Shade Tree Program Notebook

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This document is a working result at the suggestion of Geneva's Shadetree Committee, integrating the planning model suggested by the International Society of Arboriculture, with help from the Urban Forestry LLC's "Tree Risk Survey Report" prepared by Andrew Pleninger, assembled by Jessica Vaughn and Caterina Saracino, under the guidance of the City of Geneva's Engineering and Public Works.

PART I: Record of Events

Introduction

Over time, weather, poor planning, and diseases can damage trees, making trees prone to failure and hazardous to the population. These trees pose significant risks to personal safety and property. The City of Geneva faces several issues of how to manage their beautiful assortment of shade trees. These issues include fiscal constraints, environmental sustainability for promoting resource health, as well as a public safety. It is important for the municipality to ensure reasonable care is being taken to manage the public safety risks associated with hazardous trees along the right of way. This notebook focuses on the prevention and amelioration of hazardous tree defects, and details a systematic procedure for inspecting and evaluating potentially hazardous trees throughout public parks and all right of ways.

Brief History

Post-storm surveys of damaged trees give concrete evidence about tree failure patterns as well as structural defects commonly associated with these failures. Regional reports reveal that during the January 1998 ice storms, which impacted much of New York, the overall tree and branch damage was much less on trees that were pruned frequently and well kept. Similarly, in 1999, more quantified data during windstorms found that 84 percent of the trees damaged had pre-existing defects. These findings explicate that most tree damage is preventable through proper care and inspection.

City officials have always recognized that well kept assets have a longer life and cost less in the long run. Similar to traffic light maintenance, roadway and sidewalk construction, and sewage disposal, tree preservation requires consistent investments of time and effort to sustain quality and preserve safety.

The objective of a tree risk management plan is to systematically and accurately detect and assess moderate to high-risk trees. A tree risk management plan also facilitates the timely removal or corrective treatment of hazardous trees, through regularly scheduled tree inspections that recognize trees before they become injurious to public safety.

Review of Current Tree Management Practices

In the spring of 2005, Urban Forestry representatives drove the forty-two miles of Geneva streets to conduct a survey of the trees within the city right of way. Urban Forestry strove to identify weak or damaged trees that posed a threat to motorists, pedestrians, and property. A total of 382 hazardous trees were identified. From this report, 187 trees were in dire need of pruning while 193 required removal. The Urban Forestry team recorded data for each tree and compiled cumulative information for the general status of Geneva's shade trees. The conclusions drawn by Urban Forestry included the necessity of action for up to 32 percent of trees in particular wards of the city. These findings motivated the City of Geneva to create a municipal tree management plan and the Shade Tree Risk Assessment Notebook.

PART II: Present

Identifying Notebook Goals

In an effort to reduce the potential of harm, the city increases responsive action by co-managing the shade tree population with the Shade Tree Committee. To facilitate risk reduction, this notebook's main goal will be to establish a shade tree risk assessment program for the City of Geneva, which focuses on preventing the threat of physical harm to the city. An advantage of this program is to assist the city to defend their program if litigation occurs. The city will be able to validate the actions taken, and justify their decisions if questions arise.

In addition to the community risk reduction goal, a risk policy statement will be implemented, which identifies the whole mission of the community towards their high-risk trees. It is the belief of the International Society of Arboriculture that the tree risk policy statement should include the following:

- Comprehension of the city's responsibility to maintain safe public areas and right of ways
- Awareness who is the manager of the risk reduction program
- List of constraints on managing hazardous trees such as location, and finances, etc

As a result of the development of the city's risk program, the city will develop and enhance subsequent strategies that focus on defining Geneva's methods of monitoring shade trees. This will provide up-to-date information on the portion of the tree population with the highest probability of failure and/or highest risk to public, so city officials will be able to apply feasible management strategies.

