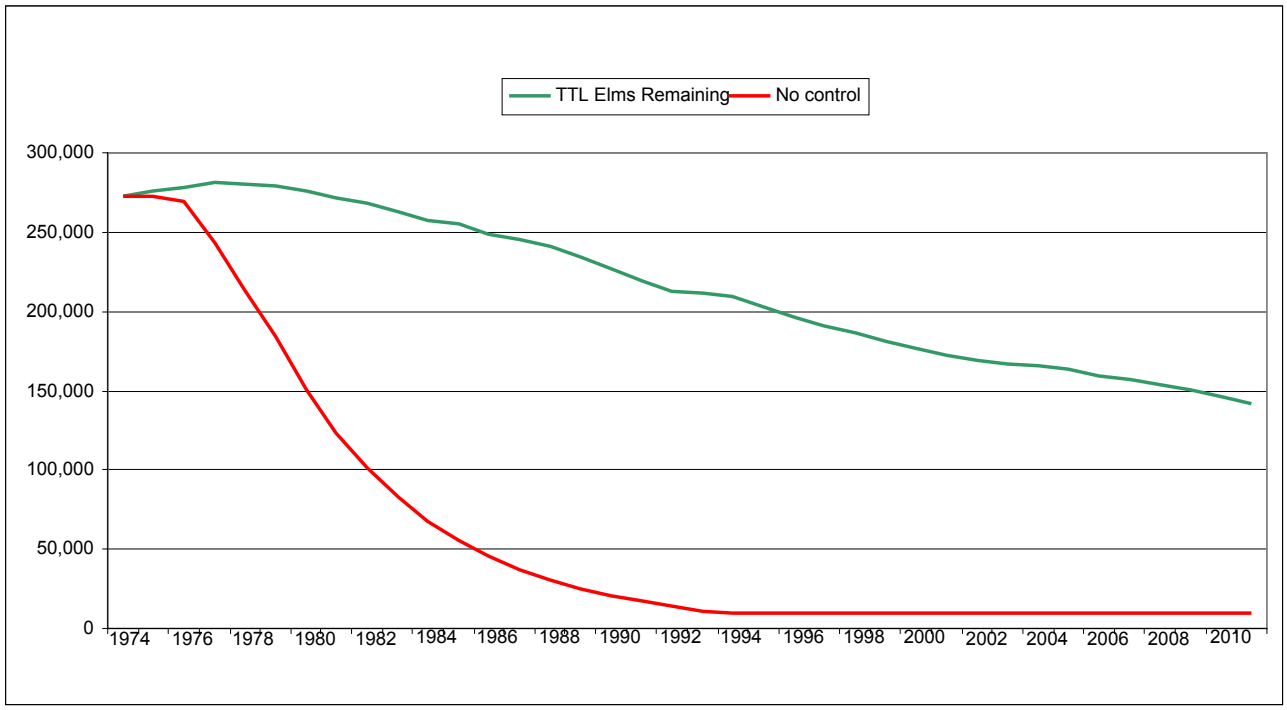
Elm loss rates to DED have fluctuated considerably since the disease was discovered in Winnipeg in 1975 (Chart 1). In 2011, the loss rate due to disease was 3.46%, the highest loss rate due to disease yet. Over the past 37 years, the average annual loss rate due to the disease is 1.38%. The goal of the DED management program historically has been to confine annual loss rates due to disease to no more than 2%. It should be noted that also historically over 80% of elm losses and removals under the DED program have occurred and continue to occur on private property and primarily riverbank properties.

Chart 1. DED Program: Elm Losses 1974 - 2011



The current operating budget for DED management on all properties in the City of Winnipeg is $3.7M, which includes $1M from the Province. Based on approved budgets for DED management since 1975, approximately $69M has been spent to date managing DED and preserving our elm forest. The average annual cost over the 37 years is $1.91 million. This funding has been spent on surveillance, tree removal, elm bark beetle control, fungicide injection, tree pruning, tree replacement, public education and research. Without this long-term program to preserve our urban elm canopy, the cost for elm tree removal alone due to DED would have been approximately $130.8M by 1992 with only approximately 10,000 elms remaining in Winnipeg by that time (Chart 2). Winnipeg would have lost almost all of its elms by 2002. This significant risk of loss is based on theoretical loss rates of 18% experienced in major cities that did not actively manage DED and to this day, have very few elms in comparison to Winnipeg. Using current costs at an average of $850/tree removal, if the remaining 140,000 were to be removed, it would cost the City $119 million alone just to remove these trees.

