FRANKLIN, INDIANA

January - February 1989

Street Tree Management Plan for Downtown and East/West Corridor Area

By ACRT Inc.

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STREET TREE MANAGEMENT PLAN

for

COFF Area

FRANKLIN, INDIANA

Prepared by

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TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

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EXECUTIVE SUMMARY

ACRT, Inc. conducted a street tree inventory and analysis of the street tree maintenance program in the downtown and east/west corridors (COFF study area) in the Franklin, Indiana, during January, 1989. The results of the inventory were the basis for the following street tree management plan.

This study area had 303 street trees and 227 planting sites on City maintained rights-of-way. The estimated value of the street trees in this area is approximately $460,000.

Following are the major findings of the inventory:

* There were 34 different taxonomic groups represented in the street tree population within this area.

* The most common species were sugar maple (22.8 percent), silver maple (16.2 percent), red maple (14.8 percent), green ash (8.6 percent) and Norway maple (5.9 percent).

* Species diversity was poor, with maples (Acer) comprising 60.3 percent of the street tree population.

* Approximately 43 percent of the acceptable street tree locations were vacant and were classified as planting sites.

* The diameter distribution of the street trees reflects a mature urban forest.

* High priority maintenance needs included sign clearances (1 street tree), removals (7 street trees), and safety prunes (76 street trees).

* The overall condition of the street trees was "good", as rated using the International Society of Arboriculture tree rating procedure.

* There were 40 street trees growing under wires.

Policy recommendations, maintenance schedules and budget requirements are presented to assist Franklin in both short term and long term street tree maintenance planning.

The immediate street tree maintenance needs within this area include sign clearances, removals, and safety prunes. This

high priority work should be performed within the next year. A hazard street tree survey should be conducted annually to minimize liability and maintain an aesthetically pleasing urban environment.

ACRT recommends that an aggressive street tree planting program be started within this area. At least 13 street trees per year should be planted to maintain the current population size. There are 530 possible tree sites within this area of which 227 are currently vacant (a stocking rate of 57 percent). If 28 street trees were planted annually, the tree population within this area would reach an acceptable stocking rate of 75 percent within five years. This recommended planting program will cost approximately $5,600 per year. A list of recommended species is provided.

ACRT recommends a five-year systematic trim cycle be implemented within the next year. A systematic trimming program will result in fewer service requests and lower "per tree" maintenance costs. The safety pruning and systematic pruning can be performed using contractor crews as needed. Work standards and specifications for pruning and planting are presented to ensure quality street tree work on the City's street trees.

Implementation of this proposed program will assist the City in recognizing maximum economic, aesthetic and environmental long term benefits from the street trees. The overall condition of the street tree population will be improved, survival rates increased, and street trees will appreciate in value. Possible municipal liability due to street trees will be decreased by elimination of hazardous conditions on a timely routine basis.

The current interest in Franklin's downtown and east/west corridor street trees is an expression of its commitment to the enhancement of the outdoor environment.

I. INTRODUCTION

Street trees are an integral component of Franklin's environment. Their shade and beauty enhance the quality of life in the City. Street trees also moderate harsh environmental conditions. Noise can be reduced to more tolerable levels through the proper placement of trees and shrubs. Street trees play an important role in cleansing the air of pollutants, reducing runoff and improving the cycling of rainwater. Daytime summer temperatures are greatly reduced by the mature trees which line the City streets.

The street trees of Franklin represent a considerable economic and environmental asset to the community. A street tree care maintenance program, based on the results of a 100 percent street tree inventory will allow priorities, scheduling, and budgeting to be based on documented field conditions. Improving street tree vigor and survival will result in long term benefits and will reduce public liability by elimination of hazardous conditions. Research has demonstrated that residential and commercial property values will increase with the number, size, and condition of street trees.

Concerned administrators of Franklin have recognized the need to protect this valuable asset with a comprehensive farsighted street tree maintenance program. An information-based management program is now possible with the complete inventory of the City's street trees. This inventory draws attention to immediate street tree problems and provides the basis for designing a long term street tree management plan. The management plan allows for accurate budgetary projections.

This report will address the following major topics:

* Street Tree Inventory and Results
* City-Wide Street Tree Management Plan
* Maintenance Schedules

* Five-Year Street Tree Care Budget
* Staffing and Equipment
* Work Standards and Specifications

Implementation of this proposed comprehensive program will ensure long term benefits. Municipal liability will be decreased by reducing hazardous conditions. Street tree vigor will be enhanced and tree survival rates increased. The overall conditions of the urban forest will be improved making Franklin a more desirable place to live and work.