Specific management strategies for the City of Geneva identify tree resource needs, staff and fiscal resources needed to implement a tree risk management program, and the

need to educate the public. It may be to the advantage of the Shade Tree Committee to design a timeline that is inclusive of these other program goals:

- Promoting professional development of tree care staff through continuous education programs
- Developing educational outreach programs and demonstrating projects to increase public awareness identifying the need for and benefits of a tree risk management program
- Coordinating with public utilities managers to promote proper pruning and the selection of smaller stature tree and shrub species for planting under utility lines
- Establishing a comprehensive wood waste-utilization management plan that focuses on implementing efficient and environmentally sustainable methods

A well-rounded group that is willing and able to develop, implement, and improve Geneva's tree risk management plan should be established and active during the entire program's design process. The tree risk management's working group should bring to the table all parties currently involved and those that will benefit trees and promote safety. A tree risk management working group may consist of many people that have special skills, however should be inclusive rather than exclusive of all potential members. Some examples of important people for the group are;

- Arborist, City Forester and/or Tree Warden
- Representatives from municipal departments such as public works, parks and recreation, transportation, fire/police/and other emergency services, planning and zoning, engineering, and the county attorneys office, county commissioners office, and/or the mayor's office
- Tree Service Providers
- Public Utility Providers, and public agencies
- Private citizens
- Media contact
- Local nonprofit organizations

All the goals set forth thus far facilitate the fundamental principal of the Tree Risk Management Program and Notebook, which is to promote tree health and sustainability and increase public safety, by reducing agents that hinder these attainable goals.

Tree Risk Management Strategy

The strategy of the Tree Risk Management is to reduce the risks that trees pose to public safety, to a level that meets professional standards and demonstrates reasonable care.

Prioritize Inspection and Corrective Actions

Realistically, a city does not have the time, personnel, or the budget to analyze 100 percent of their trees every year. Therefore, limited or prioritized inspections must carefully evaluate the conditions of the landscape and public usage patterns in right of ways and parks, to optimize the use of the limited facilities and apply them in areas with the greatest risk to public safety. This method will exclude all trees located on private property that do not impact the city's right of way.

Tree risk assessments are an estimate of the degree of risk associated with a given tree to fail and injure persons and/or damage property. Evaluations should indicate levels of high to low risk. Within a tree risk management program, implementation of more than one inspection method may be necessary. In-depth inspections of priority trees, which identify the full range of tree defects and site conditions present, are most useful when determining the likelihood of a tree to fail and strike a target. The Hazardous Tree Evaluation Form can be an effective tool for analyzing very high-risk trees and post storm tree damage surveys.

Documentation of all tree risk inspections, corrective actions, and tree failures are critical. Digital photography can be a valuable tool to document and supplement inspection

reports. Tree Evaluation data will help Geneva actively manage their tree resource and make sound, objective, and timely management decisions. Remember, trees are living organisms that require systematic inspections in order to detect and monitor potentially devastating changes, most of which are preventable.

2006-2012 SHADE-TREE RISK ASSESSMENT SCHEDULE			
Date Mo./Year	Current weather condition	Number of Trees surveyed	Future Actions/Additional Comments
10/06			
5/07			
10/07			
5/08			
10/08			
5/09			
10/09			
5/10			
10/10			
5/11			
10/11			
5/12			
10/12			

Unscheduled/Hazardous Shade-Tree Risk Assessment Details			
Date Mo./Year	Current weather condition	Number of Trees surveyed	Future Actions/Additional Comments

Tree Risk Rating System

Typically trees withstand high winds and bitter ice storms. While it is rare, there are nearly as many ways for trees to fail, as there are tree species. Sometimes rotting trees fall due to their heavy load. Other times, a blustery wind will uproot a tree with a weak root system. In both of these examples the tree had identifiable defects before any storms took place. In fact, most impending dangers are a result of old defects associated with existing decay, transportation wounds, or pest infestations. Fortunately, these blemishes are visible and provide evidence that a tree is a risk to public safety. In addition to establishing corrective actions for hazardous tree defects, this notebook details a modus operandi for inspecting and evaluating potentially dangerous trees throughout Geneva.

According to the International Society of Arboriculture, there are seven universal defects: Cankers, Cracks, Dead trees, tops, or branches, Decayed wood, Poor tree architecture, Root problems, and Weak branch unions. The included system is specifically designed for use in the Northeastern United States more specifically Geneva N.Y., during tree risk inspections. Each page is dedicated to a single type of tree defect, which are numbered and presented alphabetically.