CHART 2. Implications of Not Managing DED



The partnership between the Province and the City has been in the form of a cost-sharing agreement, in that the Province has contributed funding to the City's DED management program, and has historically maintained DED buffer zones around the City to slow the spread of DED into Winnipeg. Provincial activities in these buffers have included DED surveillance, removal of diseased and hazard elms and elm bark beetle control. More recently, the Province has reduced their activities in these buffers and the size of the buffer zones has decreased. But, over time, the Province has increased their annual financial contribution to the City's DED program.

Value of our Elm Asset

Preliminary estimates from current public tree inventory data indicate approximately 35% of our trees on boulevards and in parks are elms. It is estimated that there are approximately 280,000 trees on boulevards and in parks. If elms comprise 35% of this inventory it can be estimated that we have 84,000 elms on boulevards and in parks, representing 60% of our estimated remaining elm population of 140,000 elms.

The current estimated value of an average boulevard elm tree is $9,600. This figure is calculated using the internationally accepted method of tree appraisal by the Council of Tree and Landscape Appraisers. The appraised value of our elm asset on boulevards and in parks alone is estimated to be over $806M.

It should be noted that other cities that have not preserved their elm canopy have a much broader variety of tree species that can grow and thrive in these areas. Due to the harsh climatic conditions of our prairie city, there is a limited number of trees species, particularly shade trees, that survive and thrive in Winnipeg. The American elm is also our best performing urban shade tree. Hence, our elm population has even greater value in this regard, further emphasizing the need to preserve it. There is no replacement for our American elm.

City of Winnipeg DED Management Program and Recommended Improvements

Although Winnipeg's DED program has been highly successful, substantial increases in disease incidence and elm losses over the past 5 years has drawn attention to the need to review traditional

practices for their effectiveness and identify improvements for more effective management of the disease and preservation of our urban forest. Recent research suggests a more effective sanitation method described further in this document.

The objective of DED management is to slow the spread of the disease. By slowing the spread, the large costs of removal and replacement are distributed over a longer period of time, preventing short term increased pressure on public and private resources to remove and replace trees. Also, deforestation of communities is prevented as the urban forest can be regenerated over time without significant loss of tree cover. The main components of this program that will be described and for which improvements will be proposed include: buffer zone management (province), tree inventory, sanitation (elm firewood monitoring and disposal, disease surveillance, removal of diseased, dead and dying elm trees), elm bark beetle control, tree health care, preventative fungicide injection of high value trees, reforestation, research and public education.

Table 1 provides a summary of each of these individual recommendations along with resourcing information:

1. Buffer Zone Management (Province)
A new gap in the DED management program surfaced recently, in May 2012. Effective immediately, the Province of Manitoba terminated the maintenance of the DED buffer for the City of Winnipeg in two municipalities: Ritchot – south of Winnipeg, and Springfield – east of Winnipeg.

Historically, the DED buffers around the City of Winnipeg have played an important role in slowing the spread of DED into Winnipeg by controlling the elm bark beetle population from migrating into the city. Buffer zones reduce the overall disease pressure from surrounding areas, particularly along the river corridors, and improve the effectiveness of Winnipeg's program. In a 1991 cost-benefit analysis of DED management in Manitoba by Richard Westwood (past Director of the Province's Forestry Branch and now with the University of Winnipeg), the management of buffer zones around Winnipeg was noted to reduce Winnipeg's elm losses during 1975 to 1990 by an estimated 95,480 elms.

However, in the early 1990s, the Province reduced their management of DED in buffer zones around the City. In 1997, the potential consequences of this reduction in buffer management to Winnipeg's DED program were identified in a 1997 report of the City's Committee on Protection, Parks and Culture forwarded to the Province by the City. By the late 1990s, there were significant increases in DED incidence in Winnipeg where loss rates due to disease were above the 2% target from 1996 to 2002. It is not known at this time if the Province reinstated DED management in these areas specifically, but the Province did increase their financial contribution to the City's DED program.

Data from the Province indicates that over the past 5 years, the number of diseased and hazard elm removals have averaged 640 in the Ritchot buffer and 540 in the Springfield buffer with great fluctuations in numbers over this time. The Province has ceased basal spray treatments in all buffer areas around the city. Basic surveillance and sanitation in these two buffer areas cost over $50,000 in 2011/2012, as indicated by Manitoba Conservation.