II. STREET TREE INVENTORY METHODOLOGY

A. SCOPE OF INVENTORY

Street trees and planting sites located on the City right-of-way (ROW) in the downtown and east/west corridors in Franklin, Indiana, were inventoried during January, 1989. ACRT, Inc. developed data collection specifications and performed data collection operations and quality control. Information was collected in the field using hand-held computers, and electronically uploaded to ACRT's PC based **Tree Manager**™ software system for data processing.

Information collected for each street tree or planting site included:

* **Location**
* **Species**
* **Diameter**
* **Maintenance Requirements**
* **Clearance Requirements**
* **Condition Class**
* **Presence of Overhead Wires**

B. TREE LOCATION

Trees in the City of Franklin were inventoried by street, address, and cell number, for effective utilization of data. Street name spellings and suffixes were verified using a City of Franklin map (Figure 1). A complete listing of street names is found in Appendix A.

Addresses were recorded from actual house or building numbers. If a house number was not present, addresses were obtained from the plat maps provided by the City, or from the telephone directory. If an address could not be obtained from the maps or telephone book, then a logical address was "assigned".

FIGURE 1

MAP OF COFF AREA

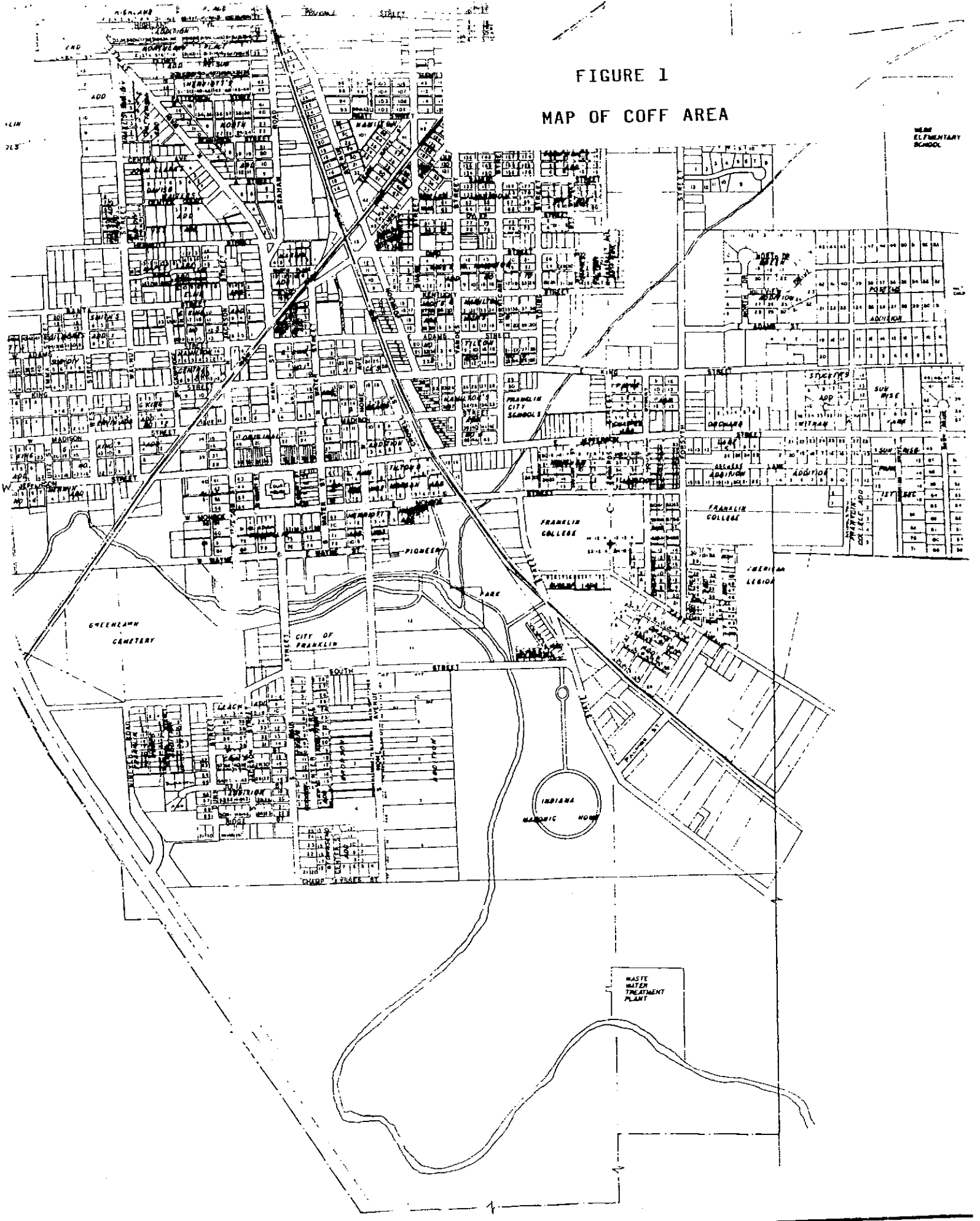


Figure 2. Location system for multiple street trees on a property.

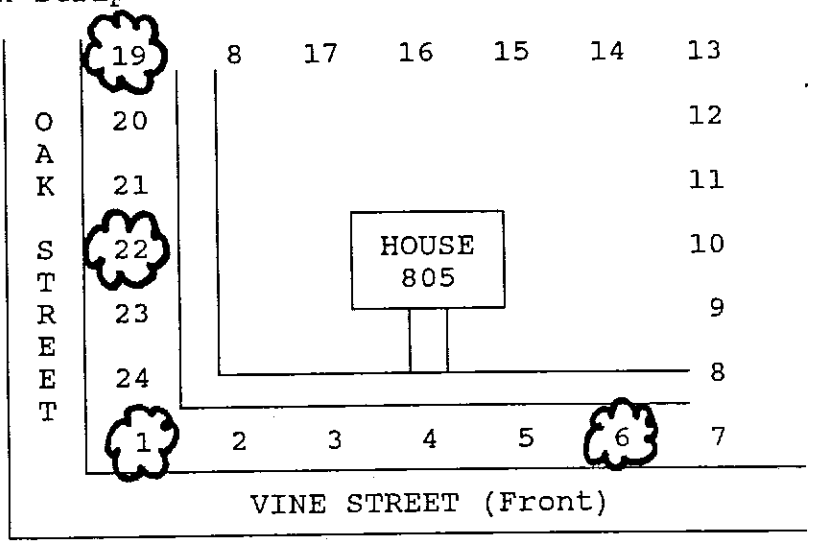
Cell Number Concept

19	18	17	16	15	14	13
20						12
21						11
22						10
23						9
24						8
1	2	3	4	5	6	7

Front of Property

25	Optional Cells	31

Cell size will vary with lot size, therefore, one cell may have more than one street tree in it. Cells 25-31 are used to indicate median strip street trees.



The street trees sketched in the above diagram are in cells 1, 6, 19, and 22. The address for each street tree in this example is 805 Vine Street.