1. Cankers

Description

Cankers are an area located on a branch, stem, or root, where either the cambium and/or bark are dead. Lightning, insects, fungi, vehicles, vandalism, and lawn mowers are some factors that typically wound the tree and result in a canker face. Large cankers or a number of small cankers in close proximity will inhibit annual formation of wood. Since there is little or no formation of wood, cankers prompt a tree weakness and stems and branches fracture near or on their cankers resulting in tree failure.
Note: If the tree becomes infected with fungi, the combination with the Canker weakens the tree considerably and the evaluation should note both factors.

Severity Levels

High risk of failure-canker affects 40% or more of trees circumference or canker and decay affect 40% or more of tree's circumference

Moderate risk of failure-canker affects 25-45% of tree circumference or canker and decay affects 25-40% of tree's circumference

Low risk of failure-canker or canker and decay affect less than 25% of the trees circumference.

How to Measure

Visual assessment of the extent of the crack can be a reliable method of analyzing potential risk. Additionally, an analysis of decay using probes may be necessary to test areas where the shell is thinnest.

2. Cracks

Description

Cracks occur in branches, stems, and roots when the weight exceeds the capacity of the stem to withstand the load. A crack looks like a deep gash in the wood. Most cracks are caused by the improper closure of wounds, or by the splitting of weak branches, or by flush-cut pruning. The presence if multiple cracks in addition to decay indicates a high potential risk for failure. There are four types of cracks that have distinctive traits, therefore their own classification of severity levels.

The four types of cracks are:

Image 1

- Vertical Shear-two halves run parallel to wood grain, separated at the stem. Consequently, wind further separates the crack leading to a high risk of failure. (Image 1)
- Vertical Inrolled-along a vertical crack, the two halves roll inward towards the stem. This typically is associated with serious wood decay. (Image 2)

Image 2

Image 3

- Vertical Ribbed-along a vertical crack, the rib raises the wood on a stem in an attempt to seal a wound. Cold temperatures or tree movements can reopen the wound exposing it to serious decay. (Image 3)
- Horizontal-runs perpendicular to the grain. It appears as though the tree is being cut down. Since horizontal cracks form just prior to tree failure there is little documentation. If any horizontal cracks are found, immediate action is recommended. (Image 4)

Image 4

Severity Levels

High risk of failure-any cracked branch, stem segments with multiple cracks in addition to decay, all horizontal cracks and all shear cracks are at high risk.

Moderate risk of failure-Stems with single crack and/or moderate decay (see decayed wood for rating)

Low risk of failure-Stem portrays no decay with only a minor Inrolled or Ribbed crack

How to Measure

Visual assessment of the extent of the crack can be a reliable method of analyzing potential risk. In addition to this, an analysis of decay using probes may be indispensable to test areas where the shell is thinnest.

3. Dead trees, tops, or branches

Description

Dead trees, tops, and/or branches can be identified by the absence or change of colors in the dead vicinity. Since Dead trees may fracture anywhere they always have a high risk of failure. Dead trees, tops, or branches also are prime suspects to rapid decomposition. As time goes by the risk for failure only increases. This means it is important to remove them as soon as possible, as there is no way to predict when the dead tree, tops, or branches will fail.

Severity Levels

High risk of failure-all Dead trees, tops, and/or branches are at a high risk, as they have increasing potential risk. Similarly, a broken branch caught in a tree's crown is always a high risk: it can become dislodged at any time if the supporting component breaks or if wind extricates it.

Moderate risk of failure-none

Low risk of failure-none

How to Measure

Visual assessment of the suspect dead tree, tops, and/or branch, can be a reliable method of analyzing potential risk. Supplementary to this, an analysis of decay using probes may be vital to test areas where the shell is thinnest.

4. Decayed wood

Description

Decayed wood is wood that has rotted or is missing. Storms, vehicles, excavation, improper pruning, vandalism and small organisms typically wound the tree, making the tree vulnerable to decay causing fungus, however most of the reduced stability is a result of degradation of the internal processes. Decaying wood is easily visible as rotten wood, hollows, cavities, holes, cracks, bulges and fungal bodies such as mushrooms. While there are certain tree species that are resistant to decay, the vulnerable species below may suffer.

