TREE RISK INVENTORY

Examined • Identified • Measured • Recorded

Report
April 2022

Town of Nashville

in cooperation with

NC Forest Service
Urban & Community
Forestry Grant Program & Treefull Communities, LLC

Town of **Nashville**
Parks, Recreation, and Cultural Resources

EXECUTIVE SUMMARY

This document reports the findings of the Level 2 Basic Assessment Tree Risk Inventory conducted in the Town of Nashville, North Carolina in January and February of 2022.

Results

Number of Trees: Approximately 268 trees were inventoried

Species Diversity: An impressive 30 species comprised the risk portion of Nashville's inventoried trees with Loblolly Pine (56%), Willow Oak (10%) and Southern Red Oak (4%) being the most abundant.

Tree Condition: The majority of Nashville's risk evaluated trees (72%) are in good condition. 23% are in fair condition and 4% are in poor condition.

Tree Size: 29 of the inventoried trees have diameters less than or equal to 12 inches and the remaining 239 have diameters greater than 12 inches.

Tree Problems: The most frequently identified concerns are co-dominant stems and decay.

Maintenance Actions: There were only 4 trees identified as high risk (#3 rating) which require immediate action to mitigate impending failure. 26 trees were identified as medium risk (#2 rating) and should be monitored over time through regular inspections, especially after severe weather events, since such events and/or just age over time could ultimately place those trees in the high risk category. All remaining 238 trees were rated as low risk (#1 rating). It is important to note here that the risk rating assigned to each tree for the most part is unrelated to failure probability and tree condition. Risk is assessed as a combination of tree stability in relation to manmade targets such as buildings, parked cars, park facilities and most importantly, people. A tree identified as one with impending failure in a remote location with little to no foot and automobile traffic, structures or facilities will still be identified as low risk due to there being no target in the event of failure. In order to maximize the benefits of this tree inventory, other non-risk related maintenance actions were identified as well as included in the comments section for each tree.

Recommendations

Removal of identified trees that pose a high risk to people and property should be a priority, followed by the pruning of certain trees that pose a high or immediate threat.

Retain and maintain existing large and older trees where possible. Promote the importance and benefits of large-maturing species and mature, properly maintained trees within the Town of Nashville.

Young trees should be structurally pruned to promote proper form as they mature. Structural pruning should occur every 3 years for the first 9-12 years.

Species diversity should be increased, even if the current urban forest is well diversified. Select trees to plant in areas where large-maturing varieties are appropriate and choose species other than those already present. Avoid planting trees which currently make up more than 10% of the Nashville tree population.

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INTRODUCTION

At the request of The Town of Nashville, a Level 2 Basic Assessment Tree Risk Inventory of all trees on public property was conducted in January and February, 2022. The species composition, size, health, risk rating and current maintenance requirements of each tree was identified and evaluated.

The goal of the project was to evaluate the risk potential, characteristics and condition of Nashville's trees and to provide recommendations for maintenance and planning of future budget needs. This information will provide The Town of Nashville with the opportunity to maximize the value and benefits of their publicly owned trees and minimize the problems associated with them. Two significant advantages of the tree inventory are that:

- Administrators and managers will have an increased awareness of the current magnitude, condition and needs of their tree resource, and

- The data establishes the baseline for information about the trees that can be updated as they are planted or removed, work is completed or tree conditions change.

Ideally, this inventory allows the community and its partners to efficiently and effectively manage the future of their publicly owned trees.

Practical goals that can be realized include:

- Mitigation of tree risk

- Improved response to public inquiry

- More efficient scheduling of labor and equipment

- Realistic budget requests and long-term planning

- Improved coordination between municipal and private services

DATA COLLECTION AND INVENTORY METHODS

For the Nashville inventory, trees were individually examined, identified, measured and recorded. The information collected for each tree included: location by Google Earth, species, size (DBH), condition, risk rating and maintenance requirements. The work was carried out by a Certified Arborist, accompanied by various employees from the Town's Parks, Recreation and Cultural Resources Department, and especially in the presence of the Assistant Director, Ashley Hamlet. Data was collected with the Urban Forest Metrix tree inventory software. The following information was recorded for each tree as described below:

Location – All trees are located with GPS coordinates.

Identification – Common and botanical name identifies each tree.

Tree Size – Using a Biltmore stick, trees were measured about four and one half feet above the ground in order to obtain the Diameter at Breast Height (DBH). For trees with multiple trunks, only the diameter of the largest trunk was measured and recorded.

Condition Rating – The overall health based on appearance (taking into account observations that include structural soundness, growth rate, and color and density of the crown) was rated. In general, the condition of each tree is recorded in one of the following categories adapted from the rating system established by the International Society of Arboriculture (ISA):

Good – The tree has no major structural problems; no significant damage due to diseases or pests; no significant mechanical damage; a full, balanced crown and normal twig condition and vigor for the species.

Fair – The tree may exhibit the following characteristics: minor structural problems and/or mechanical damage; significant damage from non-fatal or disfiguring diseases; minor crown imbalance or thin crown; minor structural imbalance or stunted growth compared to adjacent trees. This condition also includes trees that have been topped, but show reasonable vitality with no obvious signs of decay.

Poor – The tree appears unhealthy and may have structural defects. Trees in this category may also have severe mechanical damage, decay, and severe crown dieback or poor vigor.

Dead – This category refers only to dead trees.

Tree Problems – Observed conditions may indicate structural concerns, signs of decline in the tree, physical damage, maintenance issues or site limiting factors. Some descriptions which may be used in this inventory include:

Broken Branches which are specifically noted where they are large enough to present a risk, or have an impact on the appearance of the tree.

Cavities which are visible, appear as openings or holes and can be present at the base, on the trunk or on the larger limbs of the tree. They indicate the presence of internal decay but because the size of a cavity opening is not related to the extent of internal decay, the condition should be assessed to determine treatment or mitigation of risk. It should be noted that not all cavities have an exterior opening and other indicators of decay, such as fungal fruiting bodies and carpenter ants, can indicate hidden internal decay and cavities, even when the tree appears healthy and green. Cavities can severely affect the structural stability of a tree.

Competition from Adjacent Trees can occur when two or more trees grow closely together. The sides that face each other are usually sparsely branched or may be completely lacking branches in the shared space due to shade. Generally, this is not an issue for concern as the trees are in equilibrium with their growing site and one another. However, if one of the trees is removed, it may expose the previously protected side of the remaining tree, which may also now appear to have an unbalanced crown. In situations where a desirable tree is being impacted by a less desirable one (due to species, condition or age) it may be recommended to remove the lesser of the two. Some shade tolerant species, such as Flowering Dogwood, perform best under the canopy of a larger tree and are not generally negatively impacted by competition from adjacent trees and should not be removed.

Dead Wood can range in size from dead twigs to large, dead branches. Dead wood is divided into two categories: major and minor. Minor dead wood consists of twigs or small limbs less than two inches in diameter

DATA COLLECTION AND INVENTORY METHODS

and is an indication that a tree is in a state of decline. Major dead wood consists of limbs greater than two inches in diameter, and is considered by most tree experts to be the threshold at which the falling limbs become a hazard to life and property below.

Leaning at an angle of 35 degrees or greater is noted where either a recently planted tree may benefit from being straightened or a tree is leaning following a weather event. Large leaning trees cannot be corrected of this defect, however, assessment of the tree can indicate whether the lean is recent or long-term. Based on observations, a tree may or may not be recommended for removal, but the lean and its significance will be noted and appropriate recommendations made.

Pests/Diseases are noted when the appearance of insects or diseases are apparent.


Root Injury is often a result of mechanical damage from lawn maintenance, construction, utility maintenance, etc. Such injuries can lead to internal decay which can affect the structural integrity of the tree. Avoiding mechanical damage from mowers and string trimmers and protecting tree roots by tunneling or by locating and installing required utilities away from or around trees will prevent most major root damage that occurs beneath the ground surface.

Sidewalk/Curb/Asphalt Damage is a common problem in areas where adequate space does not exist between the curb and sidewalk, particularly for large, old trees. As the roots grow larger over the course of many years, cracks and lifting become increasingly apparent in the infrastructure.

Split Crown is commonly seen in, but not limited to, Bradford Pear due to wind or ice damage. Once a major portion of
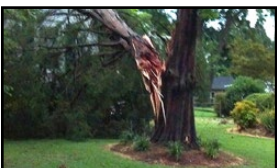
the canopy has broken away, the crown may be unbalanced, similar to a tree that is growing in close proximity to another and removal may be necessary.

Topped trees have had a severe cutting back of limbs to stubs, whether close to the origin of the branch or farther out along the limb. Not only does this disfigure the tree, but it causes stress by removing the leaves which produce food all the way to the roots. A tree

forced to use stored carbohydrates to produce new leaves may be more prone to decline and disease. Should a tree survive topping, the replacement branches are weakly attached and more prone to failure. There are no good reasons for topping any tree, although trees severely damaged by storms or other causes, or certain trees under utility wires or other obstructions may be topped, where proper pruning practices will not address a conflict and tree removal is not an option. Crown reduction by a qualified Arborist is the correct approach where a reduction in tree height is desired.

Trunk Injury occurs mostly in the same fashion as do root injuries. And, in the same way, can lead to internal decay. Even

when a trunk wound has closed over (it can never "heal") the damage and any decay can still impact the structural stability of the tree when internal cavities occur.

Weak Branch Union is a fork, which occurs when two similarly-sized (co-dominant) branches arise from the same location. In young trees, or for smaller-sized forks, this can be addressed by training or structural pruning, respectively. In larger trees, such a fork may require other maintenance and/or monitoring to address any structural issues that exist, due to included bark, decayed wood or a combination of the two.