Trees were located on a given property using a grid and cell number system. This is a concept devised by ACRT to distinguish among multiple street trees on a property and to specify location on the property. The concept is depicted in Figure 2.

The property, regardless of size, can be divided into 49 equal-sized units or cells. The size of the cells is proportional to the size of the property. The 24 cells numbered in the diagram describe the possible, approximate location of any public tree bordering the property.

Cell numbers 1-7 are used most often. Cells 8-13 and 19-24 are only used for corner properties with boundaries both on streets at the front of the lot, and also at the side of the lot. Cells 14-29 are only used when a property borders streets at both the front and rear of the lot. Cells 25-31 are used for street trees in a median or for vacant lots across from addressed lots.

The right-of-way was determined using plat maps of the City, provided by the Planning Department. When there was no sidewalk, many street trees appeared to occur in front yards of homeowners. However, if these trees were judged to occur on the right-of-way as measured from the plat maps, they were included in the inventory.

C. SPECIES IDENTIFICATION

Street trees were identified and recorded according to genus and species. The species list for the COFF area is shown in Appendix B.

A four letter computer code for the different tree species was used during data collection. Species codes were designated by using the first two letters of the genus name, and the first two letters of the species name. Additional alpha-numeric characters were used as tie-breakers and variety or cultivar specifiers. These codes provide a workable system for persons knowledgeable in tree taxonomy.

D. PLANTING SITE IDENTIFICATION

When space was available for street tree planting, potential planting sites were identified. For all planting sites in residential areas, the minimum distance to any existing tree or building was 20 feet. The surface type of each planting site was also recorded. The different surface types identified included asphalt, concrete and grass.