- *Aspen*: canker rot fungus in stem
- *Basswood*: old stem decay
- *Birch*: canker rot fungus in stem
- *Black Cherry*: rapid decay of dead branches
- *Oaks, Red:* brown-rot decay, root decay
- *All Conifers*: canker rot fungus decay
- *Balsam Fir*: stem and root collar decay

When a tree is wounded it is important to note the location of the wound and the size of the tree, as this directly affects the potential extent of internal decay. Year to year, a tree builds a shell around its wound preventing its newest layer from fungi. However if the tree is wounded more than once in a few years, the decaying areas merge and the severity reaches hazardous extent of internal decay. One reaction some trees have to the presence of decay is bulging of the stem. Bulges actually help to strengthen the tree and decrease the likelihood of failure.

Severity Levels

High risk of failure-stem has advanced decay and shell thickness is less than 1" of sound wood for each 6" of stem diameter or stem has an opening greater than 30% of the stem's circumference, and the shell thickness is less than 2" of sound wood for each 6" of stem diameter

Moderate risk of failure-stem has opening less than 30% of the stems circumference and shell thickness is between 1" and 2" of sound wood for each 6" of stem diameter and minor advanced decay on 25 to 40% of the circumference of any stem, branch or root collar

Low risk of failure-minor defects or wounds resultant from one minor accident in which the shell has formed more than 2" of sound shell for every 6 inches of stem diameter when opeing is less than 30% of stems circumference

How to Measure

Visual assessment of the extent of decay is not always a reliable method of analyzing potential risk of decay. Probes may be necessary to test areas where the shell is thinnest. When there are no other ways of measuring the extent of sound wound, an increment borer or drill may be used.

5. Poor Tree Architecture

Description

Poor tree architecture is described as a tree leaning too far to support its own load, and therefore has a great risk of failure. Normally, poor tree architecture is a result of changes in the tree's environment, an abnormal growth pattern, or damage to the tree from ailments such as; weather, mechanical abuse, vandalism and organism abuse. Typically, trees that lean naturally are well affixed and can hold their own load, however, they should be monitored. Similar to other problems, poor tree architecture is coupled with other serious defects in the lower stem or root collar the tree is a higher risk for failure. There are two classifications of Poor Tree Architecture.

image one

- Leaning trees with tension and buckle symptoms pose a have already began to fail and are a great danger. This can be observed by noticing at the side, which is concaving- there is a bulge (that looks similar to a belly bulge when a person is sitting), and on the side that the tree has bent away from, there is always a horizontal crack. (Image one)

- Leaning tree branches or Harp trees occur when the main crown loses a branch, and as a result the tree rebuilds the crown on a lower branch. The tree looks like a harp. The horizontal branch must be able to support the fast-growing and heavy branches in order this tree to survive. These trees get cracks on the buckling side and are vulnerable to high winds. (Image two)

Image two

Severity Levels

High risk of failure-disproportionate lean typically greater than 40 degrees, or tree leaning with other serious defects such as cracks, cankers and/or decay on stem, or symptoms of tension and buckling. Branch with sharp twist or bend, or harp trees

Moderate risk of failure- uneven lean typically between 20-40 degrees, without any other serious defects, and no symptoms of tension and buckling

Low risk of failure-uneven lean under 20 degrees, or a natural lean in which there are no defects

How to Measure

Thorough visual assessment of the tree architecture is a reliable method of analyzing potential risk.

6. Root problems

Description

Root problems include dead roots, missing roots, broken roots, decayed roots, leaning trees, damaged roots, poorly anchored root systems, and stem girdling roots. These ailments are caused by many factors, such as; soil compaction, grading, paving, excavation, fungal decay, and environmental stresses such as drought and/or floods. Consequently, root problems can cause trees to die or severely damage them.