This reduction in DED buffer management will again have a significant negative impact on the City's ability to protect the urban forest from DED. This risk is of particular importance in the Ritchot buffer as it is directly adjacent to the heaviest DED infections in Winnipeg. Particularly at a time where DED has steadily increased over the past 5 years and action is being taken to enhance the preservation of our urban forest, it is critical to maintain the integrity of these buffers as they serve as important habitat for the elm bark beetle via the LaSalle, Red and Seine River corridors – significant entry points of elm bark beetles and DED into the city.

Recommendation: a) That the City formally request that the Province reinstate the Ritchot and Springfield buffer zones and reinstate basal spray treatments to control overwintering elm bark beetles.

2. Elm Tree Inventory
As noted, the current elm tree inventory in the City of Winnipeg is estimated to be 140,000 elms. This figure has been calculated by reducing the original elm inventory completed in 1974/1975 by the number of elm removals since 1975, and adjusting for a 1% natural regeneration of elms and the number of elms

replanted on boulevards and in parks. The overall elm inventory has not been updated in the field since the original data collection, with the exception of a boulevard and park tree inventory currently being conducted by the Urban Forestry Branch.

Recommendation: As over 80% of DED removals occur on private property, it is recommended that an elm inventory be completed on private properties to update information on the number of elms on these properties as part of our urban forest, and to more accurately identify the value of this asset and the resources required to continue to manage DED.

3. Sanitation

a) Surveillance – Elm Firewood

All properties in the City of Winnipeg are surveyed for elm firewood annually. In accordance with the Forest Health Protection Act, it is illegal to store elm wood in the Province of Manitoba. Elm wood serves as a development site for the elm bark beetle larvae during the summer months and provides habitat for the beetle population to increase. When the elm firewood is diseased it contributes significantly to the spread of DED as spore-carrying elm bark beetles emerge from this wood carrying the spores of the fungus on their bodies and spread the DED fungus to surrounding trees the following spring. The female elm bark beetle will lay her eggs in elm wood pieces with intact bark and the brood will develop into adults in this wood by the end of summer. If the elm wood is diseased, the emerging adult beetles carry the spores of the DED fungus on their bodies, overwinter with viable spores still on their bodies, and infect healthy trees the following spring when they emerge and feed in elm canopies. Therefore, elm firewood, diseased or not, significantly contributes to the spread of DED. In some years, DED outbreaks in a neighbourhood have been traced back directly to a pile of elm firewood that was not disposed of.

On average, over the past 7 years approximately 300 firewood notices have been issued to property owners annually. We have recorded only approximately 47% compliance each year on average.

Historically, elm firewood notices are followed up as disease surveillance is carried out through the summer months. However, historically, enforcement was not carried out effectively under the previous DED Act mainly due to lack of authority on private property and the resulting lack of effective enforcement procedures. Under the new FHP Act, City representatives have delegated authority directly from the Minister of Conservation to enforce the FHP Act and Regulations on all properties in the City of Winnipeg. As a result of this recent legislation, enforcement procedures have been developed by the Province and have been implemented by the City.

When an elm firewood notice is issued to a property owner, the property owner has 14 days to properly dispose of the wood. Any non-compliant notices are followed up by Urban Forestry staff (FHP Act Inspectors) after the 14 days have expired. If the wood pile is still on site, a Forest Health Order is issued to the property owner by the City Forester or City Entomologist (FHP Act Officers) giving the property owner 20 days to comply. If they are still non-compliant after the 20 days, the City Forester or City Entomologist has the authority, as Officers of the FHP Act, to remove the wood from the property and can charge the associated costs back to the property owner.

b) Surveillance – Elm Trees

All elm trees in the City, on public and private property, are surveyed each year visually for disease symptoms and declining health. Trees that express DED symptoms are marked for removal. Additionally, trees that are 50% or more dead in the canopy are marked for removal. These trees are called hazard trees as they contribute to the spread of DED by attracting the female elm bark beetles to lay their eggs to produce the next generation of beetles and overall, increase their population.