Planting sites were further designated as small, medium, or large based on the space available for tree planting:

Site Size	Minimum and Maximum spacing between Tree Plantings	Minimum Tree Lawn Width
Small	20-25 feet	4 feet
Medium	25-30 feet	6 feet
Large	35-40 feet	8 feet

Other general specifications for planting sites follow:

* Planting sites were identified such that the center of each tree was at least two lateral feet from any curb or sidewalk.

* Planting sites were at least 25 lateral feet from the intersection of curbs.

* Planting sites were at least ten lateral feet from fire hydrants, driveways, and utility poles.

* Planting sites were at least 15 lateral feet from street lights.

* Planting sites were at least five lateral feet from any visible or identifiable underground utility accesses (manholes, meters, etc.).

* All small planting sites had an overhead clearance of at least 25 feet.

* No medium or large planting sites were located underneath primary electric wires; however, they were located adjacent to wires if there was an offset of at least ten lateral feet from the vertical plane of the nearest wire.

E. TREE DIAMETER

Tree trunk diameter in inches was measured at four and one half feet above the ground (DBH) for each street tree. Tree diameter size classes were recorded in the database file. The diameter size classes used in this report are:

* 0 - 3 inches
* 3 - 6 inches
* 6 - 12 inches
* 12 - 18 inches
* 18 - 24 inches
* 24 - 30 inches
* 30 - 36 inches
* 36+ inches

On multi-stemmed street trees, the largest diameter stem was recorded. On street trees forked at four and one half feet, the diameter was estimated at four and one half feet, as though the tree were not forked.

F. TREE MAINTENANCE

The following information was collected to provide a basis to determine and prioritize maintenance requirements and removal needs of Franklin's urban forest. This information is necessary to prepare accurate budgets and future maintenance schedules. All street trees were recorded in one of the following categories: Removal, Safety Prune, Large Tree Prune or Small Tree Prune.

Removals

Most street trees designated as "removals" had one or more major defects that could not be cost effectively and/or practically remedied. Such defects included extensive trunk decay and severely decayed or weakened V-crotches. The majority of the trees listed as "removals" had a significant percentage of their crown dead and consequently were potential safety hazards. Some removals were due to improper species use. In general, smaller street trees (0-6 inch DBH) requiring removal died as a result of poor cultural practices.

Safety Prune

Trees receiving a rating of "safety prune" were recommended for pruning to remove hazardous deadwood and/or broken branches. Most of the street trees in this category posed a potential safety hazard which could result in bodily injury or property damage. These were further classified into one or two priority categories based upon the potential for injury or liability.

> High Priority - any street tree with broken or hanging limbs, hazardous deadwood and dead, dying, insect infested, or diseased limbs or leaders greater than four inches in diameter that were in immediate danger of falling.
>
> Low Priority - any street tree with dead, dying, insect infested or diseased or weakened branches between two and four inches in diameter that were a potential safety hazard.

Small Tree Prune

"Small Tree Prune" indicated the need to prune small street trees to correct or eliminate weak, interfering or objectionable branches, in order to minimize future maintenance requirements. This applied to street trees that could be worked with a pole pruner by a person standing on the ground.

Large Tree Prune

Street trees receiving a rating of "large tree prune" often had problems which could become safety hazards if not corrected in the near future. This included street trees with dead limbs less than two inches in diameter which posed little threat of bodily injury or property damage, but which required removal of interfering or weak branches, and/or exhibited growth patterns which would eventually obstruct traffic or interfere with utility wires or buildings. All street trees in this category required manual climbing or bucket truck access for trimming. Most evergreens fell into this category.

G. CLEARANCE REQUIREMENTS

This category represented trimming needed to clear vegetation which obstructed pedestrian traffic, vehicular traffic, or light illumination. This category was divided into three priorities to further separate the work required.

Sign Clearance (High Priority) - Any street tree that partially or completely obstructed a traffic control device (e.g. stop sign, yield sign, traffic light) was noted in the inventory.

Vehicle/Pedestrian Clearance - Any street tree that obstructed the path of vehicles or pedestrians was noted. Normally, this included trees not trimmed to a height of eight feet above sidewalks and fourteen feet above roadways.

Light Illumination - Any street tree that obstructed the path of illumination from street lights was noted.