Risk Rating - A Level 2 Basic Assessment Tree Risk Rating was assigned to each tree. During a Level 2 Basic Assessment, Arborists walk completely around a tree and look for defects in all visible areas of a tree, including the surrounding area. These assessments can include, if needed, the use of a rubber mallet for "sounding" the tree and probes that can be used to evaluate open cavities. During an inventory, or as part of a tree risk assessment project, the Arborist can determine whether some aspect of tree structure or health indicates that a more comprehensive tree structure evaluation (Level 3 Advanced Assessment) is needed to more thoroughly evaluate tree condition and risk of failure. Whether part of an inventory or as a separate project, trees are presented in a risk assessment and mitigation report with noted defects and observations.

Maintenance Actions - By applying these recommendations, some of the "conditions" affecting the tree will correct, improve or mitigate the concern. In order of priority:

DATA COLLECTION AND INVENTORY METHODS

Remove Tree when the tree is either dead or is structurally unsound and cannot be mitigated due to the severity of the issue or the existing target.

Monitor when, due to an existing condition, the tree should be placed on a monitoring schedule for the remainder of its life, to address maintenance, mitigation or other actions as the tree ages.

Remove Dead Wood as it appears, is the removal of dead limbs. To manage risk, branches two inches or greater in diameter should be promptly scheduled for removal.

Remove Broken Branches such as hangers and other broken limbs to avoid damage or injury. They may not be a concern where no target exists.

Routine Prune is recommended for trees, as they all benefit from timely removal of dead, damaged, decayed or diseased wood, as well as for structural reasons, or sidewalk and utility clearance.

Raise refers to the removal of the lower-most branches of the tree, usually to reduce conflict with pedestrians, vehicles or line-of-sight for signs, road access or other visibility issues, or as the tree increases in height and caliper, eventually leaving adequate space for walking beneath. This practice, and any other pruning activity, should never result in the removal of more than 25 percent of the tree's live crown.

Reduce is the reduction of the canopy, as opposed to the destructive practice of "topping" and involves removing the end of a branch at the juncture of a lateral branch that is at least one third of the size of the main limb. This method does not stress the tree and it also promotes strong branch attachment.

Corrective Prune is done to improve branch structure for the long and short-term. When performed on young trees, it is inexpensive and highly effective and can be called **Training Prune,** while for larger, mature trees it may be referred to as **Structural Prune**.

Cleaning Prune is the process of removing dead, diseased, dying or otherwise damaged/defective branches from a tree. This both reduces the risk of human safety hazards and promotes health and good structure in the tree itself. By eliminating defective branches, pruning can improve a tree's allocation of nutrients and enhance photosynthetic productivity. A pruned tree will be more efficient and less stressed as now it can better channel resources to functioning parts of the tree and is not attempting to preserve dying sections. Thinning dead, diseased or damaged branches also limits possible routes of entry for disease and reduces the risk of already present disease or decay spreading to the remainder of the tree.

Treat Insects/Disease when a tree is being impacted by a problem that warrants treatment, depending on the problem and severity. Common examples include various types of aphids and Powdery Mildew on Crape Myrtle, or Septoria Leaf Spot and Spot Anthracnose on Dogwood. These conditions can be treated with an insecticide or fungicide when appropriate.

Mulch too deep.

Add Mulch is recommended when it is lacking or insufficient. The mulch layer should be between 2-3" or 4" on sandy soils; thick enough to keep out weeds and extend outward from the trunk to, or beyond, the outer most branches of a young tree, and not placed in contact with the trunk.

Remove Excess Mulch is a recommendation often used in landscaped areas due to the habit of mounding mulch around and up the trunk of the tree, similar in appearance to a cone or volcano. This is both a wasteful and detrimental practice. Trees can develop adventitious and girdling roots, or may simply slowly decline.

Remove Stakes/Guys is necessary when new trees are staked at the time of planting but no one returns to remove them after establishment. All hardware should be removed within one year of planting, if staking is even necessary at all. Left in place, the tree can be girdled by the guys as it increases in diameter. This will either kill the tree above the guy, or if it survives, create a weak point in the trunk resulting in failure.

Remove Basal Sprouts refers to the removal of a proliferation of sprouts around the base of the tree. This form of maintenance is commonly required in Crape Myrtle, and is often enhanced in response to repeated topping of that species.

Remove Brush/Vines refers to saplings, shrubs or vines that may be growing around the base of the tree or on the trunk and into the crown. This unwanted plant growth competes for nutrients and light and stresses the tree in general. Vines in particular must be carefully cut at the base so as not to injure the trunk of the tree.

Replace the tree when it has been recommended for removal because of decline, death or injury and the site is suitable to plant another tree in the same or nearby location.

General Notes – This section is reserved for notations in regards to location and additional maintenance actions and tree problems. Unique qualities related to exceptional size, etc., such as "Champion Tree" may be noted here as well.

CHARACTERISTICS OF THE TOWN OF NASHVILE URBAN FOREST

The characteristics of the Town of Nashville urban forest include species, diameter and condition. By identifying these aspects of the Nashville trees, one can learn much about the forest's composition, size and health. It is important to know the species as well as the number of trees present in a location. Species composition data is essential in that tree species vary considerably in life expectancy, structure and form, maintenance requirements, as well as susceptibility to certain pests and diseases. These characteristics affect management issues such as types of maintenance, frequency of activities and budgets. Similarly, tree diameter can help to estimate the relative age or maturity of the tree population. The condition assessment helps to develop a plan of action to both improve existing tree conditions, so they can better withstand stress, and to improve their future management on the site in order to maintain good health and condition.

Species Diversity

Of just the 268 trees inventoried, the Town of Nashville urban forest boasts 30 species with Loblolly Pine (56%), Willow Oak (10%) and Southern Red Oak (4%) being the most abundant. In general, no one species should account for more than 10% of the total tree population, and no group of species should account for more than 20%. This is a useful rule of thumb for maintaining a broad diversity of urban trees and it also creates a good starting point for Nashville. The reason for these guidelines is to avoid having a large number of trees succumb to a problem at one time, whether a pest or disease, response to ice or wind, or aging into mortality all at the same time. This can have a significant impact on available budgets. An example of this is the over-planting of American Elms and the resulting impact of Dutch Elm-Disease, or the recent introduction of Emerald Ash Borer.

Diameter Distribution (Relative Tree Age)

Tree diameter is not only a measure of tree age and size, but it is also a valuable indicator of the benefits provided by trees. Generally, trees increase in size with age, along with the value and the magnitude of the benefits they provide. An uneven-aged population is desirable for managing tree maintenance costs over time. There must be a sufficient number of younger, smaller trees in the tree population to account for the loss of trees over time and thereby maintain a sustainable urban forest. Trees provide the most benefits as they reach maturity, but without early and less expensive maintenance when they are young, their care becomes significantly more costly.

CHARACTERISTICS OF THE TOWN OF NASHVILLE URBAN FOREST

Figure 1. Species Overview
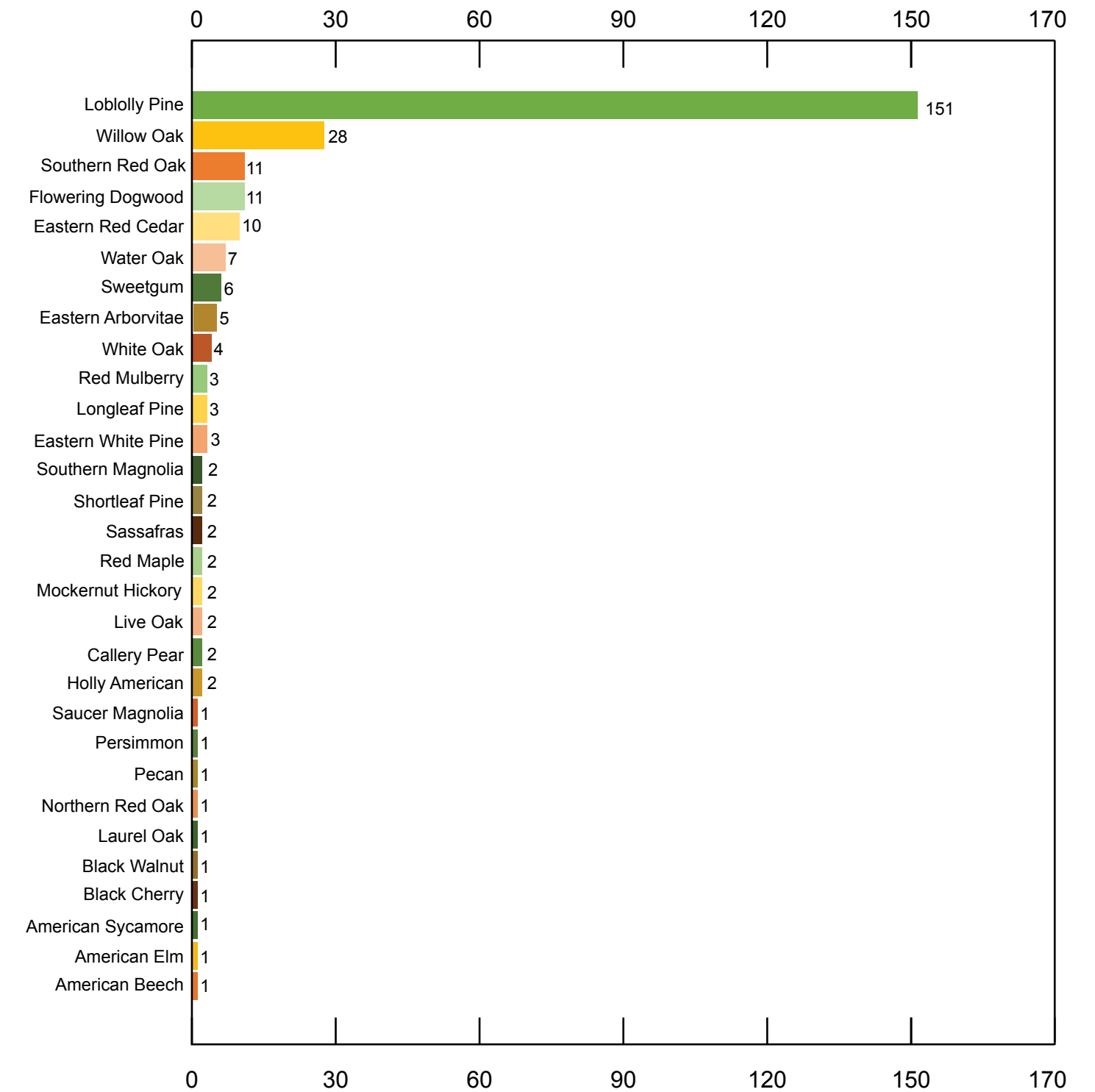
CHARACTERISTICS OF THE TOWN OF NASHVILLE URBAN FOREST