Surveillance of trees occurs approximately from mid-June to end of August, when disease symptoms are visible in the canopies. Generally, at least 2 cycles of surveillance are completed annually on boulevards, in parks and private properties not directly associated with riverbank areas throughout the City. However, 1.5 complete cycles are typically completed each year specifically on riverbanks, depending on riverbank conditions and water levels. Riverbank surveillance generally occurs from mid-July to end of August. In most years, most riverbank areas are not accessible for surveillance until mid-July.

c) Removals

Historically, elm removals have occurred during the winter months when there is less competition with other urban forestry activities, such as tree planting, stump grinding, and responding to customer service requests and storm damage. Also, it is primarily only during these months that many riverbank and other sites can be accessed and the conditions are conducive to cut down the trees and remove or burn the wood. These areas are also less prone to damage by heavy equipment during this period as the ground and waterways are frozen, and there is snow cover.

It has been determined that removal of diseased elm trees shortly after they express symptoms of the disease (termed "rapid removal") may significantly reduce the spread of the disease. However, the practice typically conflicts with available resources and its feasibility within a large scale program like Winnipeg's, historically, has been difficult as a result. At the behest of the City of Winnipeg and with partial funding from the City, research was conducted over 5 successive years from 2004 to 2010, in 14 rural Manitoba communities by the University of Manitoba and the Province of Manitoba to study a rapid removal model. This research was conducted primarily to identify to what degree this practice could reduce the incidence of DED and thereby compensate for the logistical difficulties in practicing rapid removal. Half the communities in the study conducted traditional fall/winter removal regimen and the other half of the communities conducted a rapid removal regimen.

This study was published in the scientific *Journal of Arboriculture and Urban Forestry* in May 2012. The rapid removal model as outlined in this paper included the activities listed below:

a) complete one cycle of surveillance in June to mid July to identify American elms showing signs of DED
b) removal of these early symptomatic American elms by August
c) complete a second cycle of surveillance in July and August to identify American elms showing signs of DED
d) removal of the later symptomatic American elms over fall and winter

The results of this research showed that communities following the rapid removal practice significantly reduced elm losses to DED to 1.5% compared with 3.1% elm loss to DED in communities that maintained a fall/winter removal regimen. The major focus of the rapid removal regimen is to significantly reduce the number of spore-carrying elm bark beetles in the new generation that emerges in late summer. These beetles overwinter largely in healthy trees, but also in diseased trees, and emerge the following spring transferring the spores of the fungus to healthy trees during their spring feeding activities. Research has shown that trees are not infected with the DED fungus as a result of the beetle overwintering activity, as the beetles do not go beyond the bark tissue when they burrow into the trees to overwinter.

Rapid removal was applied only to trees in which symptoms appeared early in the season and this practice was sufficient to consistently reduce the incidence of DED. However, the research noted that not all early infections can be caught in the first cycle of surveillance as many infected trees may not express disease symptoms early in the season due to a variety of circumstances. In other words, there may still be infected trees not yet identified in the first cycle of surveillance that become targets for elm bark beetles to use for brood development.

It is important to note some significant differences in elm population and size of communities in comparison to Winnipeg. The population of elms in the communities involved in this study ranged from 46 to 1,426 elms. The communities ranged in area from 0.52 km^2 to 2.63 km^2 and very few are associated directly with any river system. Winnipeg, in comparison, has an estimated 140,000 elms and is 464 km^2 in area with 4 waterways flowing into and through the city (Red, Assiniboine, LaSalle and Seine Rivers). Therefore, a complete rapid removal regimen in communities such as those in the study was more readily achievable due to the much smaller scope and fewer variables than those in Winnipeg. However, it also should be noted that a form of rapid removal could be achieved to a degree in Winnipeg.

Overall, with the significant decrease in DED incidence in the rapid removal communities, the research identified that 10 years of a rapid removal program would result in a savings in removal and replacement costs of approximately \$59,000/km^2 and prevent a decline of the elm resource of approximately \$600,000

in that 10 years. The study concluded that, wherever possible, rapid removal should be incorporated into a DED management program.