H. CONDITION RATING

All street trees were assigned a condition rating as a means of assessing overall tree health and evaluating species performance. Criteria adapted from the International Society of Arboriculture (ISA) guide for appraising amenity plants were used as the basis for the condition ratings (see Table 1).

I. OVERHEAD WIRES

Trees or available planting sites located under overhead utility wires were indicated during the inventory.

Table 1. Condition Class Specifications

FACTOR	RATING SYSTEM
Trunk Condition:	Sound & solid (5) Sections of bark missing (3) Extensive decay & hollow (1)
Growth Rate:	More than 6-inch twig elongation (3) 2- to 6-inch twig elongation (2) Less than 2-inch twig elongation (1)
Structure:	Sound (5) One major or several minor limbs dead (3) Two or more major limbs dead (1)
Insect & Diseases:	No pests present (3) One pest present (2) Two or more pests present (1)
Crown Development:	Full & balanced (5) Full but unbalanced (3) Unbalanced and lacking a full crown (1)
Life Expectancy:	Over 30 years (5) 15 to 20 years (3) Less than five years (1)

Total Points	Class	Computer Code
23 - 26	Excellent	E
19 - 22	Very Good	V
14 - 18	Good	G
10 - 13	Fair	F
6 - 9	Poor	P
0	Dead	D

*From the International Society of Arboriculture's "Valuation of Landscape Trees, Shrubs, and Other Plants: A Guide to the Methods and Procedures for appraising Amenity Plants, Seventh Edition."

III. ANALYSIS OF TREE INVENTORY DATA FOR COFF STUDY AREA

A. NUMBER OF TREES

The COFF area had 303 street trees and 227 planting sites on the public right-of-way. The majority of the trees in this study area were located on the east and west corridors of the City, while the majority of the planting sites were located in the downtown area. A complete listing of all trees and planting sites within the COFF area is found in Appendix B.

B. SPECIES COMPOSITION AND DIVERSITY

It is important to know the population size and species composition of street trees in an urban forest. Species composition information is essential because tree species vary considerably in life expectancy and maintenance requirements. Species presence, numbers, and condition influence street tree maintenance activities and planting plans.

The street trees in the COFF study area were distributed among 34 different taxonomic groups (Table 2, Appendix B). The most common species was sugar maple (69 street trees, 22.8 percent). This was followed by silver maple (49 street trees, 16.2 percent), red maple (45 street trees, 14.8 percent), green ash (26 street trees, 8.6 percent) and Norway maple (18 street trees, 5.9 percent; Figure 3). No other species comprised more than four percent of the population within this study area.

A major objective of street tree management is high species diversity. Most tree diseases and insect pests are highly selective and only attack one tree genus or species. The total street tree population in the COFF study area consisted of 60.3 percent maple (genus Acer), 8.6 percent ash (genus Fraxinus), and 31.1 percent other varied species representing 27 different taxonomic groups (Figure 3). Species diversity in the COFF study area's street tree population is low (Figure 4).