General Health and Condition

Trees were evaluated and, based on their overall outward appearance, were assigned one of four condition classes: good, fair, poor or dead. The condition class takes into account more than just the abundance of green leaves. Condition was based on visual observations of the trees' crown, trunk and any visible roots. Indicators of stress such as the dieback of twigs and epicormic shoots along the trunk or branches can cause the condition rating to be less than good. Other factors, including the presence of decay and cavities, depending on their extent, can also reduce the condition rating.

Tree with lightning damage

Figure 2. Tree Condition

Good   Fair   Poor   Dead
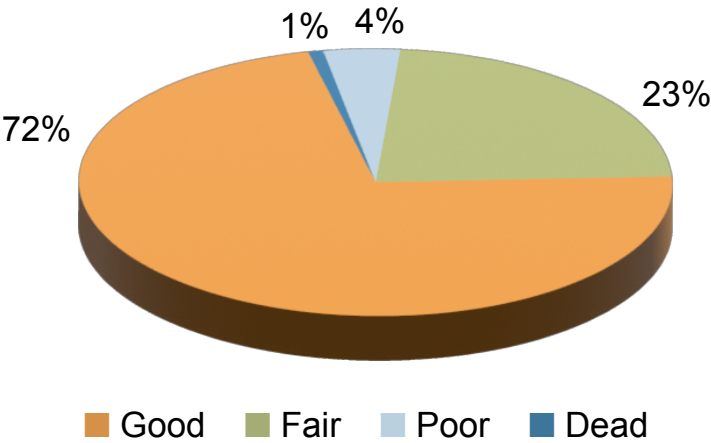
Routine Maintenance to Reduce Future Tree Problems

A pruning regime should start when the trees are young with training pruning, an inexpensive investment into the future form of the trees by reducing the development of crown structure issues. Early and ongoing maintenance of the younger trees will maximize the ecosystem services provided by these high value members of the urban forest and help ensure that they will contribute to the Nashville infrastructure for many years to come.

Mature trees will benefit from structural pruning to reduce issues such as an unbalanced crown, or an over-extended limb or crowded branching. Pruning these trees can help reduce the potential for eventual storm breakage that could damage the tree to the point that it must be removed

Maintenance Needs

Recommendations for each tree's general maintenance needs and/or corrective actions were recorded. These actions are based on a combination of the previously described Tree Problems and the Condition Rating of the tree. In many cases there is more than one maintenance need recommended per tree. Priority should be given as assigned by risk rating in the inventory (low, medium, high). The recommended actions should be taken within the constraints of the Town of Nashville's Urban Forestry budget.

URBAN FOREST MAINTENANCE AND MANAGEMENT RECOMMENDATIONS

Much like any natural resource, the urban forest needs to be conserved and managed. A tree inventory is an important tool in managing and planning urban tree populations. By providing complete and up-to-date information about the diversity, condition, and size of trees, a tree inventory enables the community to care for the existing trees as well as plan intelligently for those of the future.

Recommended Actions

<u>Planting & Replacement</u>

Specifically, these plantings should focus on large-growing, native shade trees such as the Oaks (White, Scarlet, Southern Red, Swamp Chestnut, Nuttall and Shumard), Maples (Red and Florida), Tulip Poplar, Bald Cypress, American Beech, Hickory, Winged Elm, American Basswood, Black Tupelo and Sycamore (not highly recommended as street trees but adapts well in urban environments where there is adequate planting space with no overhead electric lines). In confined spaces, such as where there are overhead electrical conductors, existing planting strips which are less than four feet wide and in sidewalks, smaller native varieties should be used such as Carolina Cherrylaurel, Flowering Dogwood (in shady areas only), Eastern Redbud, American Hornbeam, Carolina Silverbell, Sourwood and Downy Serviceberry.

Careful species and cultivar selection are necessary. When developing bid specifications for nurseries, it is recommended that specific cultivars be named, as well as transportation and handling according to ANSI Z60.1 standards. Whether using Town staff to plant trees or contracting, planting Best Management Practices should be followed according to ANSI A-300, Part 6 – Tree, Shrub and Other Woody Plant Management – Standard Practices (Planting).

<u>Management Issues</u>

To maximize the longevity of the trees in maximum health and condition requires some changes:

• **Lawn Maintenance** – Training of maintenance staff and monitoring of work is strongly recommended. Although not a major problem in this phase of the Town of Nashville Tree Inventory, the mechanical damage caused by mowers and trimmers creates wounds that open the trees to decay and that decay can become a significant complicating factor in the management of Nashville's trees. Avoiding further damage is a priority if the urban forest is to continue to serve the Nashville into the future. This means that workers should be trained on "why" avoiding damage is important and how to avoid causing more injuries, and then be periodically assessed as to their success in implementing change.

• **Mulch** – Not only is mulch an important cultural practice that benefits tree health, but the correct application of mulch can also provide protection to trees and tree roots from mechanical damage. Mulch can reduce the extent of mowing required as well as provide visual boundaries for lawn maintenance workers.

Ideally, mulch should be installed, or raked or added as necessary to provide soil cover and limit turf competition. Additionally, an educational outreach to Town staff might help in engaging them to support the mulching activities and reduce complaints.

Tree Maintenance Recommendations

The purpose of this report is to provide a snapshot of the current structure and maintenance needs of the Nashville tree population from a tree risk standpoint. Based on the data collected and presented in this report, any recommendations should be carried out in accordance with and conform to written specifications from the tree care standards provided in ANSI A300 and follow safety standards in ANSI Z133.

As previously discussed, the maintenance requirements for each tree is determined from observations of the base, trunk, large branches and canopy of the trees. These recommendations are the basis for the development of appropriate and realistic management goals. The implementation of the recommendations will allow the Town of Nashville to realize the full potential of the urban forest through the most cost-effective use of available funds.

When collecting the inventory data, each tree requiring removal and most types of pruning was assigned a risk "priority rating" of low, medium or high based on observed issues which can increase chances of tree failure in relation to existing targets such as buildings, parked cars, playground equipment, etc. This evaluation is not to serve as a guarantee of tree failure or stability, but merely as a guideline in prioritizing tree maintenance.

Removals

Based on this inventory, the Town of Nashville had only six trees recommended for removal as of February 2022. The removal of trees identified as needing priority removal based on risk rating, as well as those that should be scheduled for removal at a later time, will bring a more proactive approach to managing Nashville's trees.

Pruning

At the time of the inventory there were around nine trees listed as requiring some form of pruning. Improving the branch structure (cleaning and structural), removing deadwood and training will

URBAN FOREST MAINTENANCE AND MANAGEMENT RECOMMENDATIONS

benefit the trees. The largest challenge remains prioritizing these trees to ensure that those with the greatest long-term potential remain on the site, so that the budget targets such trees before spending funds on the ones with other issues or decline that limit their long-term potential. Any pruning work must follow the ANSI A300 Part 1 – Tree, Shrub and Other Woody Plant Management – Standard Practices (Pruning) and Best Management Practices.

Maintenance and Monitoring Plan

Once the removal, pruning and additional maintenance of the specified trees have been completed, attention should be given to establishing a routine monitoring and maintenance cycle. This on-going cycle should be structured enough to ensure inspection of all trees on a time frame advised by a Certified Arborist working with the Town tree staff on a long-term basis to manage Nashville's trees.

The advantages that result from establishing a routine mainte-nance cycle will:

- Maximize tree crew efficiency, whether contracted or in-house
- Reduce routine pruning costs by improving tree structure and health
- Prompt identification and management of risk tree conditions
- Decrease tree mortality through the early identification and treatment of disease and insect conditions
- Reduce future tree damage from storms

In addition to planning, there is also a need to establish proce-dures to ensure that the Tree Inventory information is kept up to date. Inspections following major storm events, even when no immediate or serious damage has occurred is advised, with any observed issues documented and immediately entered into the inventory with the required maintenance scheduled.

Problem Tree/Action List

Tree ID#	Species	DBH	Tree Condition	Risk Rating	Action
11	Willow Oak	31	2 poor	2-medium	Prune
20	Willow Oak	34	2 poor	3-high	Remove
21	Willow Oak	30	2 poor	3-high	Remove
25	Willow Oak	31	2 poor	1-low	Remove
26	Water Oak	28	2 poor	2-medium	Remove
63	Willow Oak	2	2 poor	1-low	Replace
64	Loblolly Pine	24	1 dead	1-low	Replace
74	Loblolly Pine	33	2 poor	2-medium	Remove
85	Flowering Dogwood	15	2 poor	1-low	Remove
90	Eastern Red Cedar	32	2 poor	2-medium	Prune
176	Loblolly Pine	14	3 fair	2-medium	Remove
234	Sweetgum	10	2 poor	3-high	Remove
235	Eastern Arborvitae	10	1 dead	3-high	Remove

Managing Mature Trees

Introduction

Trees can weather many storms as they progress from seedlings through maturity and old age, some more successfully than others due to species, location, care, or type of damage. Eventually trees become overmature and decline, if not due to age, then because of the damage and stress they have encountered over the years.