In 2010, the Urban Forestry Branch conducted a small pilot of enhanced DED management in the neighbourhood of River Heights in response to recent substantial increases in diseased boulevard trees in this area. Diseased boulevard elms were removed from July to September 2010. Other practices were intensified in this area including increased elm bark beetle control on elm trees and stumps, and fungicide injection of 500 boulevard trees as preventative treatment. The purpose of enhancing DED management practices in this area was to compile preliminary information on the logistics of applying a rapid removal concept and assess general costs and benefits of augmenting various components of an integrated program. One year after augmenting DED management in this area, the incidence of DED in the boulevard trees declined, but this reduction may not necessarily be a direct result of this intensified activity. Overall effectiveness of this augmented management on reducing disease incidence would need to occur by developing and applying a consistent methodology over a longer period of 5 years, such as that in the University study. Due to the higher incidence of DED throughout the City in 2011, continued rapid removal was not feasible in this area as a result of having to respond to higher priorities.

d) Current practice of surveillance and corresponding removals

The Urban Forestry Branch completes one cycle of surveillance on boulevards, park and private properties not associated with riverbanks on average from mid-June to mid-July. We complete at least one more cycle on these properties by end of August. Riverbank surveillance is conducted mid-July to end of August on average 1.5 cycles (one complete cycle and then revisit areas of particular concern based on historical surveillance and results of current year's first cycle). Removals begin in summer for particular properties that may have greater challenges with access in winter months, where we can get approval for early access, and where we identify an increased density of disease. The number of removals occurring during this period has fluctuated historically, and has been low relative to the total number of removals completed, due to competing urban forestry operations, particularly those that are more reactive in nature such as storm damage and addressing customer service requests. The majority of DED removals occur from October to April.

On average, over the past 7 years, we have identified approximately 650 symptomatic trees by mid-July on boulevards, in parks and on private property. On average, over the past 7 years, we have removed approximately 200 trees (either DED or hazard) by August 31. The greater challenge in this program is the early removal of a large number of trees over a large area with a wide variety of conditions.

Recommendation:

1. That the City continue with current elm firewood surveillance and enforcement procedures as outlined and with the delegated authority under the FHP Act.

2. That, upon consultation with Manitoba Conservation and the University of Manitoba, a rapid removal regimen be piloted as described below:

   Increased surveillance to identify diseased elms for early removal.

   Complete first cycle of disease surveillance by mid-July on boulevards, parks, open spaces, private properties not associated with riverbanks. Mark only trees expressing symptoms of DED. Remove only these marked diseased trees by August 31. Based on surveillance data from previous 2 years, there may be approximately 800 trees to be marked and removed in this short time frame. It may be assumed from the results of the U of M study that this number would decline over 3 to 5 years.

   Complete second cycle of surveillance, marking trees expressing later DED symptoms and hazard trees, as per locations listed above and a full cycle of surveillance on riverbanks, golf courses, and private properties associated with riverbanks by September 1. Remove 2nd cycle diseased trees and all hazard trees by March 31 in the following year.

4. Elm Bark Beetle Control

Elm bark beetle control involves spraying the base of elm trees (termed "basal spraying") and elm stumps with a pesticide to kill beetles that overwinter in elms. Chlorpyrifos, commonly known as Dursban, is the

only insecticide currently registered in Canada for the control of elm bark beetle and is highly effective in controlling overwintering beetles. One application provides two years of control.

Basal spraying is a very cost effective means of controlling the elm bark beetle population. Most of these treatments have occurred along and in areas immediately adjacent to river corridors, which provide attractive conditions and corridors for elm bark beetle habitat and movement. However, as the elm population declines over time along river corridors, it is believed that elm bark beetles are migrating into upland areas and into adjacent neighbourhoods, park and boulevard elm trees. Therefore, in order to more effectively control the vector that transmits the DED fungus to healthy trees, a more widespread application of basal spraying is recommended to further reduce the spread of DED and protect our elm canopy.

Recommendation: That the basal spray program be expanded to all American elms in the City of Winnipeg.

5. Tree replacement on boulevards and in parks

Much of Winnipeg's urban forest has reached maturity with many neighbourhoods containing trees in excess of 100 years of age. With such factors as the maturity of our urban forest, increasingly challenging conditions for growing trees in the urban environment, and more frequent and severe fluctuations in weather conditions, the number of trees lost in general has increased and is expected to increase further. Although over 80% of DED removals have occurred historically on private properties, there is still a significant number of trees lost from boulevards and parks through the DED program. Over the past 5 years, approximately 700 diseased and hazard elm trees on average have been removed annually from boulevards alone. This number makes up approximately 40% of the trees planted on average on boulevards and in parks annually. Preliminary data from the current tree inventory data collection shows an estimated 83,000 potential planting sites on boulevards in the City.