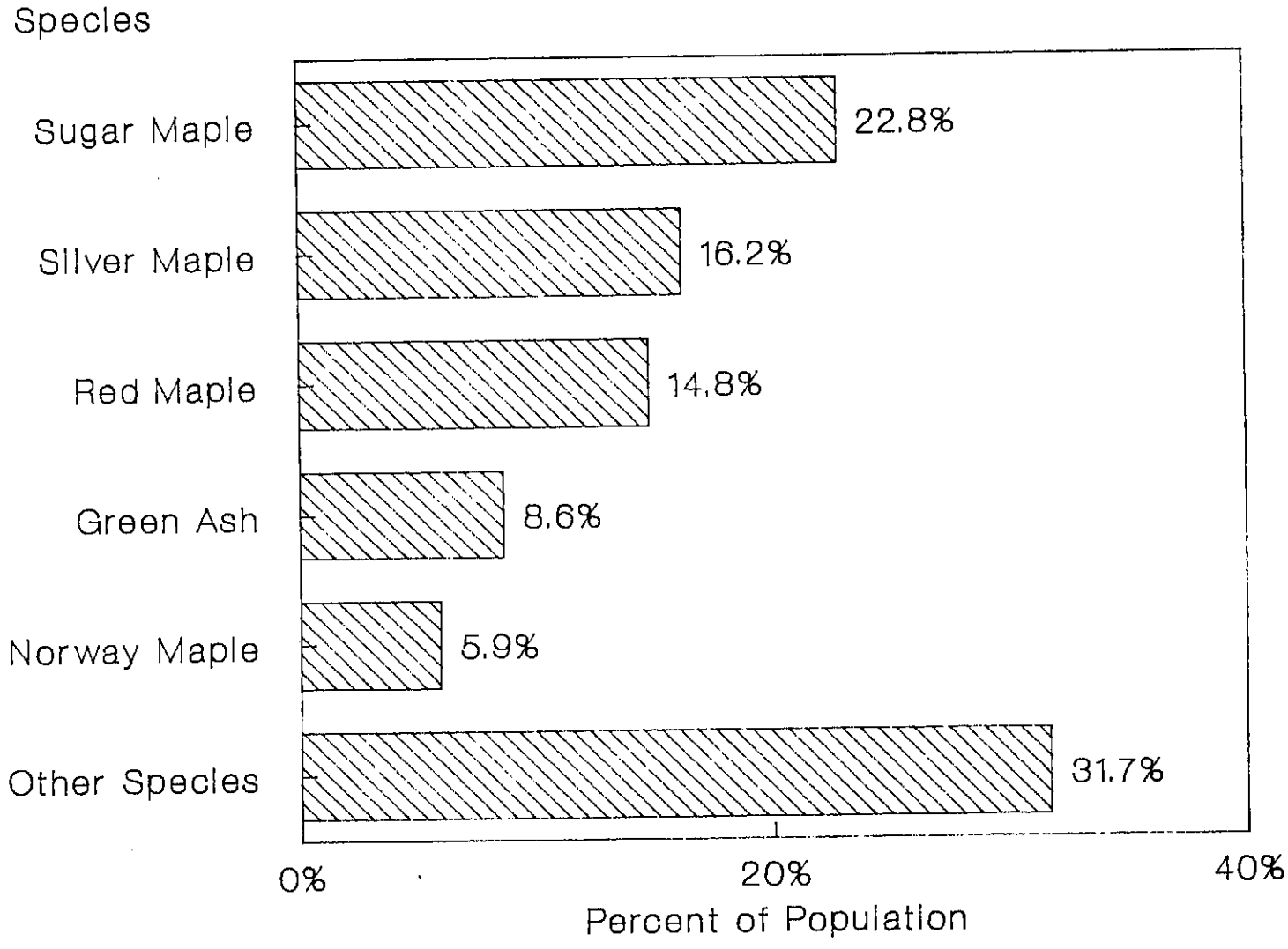
Table 2

COFF Street Tree Inventory

Species by Diameter Summary Report

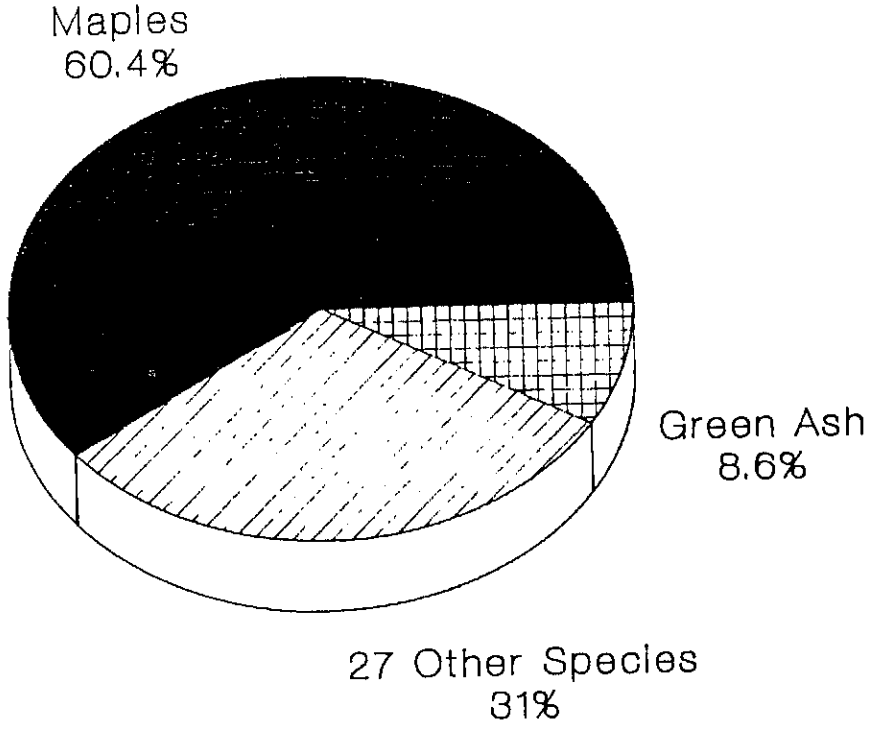
Species Name	0-3 IN DBH	3-6 IN DBH	6-12 IN DBH	12-18 IN DBH	18-24 IN DBH	24-30 IN DBH	30-36 IN DBH	36+ IN DBH	Total Trees	Percent of Population
SUGAR MAPLE	3	3	11	20	25	6	1	0	69	22.8
SILVER MAPLE	4	4	5	13	10	7	4	2	49	16.2
RED MAPLE	4	0	1	12	13	6	8	1	45	14.8
GREEN ASH	3	12	3	2	4	0	0	2	26	8.6
NORWAY MAPLE	3	2	6	4	3	0	0	0	18	5.9
HONEYLOCUST	3	6	3	0	0	0	0	0	12	4.0
ARBORVITAE IN PLANTER	10	0	0	0	0	0	0	0	10	3.3
CALLERY PEAR	3	5	0	0	0	0	0	0	8	2.6
MAGNOLIA	3	4	0	0	0	0	0	0	7	2.3
LITTLELEAF LINDEN	6	0	0	0	0	0	0	0	6	2.0
TULIPTREE	3	1	0	0	0	1	0	0	5	1.6
AMERICAN SWEETGUM	3	0	1	0	1	0	0	0	5	1.6
HACKBERRY	0	1	1	2	0	0	0	0	4	1.3
REDBUD	1	1	2	0	0	0	0	0	4	1.3
COMMON HORSECHESTNUT	0	0	0	2	0	0	1	0	3	1.0
WASHINGTON HAWTHORNE	0	3	0	0	0	0	0	0	3	1.0
SIBERIAN ELM	0	0	0	2	0	0	0	1	3	1.0
PIN OAK	0	0	1	0	1	0	0	0	2	0.7
LONDON PLANETREE	0	0	1	1	0	0	0	0	2	0.7
OTHER	2	0	0	0	0	0	0	0	2	0.7
COLORADO BLUE SPRUCE	0	0	0	2	0	0	0	0	2	0.7
RED OAK	0	0	0	1	1	0	0	0	2	0.7
CATALPA	0	0	0	0	1	1	0	0	2	0.7
BASSWOOD	0	0	0	0	0	2	0	0	2	0.7
AMERICAN ELM	0	0	0	0	1	0	1	0	2	0.7
CRABAPPLE	0	2	0	0	0	0	0	0	2	0.7
AMERICAN HORNBEAM	0	0	1	0	0	0	0	0	1	0.3
EUROPEAN BEECH	0	1	0	0	0	0	0	0	1	0.3
BLACK WALNUT	1	0	0	0	0	0	0	0	1	0.3
DOGWOOD	1	0	0	0	0	0	0	0	1	0.3
MAPLE SPECIES	1	0	0	0	0	0	0	0	1	0.3
ARBORVITAE	0	1	0	0	0	0	0	0	1	0.3