Every tree goes through the same stages, some more rapidly than others, but in nature they follow the same sequence:
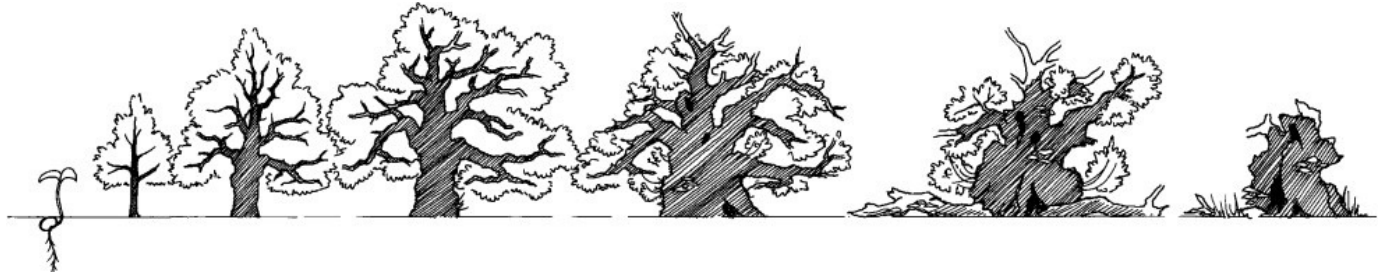
Seedling   Sapling   Young   Mature   Over Mature   Senescent   Dead

Source: <u>Veteran Trees: A Guide to Good Management</u>, Ch 3, 199

In nature, the full life cycle of a tree can occur uninterrupted, aside from fire or other catastrophic events, but in a developed landscape or urban environment, such elderly trees require active management decisions. Managing mature and declining trees, particularly when the goal is to keep them on-site, can be challenging as many factors contribute to the management decisions:

1. Use of the site & targets: frequency of people, vehicles, events and maintenance staff

2. Site maintenance: turf management, equipment use and damage caused to trees

3. History of damage: weather events, construction, utility installation, digging

4. History of management: training, structural and cleaning pruning, mulch, fertilization

5. Pests and diseases: severity and outcomes of infestation or infection, treatability

6. Decay: lower tree root and butt rots, cavities in the trunk and scaffold limbs, dead wood

The final factor that must be addressed when managing mature trees is cost. Infinite funds can be spent on every tree to retain it as long as possible – but how long is "as long as possible"? 1 year? 5 years? 10 years? Where funds are finite, decisions must be made on which trees are the best candidates for maintenance, which trees will benefit most and are likely to survive intact longest. Those that are not good long-term candidates require removal.

Where the line is drawn between removal and maintenance, is budget driven. Limited budgets require decisions that prioritize spending to maximize the presence and condition of trees that will be improved by maintenance, and that have long-term potential to remain on-site, along with removal and planting expenditures.

Trees can fall into several different categories, but time or disease or damage can move a tree into another category at any time. Good cultural practices and proper maintenance are recommended to slow that progression as much as possible.
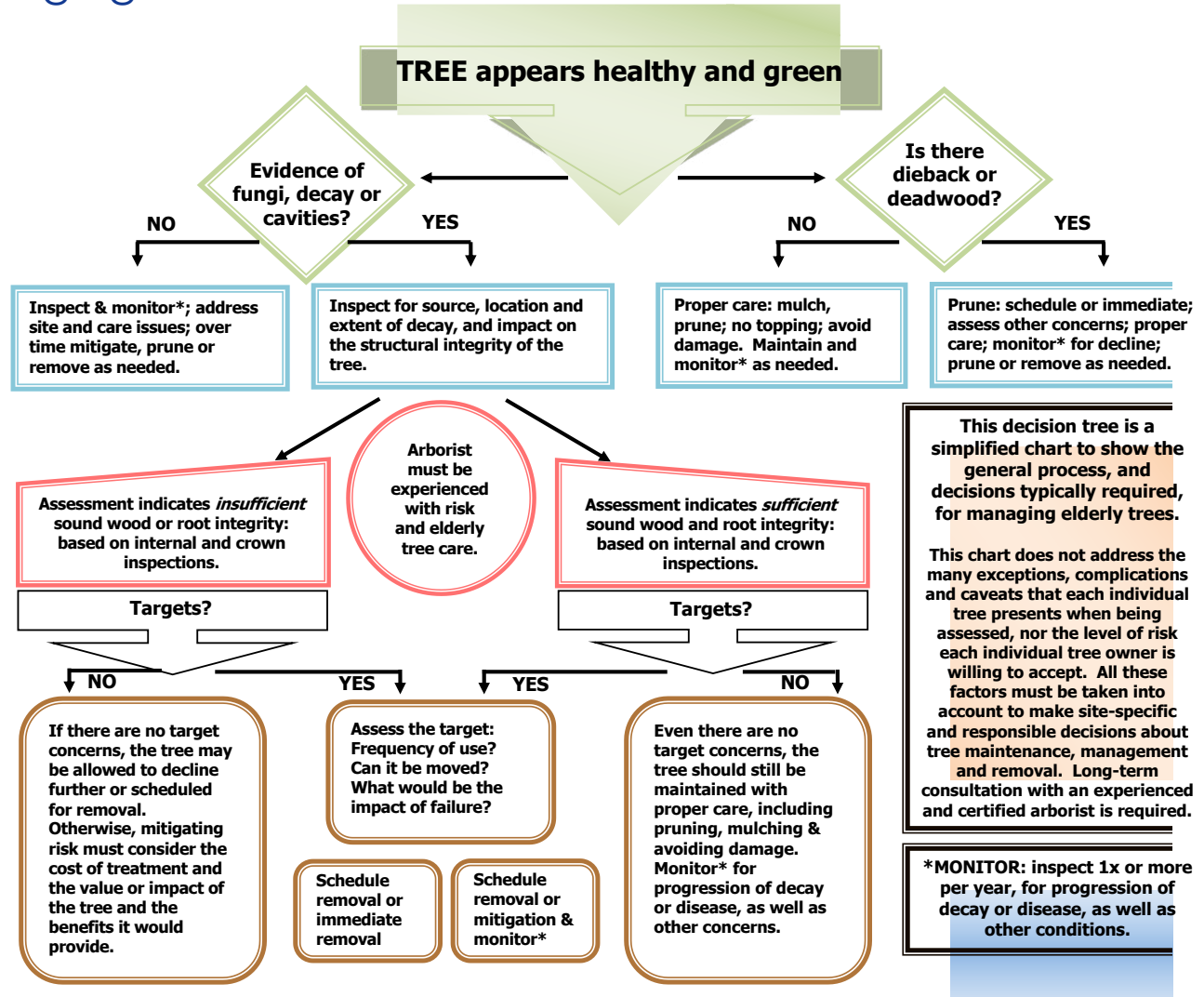
Managing Mature Trees

TREE	Immediate Removal	Removal	Monitor	Mitigate
1. Trees that require immediate removal due to a compromised structural condition, regardless of their contribution to the site.	☐			
2. Trees that do not make much contribution to the site in appearance, shade or location but do not present any immediate risk factors. Removal decisions may be scheduled according to available budget or based on monitoring observations.		☐ to schedule removal		
3. Trees that contribute to the site in appearance, shade or location but show signs of decay. The type of decay, its rate of advancement, and location on the tree may require removal due to the virulence of the fungi, or structural concerns.	☐ based on assessment	☐ based on assessment	☐ assess for action	
4a. Trees that contribute character to the site and present less immediate risk may not require removal. But whether such trees will also benefit from maintenance must be determined, otherwise the trees may be permitted to continue to decline, with no management or maintenance activities beyond deadwood pruning and a monitoring schedule. Trees may remain for an indefinite period of time.		☐ based on monitoring	☐ assess for action; reassess on schedule if not removed	☐ based on results of assessment
4b. Trees that contribute character to the site and have healthy crowns and crown structure, are usually the best candidates for maintenance and long term presence. Eventually the trees may require a reassessment of on-going budget investment as they age and decline, or develop fungal conks or are damaged by storms.		*eventually*	☐ assess for action and reassess on schedule	☐ on-going maintenance as long as deemed appropriate
5. Young trees have long-term potential based on species, condition, structure and location, but may not make a significant contribution in their early stages. But managed with care and maintenance, especially in the early years, will pay dividends in the future.		*someday, far in the future*		☐ on-going maintenance

The most significant issues that most trees face are not the past storm damage or the natural decline of the trees. The most significant issues are:

1. ongoing maintenance damage from management practices and equipment use, and
2. presence of decay fungi, which can be spread due to item 1, above.

The presence of decay fungi is a major complicating factor in assessing and monitoring trees, as many decay fungi increase the rate of decline. And, while fungal species rates of decay and location in the tree may vary, trees must be regularly monitored internally and externally, to make decisions that will address the usage and traffic, the level of acceptable risk and the character of an urban forest, now and into the future.

Managing Mature Trees

TREE appears healthy and green

Evidence of fungi, decay or cavities?

Is there dieback or deadwood?