In 2007, the operating budget was increased to eliminate the backlog of tree planting requests, and to improve tree replacement and enhance tree maintenance in the downtown area to a 0.75 replacement ratio. Since that time DED has steadily increased and current average tree replacement ratio per year is 0.52. Winnipeg has experienced a net loss of urban forest canopy for many years. To sustain the urban forest at least a 1:1 tree replacement ratio is required with an ideal ratio of 2:1, i.e. 2 trees planted for each tree lost, to expand the urban forest.

Recommendation: That the tree replacement ratio for boulevard and park trees be increased to 1:1. A more comprehensive option would be to increase the tree replacement ratio to 2:1 for 5 years to cover the deficit in tree replacement for many years and then reduce it to maintain 1:1 annual tree replacement. The use of contractor resources for this increased planting is a concern as the private tree care industry is currently at capacity for City of Winnipeg contracts. We would require 2 years for private industry to build capacity and for the City to build capacity for the supervision of contractors and to source additional nursery stock.

6. Public Education

The City of Winnipeg currently has a service agreement with the Coalition to Save the Elms, now known as Trees Winnipeg. Trees Winnipeg is a community-based non-profit charitable organization that was established in 1992 to protect, preserve and promote the health of the urban forest and urban environment through public education and awareness. This organization played a significant role in reinstating Provincial funding for Winnipeg's DED management program in the early 1990s.

The City of Winnipeg provides office space and an annual grant to Trees Winnipeg in exchange for urban forestry education and awareness programs and services for the citizens of Winnipeg as listed below:

- Community Tree Banding education and services
- Public workshops, website information
- Arbor Day in the Park
- Broadway Avenue Tree Rehabilitation Project

More recently, Trees Winnipeg has implemented two new programs: Historic Trees of Winnipeg and Winnipeg Forest Watch. These programs have been developed to establish an inventory of the historic trees in Winnipeg, to increase public awareness of tree protection, and to garner more community

involvement in caring for the health of our urban forest with the ever-increasing threats of invasive pests, such as emerald ash borer.

Trees Winnipeg is a key partner and stakeholder in the effective management of DED and our urban forest by raising public awareness about the value of the urban forest and environment, providing education and training to their members and the public, and by facilitating the development of action-oriented community groups working together to protect and enhance the urban environment. This organization is the vehicle through which citizens and communities are actively engaged and educated in caring for the health of our public trees and trees on their private properties. Trees Winnipeg provides a valuable service to the citizens of Winnipeg that the City of Winnipeg does not provide.

Recommendation: That the City maintain the partnership and service agreement with Trees Winnipeg for public education and awareness of our urban forest and environment.

7. Research

Please see rapid removal research discussion in item 3. above. The City of Winnipeg has also partnered and helped fund research at University of Manitoba into other insecticides for elm bark beetle control. There are currently no recommendations for additional research.

8. Enhanced management of trees on private property

a) Fungicide Injections

Fungicide injections have been available for many years as a component of DED management to preserve trees of very high value. The City of Winnipeg has applied preventative fungicide injections to a relatively small number of high value trees during its 37 years of managing DED. The fungicide is applied every 2 to 3 years as part of DED prevention and costs on average between $200 and $300 per treatment for a mature tree.

It should be noted that fungicide injections have never been intended in the scientific community and tree care industry to replace sanitation, which has been and still is the primary method to reduce the spread of DED. Due to the cost of treatment, associated long-term commitment to treatment cycles and the volume of elms in our public domain, the City has ceased fungicide treatments on public trees to focus our resources on surveillance and sanitation. These specialized fungicide treatments are better suited to individual high value elms on private property which contribute significantly to the value of that property. Many property owners with high value elms have their trees treated and pay for treatment of boulevard elms adjacent to their properties.

No recommendation for funding fungicide injections on private property is being presented for consideration due to a number of difficulties in administering such a program, including but not limited to measuring and qualifying high value trees on private property, selection of fungicides and injection systems, variable effectiveness of the fungicides, regulation of pesticides, and legislative requirements for pesticide application.

b) Tree Replacement on Private Property

The most significant losses to our urban forest as a result of DED have occurred on private properties, particularly on riverbank properties. We can be certain that the number of trees lost from these areas have not been replaced. Trees in these areas make a significant contribution to our urban forest and provide green corridors that connect our communities.