COMMON PEACH	1	0	0	0	0	0	0	0	1	0.3
BOXELDER	0	0	1	0	0	0	0	0	1	0.3
*** Total ***	55	46	37	61	60	23	15	6	303	100.0

Figure 3. Profile of Street Tree Species



Franklin, IN (COFF, 1989)

Figure 4. Species Diversity Overview



Franklin, IN (COFF, 1989)

Due to pest selectivity and the uneven species diversity, there is a major risk of losing two-thirds of the street trees in the COFF study area. About 23 percent of the street trees could be lost in a very short period if the dominant species (sugar maple) was attacked by a species-specific insect or disease. **If a pest or disease specific to all maples reached epidemic proportions, the results would be devastating.**

For these reasons **ACRT recommends that no single tree species be planted so that it comprises more than 10 percent of the population and no genus such as Acer comprise more than 20 percent of the population.** Planting of any type of maple in the COFF study area should be curtailed for at least 10 years. Diversity must be increased by filling available planting sites with species other than maples.

The major problem species found in the COFF study area included silver maple, Siberian elm, and boxelder. These species are brittle, weak-wooded, and susceptible to wind breakage. When these species are found to have severe trunk decay or crown dieback, they should be removed. Ultimately, these species should be entirely phased out and replaced with desirable species.