NO **YES** **NO** **YES**

Inspect & monitor*; address site and care issues; over time mitigate, prune or remove as needed.	Inspect for source, location and extent of decay, and impact on the structural integrity of the tree.	Proper care: mulch, prune; no topping; avoid damage. Maintain and monitor* as needed.	Prune: schedule or immediate; assess other concerns; proper care; monitor* for decline; prune or remove as needed.

Arborist must be experienced with risk and elderly tree care.

Assessment indicates *insufficient* sound wood or root integrity: based on internal and crown inspections.

Assessment indicates *sufficient* sound wood and root integrity: based on internal and crown inspections.

Targets?

Targets?

NO **YES** **YES** **NO**

If there are no target concerns, the tree may be allowed to decline further or scheduled for removal. Otherwise, mitigating risk must consider the cost of treatment and the value or impact of the tree and the benefits it would provide.

Assess the target: Frequency of use? Can it be moved? What would be the impact of failure?

Even there are no target concerns, the tree should still be maintained with proper care, including pruning, mulching & avoiding damage. Monitor* for progression of decay or disease, as well as other concerns.

Schedule removal or immediate removal

Schedule removal or mitigation & monitor*

This decision tree is a simplified chart to show the general process, and decisions typically required, for managing elderly trees.

This chart does not address the many exceptions, complications and caveats that each individual tree presents when being assessed, nor the level of risk each individual tree owner is willing to accept. All these factors must be taken into account to make site-specific and responsible decisions about tree maintenance, management and removal. Long-term consultation with an experienced and certified arborist is required.

***MONITOR: inspect 1x or more per year, for progression of decay or disease, as well as other conditions.**

Decay In Mature Trees

Trees with long-term and repeated injury to the base, basal flare, and surface roots are at a high risk for infection by fungal decay. While some fungal diseases CAN be spread by root grafts between trees of the same species, mechanical damage can be a significant method that the fungal diseases are spread from tree to tree; either by wounding the tree so that fungal spores spread by wind can establish, or by cutting fruiting bodies on one tree and then damaging another tree with those same blades to spread the diseases.

Ganoderma lucidum (or curtisii, or both) and Inonotus dryadeus are two of the most serious fungi affecting trees and, when their fruiting bodies become evident, trees are in a significant state of decay at the base and present a significant risk of failure. Bondarzewia berkeleyi, Laetiporus sulphureus, L. cincinnatus, and Meripilus sumstinei also present serious concerns and, if the decay in the trees is not extensive enough to require immediate removal, they require regular monitoring by a professional experienced in decay assessments. To further expand on the table and decision

tree on the previous pages, retention decisions must be based on a determination of the extent of internal decay, the location of the tree, the exposure of the tree to wind and the general appearance of the tree, with respect to thinning of the crown, as well as the level of monitoring possible.

Whether fruiting bodies are observed on a yearly basis does not mean that trees are free from disease. The trees may simply not be at the point where the spread of the decay has produced fruiting bodies. But other indicators, aside from fruiting bodies, can reveal issues. As a rule, the presence of carpenter ants can indicate the presence of internal decay. Also, trees with thinning crowns MAY be an indication of decay, or merely an indication of stress or other factors contributing to decline.

A policy of long-term commitment to monitoring annual conk production is required, with the subsequent removal or mitigation and monitoring decisions, carried out according to the final policy and practices that are established with the community and their consulting arborist.

Managing Mature Trees

Common Decay Fungi

Bondarzewia berkeleyi

Ganoderma lucidum/curtisii

Inonotus dryadeus

Laetiporus cincinnatus

Laetiporus sulphureus

Meripilus sumstinei

Inonotus ludovicianus

Since these are all annual conks they may not appear every year, even when the fungus is capable of producing a fruiting body. So where the disease is present on surrounding trees, may mean that other trees, without fruiting indicators, may also have fungi present.

# Managing Mature Trees

Managing Risk

Trees can withstand multiple storm events, but commonly they are damaged trees through wind throw and catastrophic limb loss. Proper tree management requires the care of damaged trees to reduce potential for breakage in future storms and the removal of trees that show compromised structural integrity that, should they fail, could cause damage to infrastructure (public or private).

In some situations, especially for communities which are responsible for many trees, the costs for maintaining each and every one of them would be substantial. Therefore, some decisions must be made, based on the budget and on the level of risk acceptable to the Town. Risk level is the acceptance that something could happen to a tree or by a tree. The level of risk acceptance ranges between no risk (e.g. all trees removed, or only small trees replanted) to high risk (e.g. no trees removed or mitigated).

While the list on page 11 and the flow chart on page 12 show the general decision- making processes, and incorporate risk assessment, an explanation of risk and its management may be helpful.

The goal of risk management with respect to trees is to manage the trees so that they can provide the benefits we value in a way that reduces the potential for injury or damage. For trees, that should fall between removing all trees so that they never have the opportunity to fail, and never touching a tree once it has been planted, regardless of its structure or the visible problems.
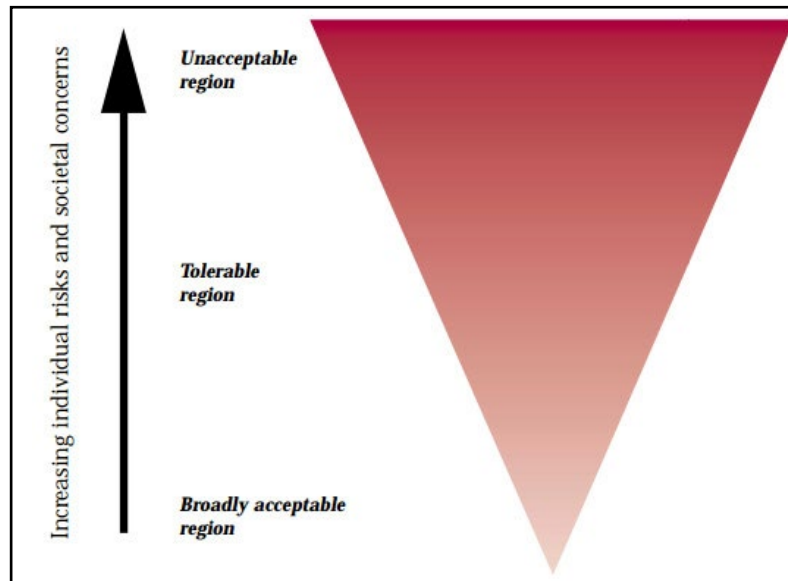
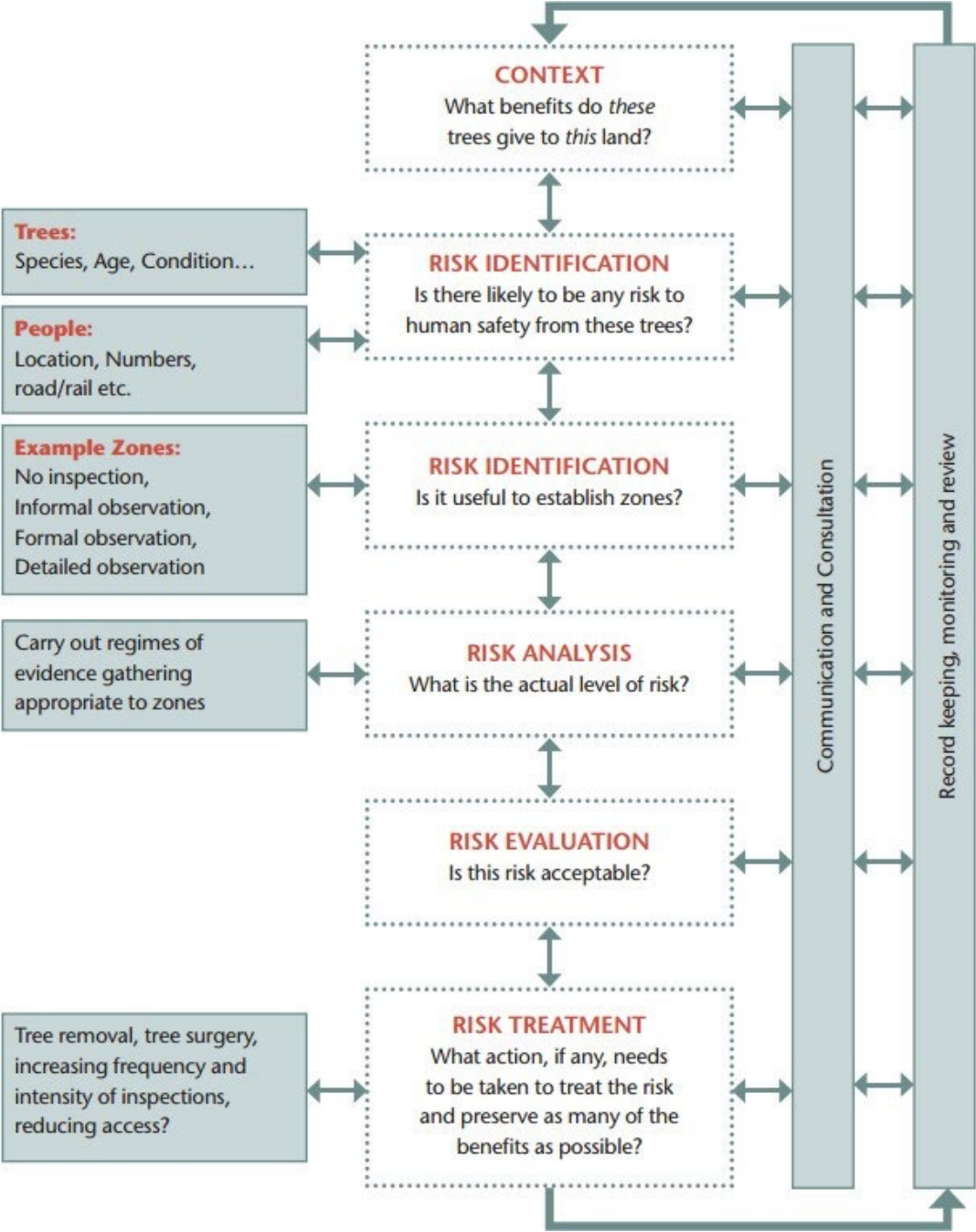**Source:** <u>Reducing Risks, Protecting People,</u> 2001

Assessing tree risk requires the knowledge of a Certified Arborist with Tree Risk Assessment Qualification. The qualification itself and the methodology for assessing risk utilize industry- accepted Best Management Practices. This is the basis on which a community can determine its tolerable or acceptable risk. While simply removing all trees might be the easiest way to reduce risk, it is not the best way to have the benefits that trees provide – and that requires action, whether pruning, removal, or planting – and to do so in a way that retains the existing character of the community, creates a

basis for its future character, establishes a management policy for the future to reach its goals and be financially sustainable.