Severity Levels

High risk of failure-recent indication that a leaning tree has root lifting, soil movement, soil mounding, and/or more than 40 percent of roots within Critical Root Radius are damaged, decayed, severed or dead, and/or stem girdling roots constrict more than 40 percent of trees circumference

Moderate risk of failure-between 25-40 percent of roots within Critical Root Radius are damaged, decayed, severed or dead

Low risk of failure- Under 25 percent of roots within Critical Root Radius are damaged, decayed, severed or dead

How to Measure

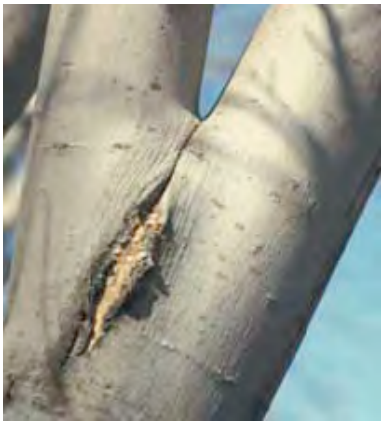
- Critical Root Radius: quantifies the area of damage to the root system. Up to 40 percent of root system can be damaged before anchoring is dangerously weakened.
  CRR=DBH*1.5 feet per inch
  The area should be greater than the drip line of the tree…for example if a trees DBH=10 inches, then the CRR =15 feet.
- Root Decay: Since it is difficult to notice visually, it is important to utilize a metal probe to determine whether the buttress and main roots have at least 60-70 percent sound, then the tree is conclusively safe.
- Stem Girdling Roots: after trees are planted too deeply, a widespread decay at the root collar will become visible. Some observable features of decay will be stunted growth, parched foliage, irregular leaning, and lack of a characteristic trunk such as early leaf coloration and leaf fall. If this method proves inefficient, tree risk inspections using specialized diagnostic tools may be necessary.

7. Weak Branch Unions

Description

Weak Branch Unions lack an upturned ridge of bark between the stem and branch called the branch bark ridge. The ridge is found on the uppermost part of the union. There are a number of factors that cause trees to have weak branch unions, such as injury or even environmental stress. While weak branch unions are not limited to any particular tree species, it has been observed most frequently in the green ash, hackberry, boxelder, red maple, silver maple, amur maple, cherry, and willow. There are two types of weak branch unions that lead to tree failure.

- Included bark occurs when a branch or stem grows so closely together that the bark grows between the branches, inside the tree. Since bark does not adhere to wood, the branch is further removed from the tree



- Epicormic branches result when a tree has been injured or pruned incorrectly; and a new sprout forms on a preexisting stem, growing rapidly and becoming heavy before the tree is ready to support the new branch. These types of branches are very likely to fail.

Severity Levels

High risk of failure-a weak union that is cracked, cankered, or decayed, and/or a large epicormic (shallowly attached) branch on a decaying stem

Moderate risk of failure-a branch or co-dominant stem with included bark (bark growing inside tree)

Low risk of failure-strong branch unions

How to Measure

Thorough visual assessment of the tree is a reliable method of analyzing potential risk.

Abridged Guide to Inspecting Trees
August 2006

Tree Location

To ensure that the evaluation information obtained is usable, it is necessary to record the precise location of each inspected tree. Thus, the Tree Risk Inspection Form contains a column for recording street addresses and tree numbers. The street address should include both number and name of street; and if no number is present inspectors should assign one based on the addresses of adjacent properties. Tree numbers ascend with the property numbers on each side of a given street, and a number should be accordingly assigned to each tree (please see example following the Guide to Inspection section.) If necessary, additional information regarding the tree's location may be recorded in the Tree Risk Inspection Form "Location" or "Comments" box. Such data includes categorizations of placement such as:

Tree Lawn – located between sidewalk and street
Lawn – within ROW with no sidewalk present
Tree Pit – in cutout of sidewalk
Behind Walk – within ROW, between sidewalk and private property
Private – private property, but hazardous to ROW

Tree Categorization

To aid tree identification and cumulative information collection, it is important to record each tree's species and DBH. This data is also recorded on the Tree Risk Inspection Form.