Through consultations with Trees Winnipeg (Coalition to Save the Elms), Trees Winnipeg has proposed to develop and administer a cost-shared Tree Replacement Pilot Program for private property owners in partnership with the City of Winnipeg. Trees Winnipeg has worked in partnership with the City of Winnipeg for many years to engage the citizens of Winnipeg in protecting and preserving our urban forest, as noted in item 6. above. This organization has the experience, knowledge and community support to successfully deliver such a program. The key objectives of the proposed program are listed below:

1) To increase the tree replacement ratio to 2:1 (two trees planted for each elm lost) for private properties that have lost elms due to DED, thus aiding the City in the reforestation of our urban forest, and,

2) To increase awareness of the value of the urban forest, tree planting and species diversity, and of proper tree-care practices among Winnipeg residents.

In this proposed program, property owners who have lost one or more elms to DED from their property would have the opportunity to receive vouchers to obtain trees from participating nurseries or garden centres to replace their lost trees. These individuals would be required to attend workshops on tree planting and tree care prior to receiving the vouchers. The value of a voucher would cover the cost of a basic retail price of a pre-determined size of tree. The property owner would have the option of purchasing a larger tree and paying the difference at their own expense. Trees Winnipeg would provide in-kind contributions for public education, tree planting audits, and staff and administration.

Recommendation: That the City consider entering into a service agreement with Trees Winnipeg to develop and administer a tree replacement pilot program for private property owners.

c) Tree Pruning on Private Property

Tree pruning is a component of overall tree health care. An opportunity to subsidize private tree pruning was considered. However, numerous difficulties were identified in the administration of such a program, i.e. qualification of property owners, complex nature of pruning requirements and practices, confirmation of work completed, and the distribution and delivery of such a subsidy. Due to these factors and associated high costs of maintaining such a program, it was placed as a lower priority in comparison to the other two enhancements for tree management on private property. Therefore, no recommendation for pruning trees on private property is being presented for consideration.

Table 1: Summary of Individual Recommendations:

Activity	Description	Estimated additional cost	Notes / Limitations
Reinstate Ritchot and Springfield Buffers and reinstate elm bark beetle control in all buffers	Request that the Province reinstate management of these areas, including elm bark beetle control in all buffers	No additional cost to the City	Provincial budget reduction
Complete elm inventory on private property	Conduct an elm tree count on private property	Additional $50,000 from capital budget and $50,000 from Province – once every 5 years	Conducted by surveillance staff during their DED surveillance activities; provides a snapshot of private elm inventory every 5 years
Elm firewood monitoring	Continue elm firewood surveillance and enforcement procedures	Within existing operating budget	
Modified rapid removal	Apply increased surveillance and rapid removal to boulevards, parks and private properties not associated with riverbanks (mid-June to end of August)	Additional $450,000 from operating budget and $450,000 from Province – per year	Increased operating budget required; a combination of contracted services and in-house staff used because of private industry's limited capacity.
Increase elm bark beetle control	Treat all elms in the City of Winnipeg on a 2 year rotation (50% of elms in year 1, 50% in year 2)	Additional $100,000 from operating budget and $100,000 from Province – per year	Enhanced EBB control would treat 70,000 elms per year. Limitations: Availability of product, public perception
Increase tree replacement on boulevards and in parks	1:1 tree replacement ratio on boulevards and in parks **2:1 in years 1 to 5 to catch up to net loss over many years, then maintain 1:1 ratio thereafter**	Additional $500,000 from capital budget and $500,000 from Province – per year **Additional $1,000,000 – years 1 to 5; then reduce to $500,000 annually - capital budget; Provincial funding $1,000,000 and then $500,000 respectively**	Limitations: Availability of resources and nursery stock; would require 2 years to build capacity; contracted services for supply of trees and planting
Trees Winnipeg partnership	Maintain service agreement with Coalition to Save the Elms (Trees Winnipeg) for public education and awareness	Within existing operating budget	
Enhanced management of trees on private properties	**Enter into additional service agreement with Coalition to Save the Elms (Trees Winnipeg) to administer tree replacement program**	**Additional $300,000 from operating budget and $300,000 from Province – per year**	voucher for 2 trees / every diseased elm lost from private property; property owner required to attend tree planting and tree care workshops provided by Trees Winnipeg

bold = additional descriptions and costs as described in Scenario 2: Full Enhanced Management