The "many exceptions, complications and caveats that each individual tree presents when being assessed" as noted in the flow-chart on page 3, is expanded for more detail in the flow chart below. This is why long-term consultation with an experienced and certified arborist is strongly recommended; and why an accepted industry standard for assessing tree risk exists.

Managing Mature Trees

And this is also why an established management policy for the trees and risk should be developed and then carried out: to demonstrate the duty of care in a rational and cost-effective basis to and for the residents of a community.

CONTEXT
What benefits do *these* trees give to *this* land?

Trees:
Species, Age, Condition…

RISK IDENTIFICATION
Is there likely to be any risk to human safety from these trees?

People:
Location, Numbers, road/rail etc.

Example Zones:
No inspection,
Informal observation,
Formal observation,
Detailed observation

RISK IDENTIFICATION
Is it useful to establish zones?

Carry out regimes of evidence gathering appropriate to zones

RISK ANALYSIS
What is the actual level of risk?

RISK EVALUATION
Is this risk acceptable?

Tree removal, tree surgery, increasing frequency and intensity of inspections, reducing access?

RISK TREATMENT
What action, if any, needs to be taken to treat the risk and preserve as many of the benefits as possible?

Communication and Consultation

Record keeping, monitoring and review

Source: Common Sense Risk Management of Trees, 2011

Managing Mature Trees

Why are we spending so much time discussing management, and removals, and decay?

The manner in which the tree failed shows 3 concerns that are shared by many of the other trees on the site, regardless of how green/leafy they may look.

1. Basal Decay – Decay does not have to be externally visible to weaken the structural integrity of a tree; the presence of basal decay fungi is a concern.

2. Root decay – Root decay is generally not visible above ground but the impact can be seen here with a very small root plate that supports and feeds the tree; the presence of decay fungi that affect tree roots is a concern.

3. Target – The street, traffic and parked cars, or even a house across the street, could have been impacted, had the tree fallen in a slightly different direction.

Budgeting to manage trees properly and mitigate existing risk requires context and knowledge.

It should be noted that crown reduction can be a very effective way to mitigate risk as it reduces the size of the crown and leaf area, so that a tree presents less sail to strong winds which are a typical force that results in tree failure. However, trees also need their leaf area to support cell function and tree growth. So any trees treated in this way must have sufficient crown and leaf area remaining so that they can continue to grow and survive.

Some trees may be good candidates for crown reduction, while others would not benefit from the treatment sufficiently to warrant the cost. This is why prioritizing the trees for treatment and working with a certified arborist to monitor and treat the trees is so essential.

Managing Mature Trees

Developing a Management Strategy

Step 1

An inventory of urban trees is the first step to develop a management strategy that will serve the community for years to come.

Step 2

The second step is carrying out the immediate recommendations of that inventory report. The immediate removals and pruning are based on mitigating any immediate risk presented by trees that may be structurally compromised by decay, damage or death and where, should failure occur, the possibility of damage or injury exists. Following through on the immediate recommendations of the inventory is a very important step.

Step 3

Once the immediate work has been completed, the third, longer and more involved, task of managing for the priorities must occur:

1. Healthy mature trees.

2. Structurally sound trees able to withstand extreme weather events with reduced breakage.

3. Canopy and shade that provides a setting for community events and a welcoming place for residents to enjoy.

4. Contributing to the character and quality of life within the community.

5. Maintaining the history of the community.

But when a community has a predominantly mature tree population, managing existing trees while building a new and more resilient tree populations is challenging. Before Step 3 can be fully accomplished, the community must navigate the management of an aging population of trees in a way that retains the existing character and creates a basis for its future character. Out of those efforts, not only will the framework for a management policy become clearer, but the budget requirements and long-term commitments will be more clearly understood.

Step 2.5

The interim step that must occur, before Step 3, is at the crossroads of budget and need. Depending on the number of older trees and their general decline, many trees will require some sort of work to improve their present structure. While each tree might benefit from maintenance work to some degree, the question is: Would that work make a difference in how long the tree would possibly survive and the level it could contribute to the site during that time? What is the cost/benefit ratio of treatment/longevity.

Investing limited funds in the trees that have the best potential for a long-term presence is the main priority, now and in the future. But at the start, it must be expected that many of the older trees will require removal and replacement in the next 1-10 years, which will skew the tree population to young trees and change its character for many years to come.

So the priority for Step 2.5 is buffering the impact of removal and replacement, in order to allow the community to retain a degree of its existing character, keeping some its older mature trees intact.

So selecting some older trees which would benefit from maintenance and ensure their longevity for 5 or 10 years or more, is essential.

To expand on the description in the table on page 11, and some of the considerations, exceptions, complications and caveats that must be considered:

1. IMMEDIATE REMOVAL: That some trees must be removed now, refers mainly to trees with internal or external decay that compromises structural stability and where there is a target. The extent of the decay, and the age and species of the trees, as well as the tree location, are additional factors in this decision.

2. SCHEDULED REMOVAL: Tree may be in a similar condition as the trees listed above, but they do not have the same target potential.

Considerations for both 1 and 2:

- Even if the problems could be mitigated, or reduced in severity, the length of contribution by the tree must be considered to the cost of treating them. Ultimately, the tree will still require removal. This decision should be impacted by cost for multiple treatments and final removal.

- The low risk option would be removal; mitigating the trees now and in the future would be a moderate to moderate/high risk, depending on the condition of the tree, with maintenance and, ultimately, removal costs.

3. MONITORED DECLINE to scheduled removal: Some trees are structurally sound enough to be left in place and observed. As long as they do not present a risk of failure and do not have large dead limbs or hangers, they can remain until their status changes. These trees may be in fair, or even poor, condition, e.g. show signs of past storm damage and/or signs of decline (thin or thinning crowns, dieback of small branches, epicormic shoots along main limbs).

- When the tree status changes, the Town may choose to mitigate risk and retain the tree, or to remove the tree. It will depend on the Town budget and its priorities at the time, for example, if several trees in the area around such a tree had required removal for some reason, maintaining that one declining tree may be determined to be important. Or it could be decided that the tree must be removed so when new trees are planted, they will not be impacted when the time DOES come to remove that long-declining tree.

Managing Mature Trees

- The low risk option would be removal, while leaving the trees and only removing large dead limbs or hangers as required would be a moderate to low risk, as long as the trees were regularly inspected for changes in status.

4a & b. MONITORED & MITIGATED: Some trees are reasonably healthy and may withstand being neglected, but they would benefit from pruning maintenance for structure and for health. This can help extend the life of the tree before it begins to decline, and reduce branching habits that make the tree more prone to damage from storms. These may be younger trees or older trees that have good crown density.

- Managing these trees and budgeting for maintenance it is recommended.

- Low risk could be doing nothing for a long time, but it could also mean that these trees will require removal sooner than if they had been managed properly. Routine maintenance for deadwood and broken limbs is a wise investment.

5. YOUNG TREES: Most young trees are un-managed until they reach a size where their issues are more costly to address. While tree selection, planting and post-planting care are very important, so is training pruning. Trees that are 20' or less can be very inexpensively pruned from the ground to improve their mature structure. This is a cost-effective approach that will pay large dividends as the trees mature.

Further Comments on Maintenance and Trees

Other common issues that must be addressed in any tree management program include mechanical damage. Physical damage by mowers is not only a common problem for many landscape trees but this damage is the primary cause of the spread the fungal decay organisms from tree to tree. Many trees in the landscape are repeatedly injured, not only on the surface roots but on the trunks as well. And the small trees are no less impacted in most situations.

This damage is between the curb and the street, there is no grass here to mow. The "ledge" where damage has been occurring for many years is very visible. The tree continues to try and grow over the wound, its natural response to damage.

Repeated damage to roots cause stress to the trees and opens the trees to decay.

Here, even without any fungal decay organisms present, the combination of repeat damage and tree growth response creates a concave area where water can collect.

Maintenance policies and training are essential for mowing staff.

Mulch is STRONGLY recommended for each tree, or for groups of trees. This may slow the speed of the mowers, as they must not drive over the mulch or mulch beds, but management must decide which investment to protect, staff hours or the trees. Mulch 2-3" in depth, to a maximum of 4", and place so that it is not piled against the base of the trees.

Managing Mature Trees

Other management or maintenance issues to be addressed when managing trees, not just elderly trees:

1. Re-seeding grass or planting around trees: The majority of tree roots are in the top 6-18" of soil and the small feeder roots are necessary for the trees to access water and nutrients and maintain their health and vitality. Disturbance such as soil preparation, adding or removing fill, etc., will affect the tree roots.