Defect Codes

The section of the Tree Risk Inspection Form regarding the specific defects that are weakening or killing a tree is vital to the analysis of defect patterns; and may also be of use in determining the appropriate action to recommend. For the convenience of inspectors, the code acronyms and their meanings are included on the Risk Inspection Form.

Factors in Determining a Risk Rating

Probability of Failure (1-4 points)

Low (1 Point): minor defects present
- minor branch or crown dieback
- minor defects or wounds
-

Moderate (2 Points): several moderate defects present

- stem decay within safe shell limits (i.e. more than one inch of sound wood for each six of stem diameter)
- cracks without much decay
- defects on approximately 30-40% of tree's circumference
- weak branch union with included bark
- stem girdling, with less than 40% of circumference compressed wood
- root damage, less than 40% within the CRR

High (3 Points): significant or numerous defects present
- stem decay beyond safe shell limits (i.e. less than one inch of sound wood for each six of stem diameter)
- cracks in contact with other problem areas or the soil
- defects on more than 40% of tree's circumference
- crown damage: over 50% for hardwoods and over 30% for pines
- weak branch union with cracks or decay
- stem girdling, with over 40% of circumference compressed wood
- over 40% of roots within the CRR damaged
- leaning with recent root breakage, soil mounding, cracking, or extensive decay
- dead tree without other significant defects

Extremely High (4 Points): numerous significant defects present, or visual obstruction of traffic signals
- stem decay or cavity beyond safe shell limits with severe cracks
- stem or branch cracked and split in half
- defects on over 40% of tree's circumference with cracks and decay
- weak branch union with cracks and decay
- leaning with recent root breakage, soil mounding, cracking, and extensive decay
- dead branches: hangers or with cracks
- dead tree with other significant defects
- visual obstruction of traffic signs, lights, or intersections
- physical obstruction of traffic, pedestrian or vehicular

Size of Defective Parts

Less than 6 inches (1 Point)
Between 6 and 18 inches (2 Points)
Between 18 and 40 inches (3 Points)
Over 30 inches (4 Points)

Target Rating/Priority

Lawn or sidewalk (1 Point)
Residential Street (2 Points)
Arterial street, residential district (3 Points)
Primary utility, a building, or arterial intersection (4 Points)

Risk Rating

To determine a final score for an evaluated tree, inspectors will add the numeric results of the Probability of Failure, Size of Parts, and Target Rating categories. This number is the Risk Rating and determines the urgency of action for pruning or removal. If absolutely no defects are discovered, a zero may be recorded for any or all categories. Thus, the risk ratings range is from zero (a tree that is in good health and requires no maintenance) to sixteen (a tree in terrible condition and a threat to the community.)

Action Codes

Once the tree has been evaluated, it is necessary to determine the appropriate action. Action code acronyms and their meanings are given on the Tree Risk Inspection Form for convenience of use. These codes are informed recommendations based on observed tree conditions.

Crown Reduce (CR) – High Priority – defects in trunk, limbs, and scaffold; or co-dominant leaders with included bark – scaffold length must be reduced to avoid trunk or branch failure

Prune Safety 1 (PS1) – High Priority – high risk of large part failure and target damage

Prune Safety 2 (PS2) – Lower Priority – lesser risk of failure and target damage

Remove H01-H12 (RH) – Priority Varies – highest priority for removal (H12) means highest risk of failure or of striking a target; and lowest priority (H01) for trees with lowest risk of failure or damage to target

Remove Dead (R) – Remove dead tree

Stump (S) – Remove stump

Inspector Comments

The comment section of the Tree Risk Inspection Form is provided for additional information that inspectors may feel is significant for the tree evaluation. Such data includes resistograph results and justification for a recommendation not to replant at the site. Inspectors should initial these additions in case they must be contacted for further information.

Actions Taken

It is beneficial to record when and what actions were taken as a result of the inspectors' evaluation of a tree. This information allows the City of Geneva to maintain a record of

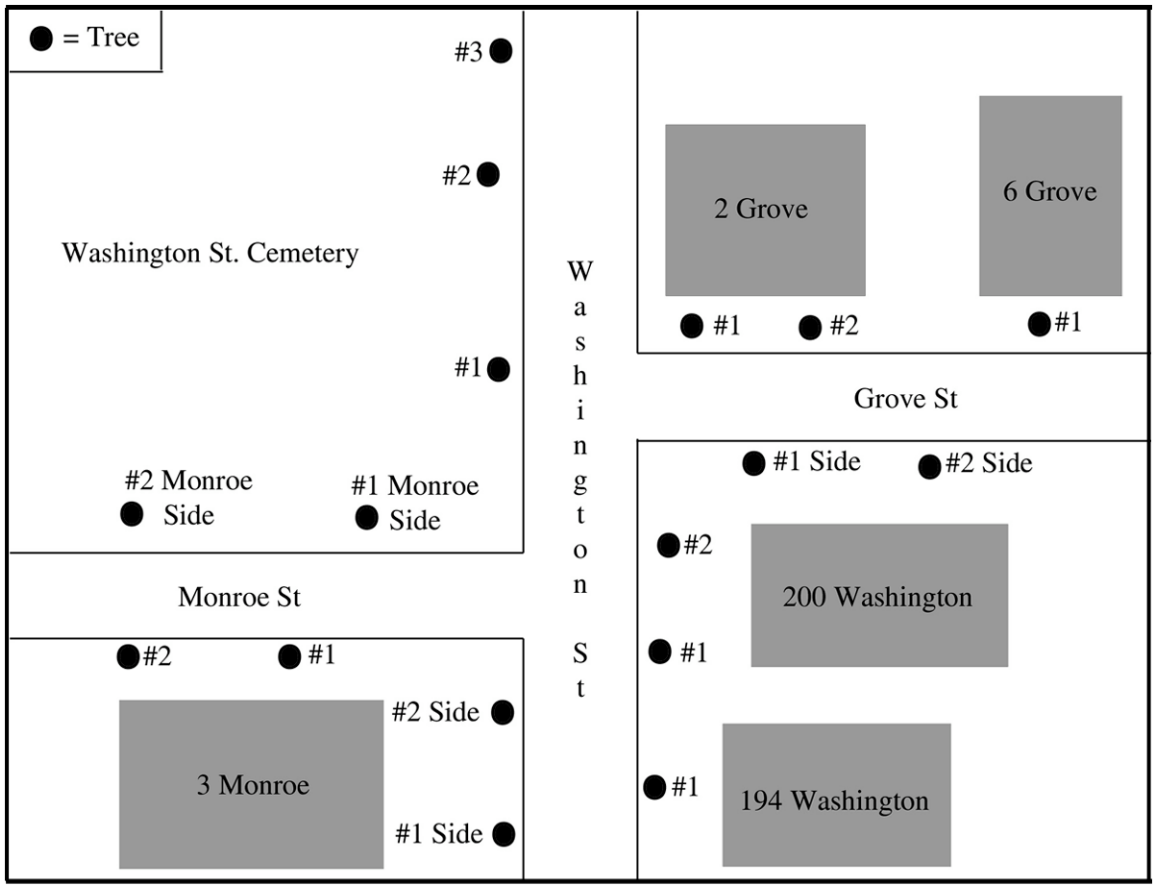
how the municipality handles defective trees and tree complaints. Additionally, an awareness of what its predecessor suffered may aid in the choice of an ideal replacement tree for the site.

Hazardous Tree Evaluations

As opposed to the general Tree Risk Inspection Survey Form, the Hazardous Tree Evaluation Form is intended as a record of an inspector's responses to trees that are in definite need of action, and called to attention during a general survey or by a complaint. These records serve as a form on which to organize action by priority, and justification for the municipality's action, in the event that there is question or liability due to a tree hazard. The components of the Hazardous Tree Form are similar to those of the Tree Risk Form, with the addition of the Priority section.

Priority Action Trees

A tree's risk rating and specific defects determine the priority of a tree in need of action. Trees of highest priority must be submitted first for maintenance or removal. Ranking trees in terms of need ensures a logical and methodical approach to tree management and risk reduction.



Some of the above addresses have been changed in order to clarify the tree numbering system.