2. Any utility installation, improvement or repair should be done in consultation with a certified arborist, preferably one with a good understanding of the site and the trees, as well as the management and concerns for the specific trees affected. This should also be required if planning to attach any infrastructure to any trees.

3. Mulch needs to be refreshed periodically. Wind and rain, foot traffic and composting reduce mulch thickness, as will mowers on the edges of the installed mulch. Wood chips are preferred over bark chips, and dyeing is not necessary. Smaller chips break down more quickly, which is not a bad thing, and are also less likely to blow around. Partnering with utility contractors and having a site where chips can be dumped, and even partially composted, can be a way to reduce mulch replacement costs.

4. Where decay fungi are present, a recommendation to fertilize trees with thin crowns is not advisable, as increasing the weight of the crown could put more stress on any invisible internal weak or decayed areas of the trees. Fertilization decisions should be made in consultation with a professional experienced in decay assessments.

6. *Establishing a long-term working relationship with a consultant who can advise, recommend, review, and treat elderly trees is essential. A consistent management approach and clear communication between all parties involved is essential for the success of the long-term management of your trees.*

SOURCES OF FUNDING

Funding sources for tree care range from the Town's budget to joint programs with area companies and merchants. The Town of Nashville is encouraged to explore the following sources of support for tree care:

- **Government grants**. Federal programs such as the Urban and Community Forestry Grant (which is funding this project through the North Carolina Forest Service) appropriate funds for tree planting and maintenance programs in cities throughout the United States. The North Carolina Department of Transportation (NCDOT) has funding available for transportation enhancement activities, including roadside beautification.

- **Foundation grants.** The Foundation Center, online at http://fdncenter.org/ is a good reference.

- **Private donations.** Area corporations and organizations may donate funds to special tree planting and maintenance programs. Local officials can generate public support of tree care through programs such as the existing "memorial tree" program or special tree improvement projects. Individuals, businesses or local groups might also be sources of funding.

- **Volunteer groups.** Local officials can encourage community organizations to donate funds or organize fund-raising activities or other support for community tree planting and maintenance programs.

- **Cooperative tree-planting programs.** In such programs, home-owners are offered a selected choice of street trees at a reduced price. In effect, a cooperative tree-planting program allows the homeowner to assume some of the cost of street tree planting while the Town can limit the species choices. Again, the key to the success of such a program is a detailed plan for implementing and publicizing the project. Raleigh's "NeighborWoods" program is an excellent example of such an organization.

- **Automobile Damage Reimbursement:** The Town should be reimbursed for any tree damage caused by an automobile accident, if the provision is in the Code of Ordinances.

APPENDIX

Pruning Young Trees

Proper pruning is essential in developing a tree with a strong structure and desirable form. Trees that receive the appropriate pruning measures while they are young will require little corrective pruning when they mature.

Keep these few simple principles in mind before pruning a tree:

- Each cut has the potential to change the growth of the tree. Always have a purpose in mind before making a cut.

- Proper technique is essential. Poor pruning can cause damage that lasts for the life of the tree. Learn where and how to make the cuts before picking up the pruning shears.

- Trees do not heal the way people do. When a tree is wounded, it must grow over and compartmentalize the wound. As a result, the wound is contained within the tree forever.

- Small cuts do less damage to the tree than large cuts. For that reason, proper pruning (training) of young trees is critical. Waiting to prune a tree until it is mature can create the need for large cuts that the tree cannot easily close.

Making the Cut

Where you make a pruning cut is critical to a tree's response in growth and wound closure. Make pruning cuts just outside the branch collar. Because the branch collar contains trunk or parent branch tissues, the tree will be damaged unnecessarily if you remove or damage it. In fact, if the cut is large, the tree may suffer permanent internal decay from an improper pruning cut.

If a permanent branch is to be shortened, cut it back to a lateral branch or bud. Inter-nodal cuts, or cuts made between buds or branches, may lead to stem decay, sprout production, and misdirected growth.

Pruning Tools

When pruning trees, it is important to have the right tool for the job. For small trees, most of the cuts can be made with hand pruning shears (secateurs). The scissor-type, or bypass blade hand pruners are preferred over the anvil type. They make cleaner, more accurate cuts. Cuts larger than one-half inch in diameter should be made with lopping shears or a pruning saw.

Never use hedge shears to prune a tree. Whatever tool you use, make sure it is kept clean and sharp.

Establishing a Strong Scaffold Structure

A good structure of primary scaffold branches should be established while the tree is young. The scaffold branches provide the framework of the mature tree. Properly trained young trees will develop a strong structure that requires less corrective pruning as they mature.

The goal in training young trees is to establish a strong trunk with sturdy, well-spaced branches. The strength of the branch structure depends on the relative sizes of the branches, the branch angles, and the spacing of the limbs. Naturally, those factors vary with the growth habit of the tree. Pin oaks and Sweetgums, for example, have a conical shape with a central leader. Elms and live oaks are often wide-spreading without a central leader. Other trees, such as lindens and Bradford pears, are densely branched. Good pruning techniques remove structurally weak branches while maintaining the natural form of the tree.

Trunk Development

For most young trees, maintain a single dominant leader growing upward. Do not prune back the tip of this leader. Do not allow secondary branches to outgrow the leader. Sometimes a tree will develop double leaders known as co-dominant stems. Co-dominant stems can lead to structural weaknesses, so it is best to remove one of the stems while the tree is young.

The lateral branches growing on the sides contribute to the development of a sturdy well-tapered trunk. It is important to leave some of these lateral branches in place, even though they may be pruned out later. These branches, known as temporary branches, also help protect the trunk from sun and mechanical injury. Temporary branches should be kept short enough not to be an obstruction or compete with selected permanent branches.

Permanent Branch Selection

Nursery trees often have low branches that may make the tree appear well-proportioned when young, but low branches are seldom appropriate for large-growing trees in an urban environment. How a young tree is trained depends on its primary function in the landscape. For example, street trees must be pruned so that they allow at least 16 feet of clearance for traffic. Most landscape trees require only about 8 feet of clearance.

APPENDIX

The height of the lowest permanent branch is determined by the tree's intended function and location in the landscape. Trees that are used to screen an unsightly view or provide a windbreak may be allowed to branch low to the ground. Most large-growing trees in the landscape must eventually be pruned to allow head clearance.

The spacing of branches, both vertically and radially, in the tree is very important. Branches selected as permanent scaffold branches must be well-spaced along the trunk. Maintain radial balance with branches growing outward in each direction.

A good rule of thumb for the vertical spacing of permanent branches is to maintain a distance equal to 3 percent of the tree's eventual height. Thus, a tree that will be 50 feet tall should have permanent scaffold branches spaced about 18 inches apart along the trunk. Avoid allowing two scaffold branches to arise one above the other on the same side of the tree.

Some trees have a tendency to develop branches with narrow angles of attachment and tight crotches. As the tree grows, bark can become enclosed deep within the crotch between the branch and the trunk. Such growth is called included bark. Included bark weakens the attachment of the branch to the trunk and can lead to branch failure when the tree matures. You should prune branches with weak attachments while they are young.

Avoid over-thinning the interior of the tree. The leaves of each branch must manufacture enough food to keep that branch alive and growing. In addition, each branch must contribute food to grow and feed the trunk and roots. Removal of too many leaves can "starve" the tree, reduce growth, and make the tree unhealthy. A good rule of thumb is to maintain at least half the foliage on branches arising in the lower two-thirds of the tree.

Newly Planted Trees

Pruning of newly planted trees should be limited to corrective pruning. Remove torn or broken branches, and save other pruning measures for the second or third year.

The belief that trees should be pruned when planted to compensate for root loss is misguided. Trees need their leaves and shoot tips to provide food and the substances that stimulate new root production. Un-pruned trees establish faster with a stronger root system than trees pruned at the time of planting.

Pruning Mature Trees

Pruning is the most common tree maintenance procedure. Although forest trees grow quite well with only nature's pruning, landscape trees require a higher level of care to maintain their safety and aesthetics. Pruning should be done with an understanding of how the tree responds to each cut. Improper pruning can cause damage that will last for the life of the tree, or worse, shorten the tree's life.

Reasons for Pruning

Because each cut has the potential to change the growth of the tree, no branch should be removed without a reason. Common reasons for pruning are to remove dead branches, to remove crowded or rubbing limbs, and to eliminate hazards. Trees may also be pruned to increase light and air penetration to the inside of the tree's crown or to the landscape below. In most cases, mature trees are pruned as a corrective or preventive measure.

Routine thinning does not necessarily improve the health of a tree. Trees produce a dense crown of leaves to manufacture the sugar used as energy for growth and development. Removal of foliage through pruning can reduce growth and stored energy reserves. Heavy pruning can be a significant health stress for the tree.

Yet if people and trees are to coexist in an urban or suburban environment, then we sometimes have to modify the trees. City environments do not mimic natural forest conditions. Safety is a major concern. Also, we want trees to complement other landscape plantings and lawns. Proper pruning, with an understanding of tree biology, can maintain good tree health and structure while enhancing the aesthetic and economic values of our landscapes.

When to Prune

Most routine pruning to remove weak, diseased, or dead limbs can be accomplished at any time during the year with little effect on the tree. As a rule, growth is maximized and wound closure is fastest if pruning takes place before the spring growth flush. Some trees, such as maples and birches, tend to "bleed" if pruned early in the spring. It may be unsightly, but it is of little consequence to the tree.
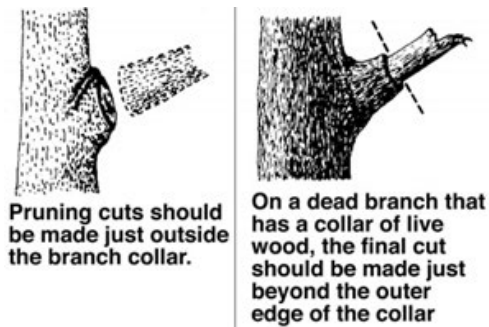
A few tree diseases, such as oak wilt, can be spread when pruning wounds allow spores access into the tree. Susceptible trees should not be pruned during active transmission periods.

APPENDIX

Heavy pruning just after the spring growth flush should be avoided. At that time, trees have just expended a great deal of energy to produce foliage and early shoot growth. Removal of a large percentage of foliage at that time can stress the tree.

Making Proper Pruning Cuts

Pruning cuts should be made just outside the branch collar. The branch collar contains trunk or parent branch tissue and should not be damaged or removed. If the trunk collar has grown out on a dead limb to be removed, make the cut just beyond the collar. Do not cut the collar.

Pruning cuts should be made just outside the branch collar.

On a dead branch that has a collar of live wood, the final cut should be made just beyond the outer edge of the collar

If a large limb is to be removed, its weight should first be reduced. Making an undercut about 12 to 18 inches from the limb's point of attachment does this. Make a second cut from the top, directly above or a few inches farther out on the limb. Doing so removes the limb, leaving the 12- to 18-inch stub. Remove the stub by cutting back to the branch collar. This technique reduces the possibility of tearing the bark.

Use the three-cut method to remove a large limb.
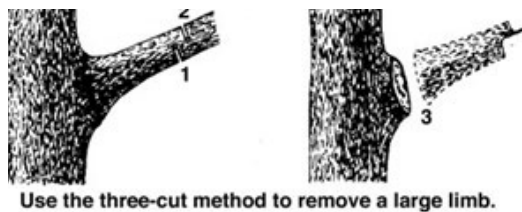
Pruning Techniques

Specific types of pruning may be necessary to maintain a mature tree in a healthy, safe, and attractive condition.

Cleaning is the removal of dead, dying, diseased, crowded, weakly attached, and low-vigor branches from the crown of a tree.

Thinning is the selective removal of branches to increase light penetration and air movement through the crown. Thinning opens the foliage of a tree, reduces weight on heavy limbs, and helps retain the tree's natural shape.

Raising removes the lower branches from a tree in order to provide clearance for buildings, vehicles, pedestrians, and vistas.

Reduction reduces the size of a tree, often for clearance for utility lines. Reducing the height or spread of a tree is best accomplished by pruning back the leaders and branch terminals to lateral branches that are large enough to assume the terminal roles (at least one-third the diameter of the cut stem). Compared to topping, reduction helps maintain the form and structural integrity of the tree.

Before   Crown Cleaning   Crown Thinning

Crown Raising   Crown Reduction
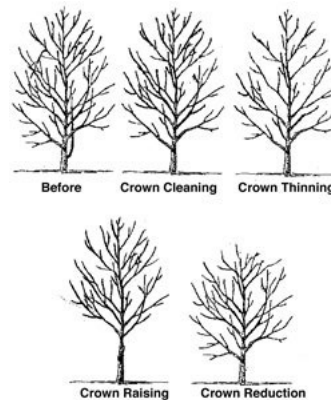
How Much Should Be Pruned?

The amount of live tissue that should be removed depends on the tree size, species, and age, as well as the pruning objectives. Younger trees tolerate the removal of a higher percentage of living tissue better than mature trees do. An important principle to remember is that a tree can recover from several small pruning wounds faster than from one large wound.

A common mistake is to remove too much inner foliage and small branches. It is important to maintain an even distribution of foliage along large limbs and in the lower portion of the crown. Over-thinning reduces the tree's sugar production capacity and can create tip-heavy limbs that are prone to failure.

Mature trees should require little routine pruning. A widely accepted rule of thumb is never to remove more than one-quarter of a tree's leaf-bearing crown. In a mature tree, pruning even that much could have negative effects. Removing even a single, large-diameter limb can create a wound that the tree may not be able to close. The older and larger a tree becomes, the less energy it has in reserve to close wounds and defend against decay or insect attack. The pruning of large mature trees is usually limited to removal of dead or potentially hazardous limbs.

APPENDIX

Wound Dressings

Wound dressings were once thought to accelerate wound closure, protect against insects and diseases, and reduce decay. However, research has shown that dressings do not reduce decay or speed closure and rarely prevent insect or disease infestations. Most experts recommend that wound dressings not be used. If a dressing must be used for cosmetic purposes, then only a thin coating of a nontoxic material should be applied.

Hiring an Arborist

Pruning large trees can be dangerous. If pruning involves working above the ground or using power equipment, it is best to hire an Arborist. An Arborist can determine the type of pruning necessary to improve the health, appearance, and safety of your trees. An Arborist can provide the services of a trained crew, with all of the required safety equipment and liability insurance.

There are a variety of things to look for when selecting an Arborist:

- Membership in professional organizations such as the International Society of Arboriculture (ISA), the Tree Care Industry Association (TCIA), or the American Society of Consulting Arborists (ASCA)

- Certification through ISA's Certified Arborist program

- Proof of insurance

- List of references (don't hesitate to check)

Avoid using the services of any tree company that

- Advertises topping as a service provided; knowledgeable arborists know that topping is harmful to trees and is not an accepted practice

- Uses tree climbing spikes to climb trees that are being pruned; climbing spikes can damage trees, and their use should be limited to trees that are being removed
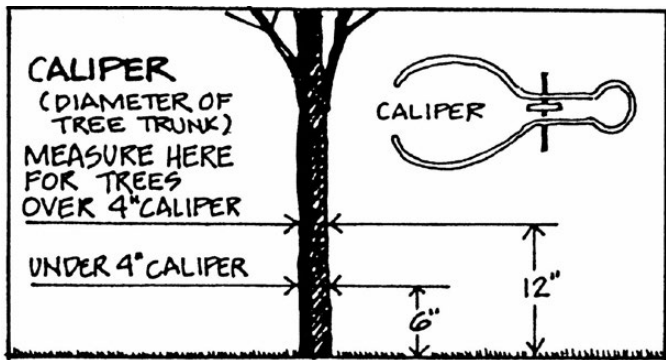
Pruning Information Source: International Society of Arboriculture

Hire an Arborist

GLOSSARY

Crape Myrtle tree
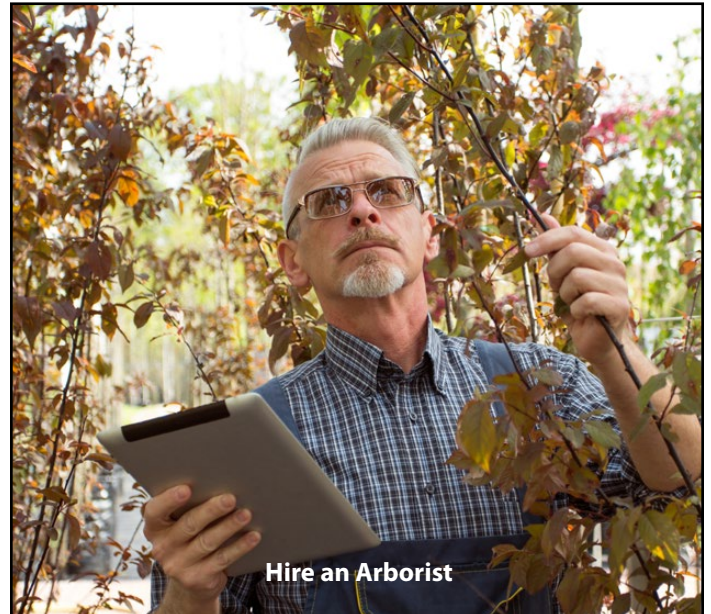
Caliper - the diameter measurement of tree-trunk taken at six inches above ground level for trees up to and including four inches in caliper. For larger trees, measurement of caliper shall be taken at twelve inches above ground level.


Canopy - the portion of a tree above the trunk.

Champion Tree - any tree that is listed on the National Register of Big Trees, which is a list of the largest living specimens of each tree variety found in the continental United States. The Town of Nashville, at its discretion, may be interested in starting a "local" Champion Tree program even though such trees may not actually appear on the National Registry.

Cultivar - a cultivated plant that has been selected and given a unique name because of its decorative or useful characteristics.

DBH (Diameter at Breast Height) - the diameter of a tree 4.5 feet above the average ground level.
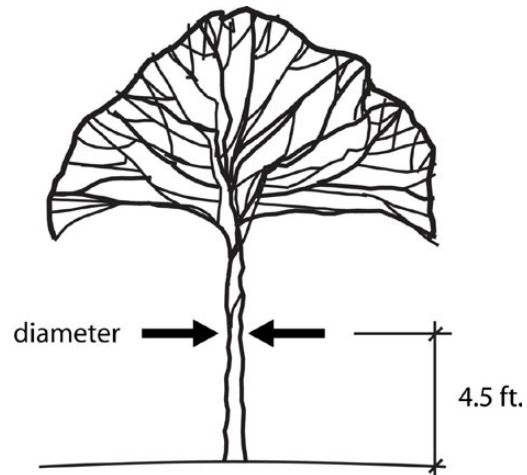
Drip Line - the area beneath a tree's canopy extending to the outermost tips of the branches above.

International Society of Arboriculture (ISA) - an international non-profit organization headquartered in Champaign, Illinois USA. Its mission statement: "Through research, technology, and education promote the professional practice of arboriculture and foster a greater public awareness of the benefits of trees." (http://www.isa-arbor.com/)

Maintenance - proper cultural practices including pruning, fertilization, pest management and root system protection.

Monoculture - a single, homogeneous culture without dissension or diversity.

Tree Inventory - the gathering of accurate information on the health and diversity of the community forest on a development site or within a community.

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