Represented above is a diagram of the tree numbering method. The city is sectioned off according to property lines, and these property lines also delineate groups of trees. So, each property with trees will have a number 1 tree, and number 2, and so on. Tree numbers ascend with the address numbers on a street. For example, on the right side of the above diagram the addresses on Washington Street go from 194 to 200. The address numbers are growing as one moves towards the top of the page. Thus, in the ROW within the property lines of 200 Washington, the tree nearer to 194 is number 1, while the tree farther up (towards higher addresses off the map) is labeled number 2. The same principle can be seen applied to the trees along the shown section of Grove Street. When the trees in question are at a corner address, it is important to verify which street the specimens face. Therefore, one must ascertain the street on which the property fronts to demarcate what trees will be labeled "Side." As shown above, 3 Monroe was found to face Monroe Street, so the two trees on Washington were labeled with "Side" in addition to their numbers. Notice that the "Side" trees facing Washington still follow the same ascending address numbering system as the 200 and 194 Washington trees. The trees of any property at which an address can not be found and must be assigned will still follow this system. Public area ROW trees (such as those of the Washington St. Cemetery) can also be labeled in this fashion, using adjacent address for guidance.

Common Defects within Tree Species Groups

Species Group	Commonly Detected Defects	Comments
Ash	Weak unions Poor architecture Branch breakage	Weakness with included bark and pattern of opposite branching Several co-dominant stems common Trees over 15" DBH may shed branches
Aspen	Decay Canker Root problems	Canker-rot fungus prevalent in older trees Cankers can cause stem breaks Root girdling
Basswood	Decay Branch breakage	Sizeable columns of decay prevalent in older trees Trees over 15" DBH may shed branches
Birch	Decay Root problems Dead tree tops	Stem canker-rot prevalent Roots suffer from soil compaction or high soil temperature Root damage may leave tree at risk to boring insects
Black Cherry	Branch breakage	Dead branches decay quickly in this species
Boxelder	Decay Branch breakage	Rapid and pervasive decay of wood Trees over 15" DBH may shed branches
Cottonwood	Root problems Branch breakage	Root girdling Sizeable older trees may shed branches
Elm	Dead branches or tree Root problems	Result of Dutch elm disease Root girdling Included bark
Hackberry	Cracking Weak unions Branch breakage	Cracking often found in lower area of stem Weakness a result of trees' growth pattern Trees over 15" DBH may shed branches
Hawthorn	Weak unions	Weakness a result of branching pattern
Hickory	Branch Breakage	Trees over 15" DBH may shed branches
Honey locust	Cankers Root problems Branch breakage	Cankers from insects or fungus common Root girdling Trees over 15" DBH may shed branches
Ironwood	Root problems	Shallow roots likely to be damaged
Maples (red and sugar)	Cracking Cankers Weak unions Root problems	Early wounds turn into cracks as trees get older Cankers from insects or fungus common Produce co-dominant stems with included bark Root girdling
Maples (silver)	(See maples above) Branch breakage	Easily fractured wood leads to cracks Trees over 15" DBH may shed branches

(Common Defects cont.)

Species Group	Commonly Detected Defects	Comments
Oaks (red)	**Decay** Dead branches Dead tree Branch breakage	Vulnerable to brown-rot decay or Damage by boring insects or root decay common Oak wilt disease Trees over 15" DBH may shed branches
Pear	Weak unions	Included bark and multiple branching are common
Walnut	Branch breakage	Trees over 15" DBH may shed branches
Willow	Cracking Root problems Branch breakage	Easily fractured wood leads to cracks Root girdling Trees over 15" DBH may shed branches
All conifers	Decay Branch breakage	Canker-rot fungus prevalent Resulting from heavy snow or high winds
Balsam fir	Decay Dead top	Decay often in the root collar and stem Needles or cambium are attacked by insects
Pines (jack and red)	Dead top or tree	Needles or cambium attacked by insects Cankers (in jack)
Pines (white)	Branch breakage Dead top or branches	Easily fractured wood leads to breakage Due to white pine blister rust
Spruces	Root problems	Vulnerable to wind-throw because of shallow roots
Tamarack	Root problems	Root rot