C. SPECIES PERFORMANCE

The overall health of an urban street tree population can be evaluated by examining the performance of the major street tree species. Two good indicators of how well a species is doing under the pressures imposed by the urban environment are maintenance needs and condition ratings. This type of information was collected during the inventory; however, its analysis is only legitimately applied to major species.

Species Performance based on Maintenance Requirements

The importance of evaluating species maintenance needs is related to the tendency for a particular species to become a

safety hazard and liability to the City. It is undesirable to continue planting those species with a high occurrence of safety hazards.

Of the five major species, red maple had the highest proportion of safety hazards. Approximately 42 percent of all red maples required either high or low priority safety pruning (Table 3). Other major species also requiring a significant amount of safety pruning were sugar maple (39.1 percent), green ash (19.2 percent), silver maple (18.4 percent) and Norway maple (38.9 percent).

Silver maple is significantly less desirable in comparison to the other major species in the City. Nearly 50 percent of all street tree removals identified in this study area were silver maples. Silver maple is a rapidly growing, weak-wooded species which is not well suited to street tree situations. Its roots have a tendency to get into sewer and water lines as well as raise sidewalks. Planting of silver maple on public street right-of-ways should be prohibited in the future.

Another species commonly requiring safety pruning that was found in this study area was Siberian elm. This is a fast-growing, weak-wooded, undesirable species and could be expected to perform as poorly as silver maple on the street tree right-of-way. This species was probably planted by homeowners or was the result of natural seeding. It is recommended that the City prohibit the planting of this and other undesirable species on the public right-of-way (Appendix I).

The high numbers of required safety trims are a result of removing or pruning trees only for sign, vehicle, pedestrian or light clearance, or in response to storm damage. Once a systematic pruning program is initiated within the City, the amount of safety pruning will decrease, and reduce the City's liability.

Table 3. Comparison of Major Street Tree Species: Safety Prune Needs (COFF)

Species	Percent of Species Requiring Safety Pruning	Number of Trees Requiring Safety Pruning	Total Number of Trees
Sugar Maple	39.1	27	69
Silver Maple	18.4	9	49
Red Maple	42.2	19	45
Norway Maple	38.9	7	18
Green Ash	19.2	5	26

Franklin, IN (1989)

Species Performance based on Condition Rating

Condition is another good measure for relative comparisons of species performance. A condition rating of very good or excellent for all street trees in the City would be ideal. Trees with consistently low condition ratings are unable to thrive in the urban environment.

The street tree population within the COFF study area consisted of 34 percent of the population in very good or excellent condition, 64 percent in fair to good condition, and two percent in poor condition, or dead (Table 4). Thus, the condition of the street tree population in this area is marginally good and with proper systematically scheduled pruning the overall condition rating will improve.

Of the five major species, green ash performed the best (Table 5). Over 53 percent of the green ash trees were in very good or excellent condition.

There were 29 other species found along the right-of-ways in this study area. This indicates that many other choices exist for street tree plantings. Unfortunately, none of those species were present in large enough numbers to adequately evaluate their performance. However, honeylocust, tuliptree, magnolia, callery pear, pin oak, little leaf linden, American hornbeam, dogwood and beech were species within this group which ranked in very good, or better, condition. These species appear to do well in the COFF area urban environment, and their planting should be increased.

D. SIZE CLASS DISTRIBUTION

The size class distribution of the street trees in the COFF study area is summarized in Figure 5. More detailed information can be obtained from Table 6.

The majority of the street trees (52.1 percent) within this study area were between six and 24 inches DBH. Small trees, less than six inches DBH, comprised 33.3 percent. Only 14.6 percent

Table 4. Summary of Street Tree Condition Ratings (COFF)

Condition	Number of Trees	Percent of Population
Excellent	0	0.0
Very Good	103	34.0
Good	144	47.5
Fair	50	16.5
Poor	5	1.7
Dead	1	0.3
Total	303	100.0

Franklin, IN (1989)

Table 5. Comparison of Major Street Tree Species: Condition Ratings (COFF)

Species	Percent of Each Species		
	Poor/Dead	Fair/Good	Very Good/Excellent
Sugar Maple	0.0	69.6	30.4
Silver Maple	6.1	73.5	20.4
Red Maple	6.7	80.0	13.3
Norway Maple	0.0	72.2	27.8
Green Ash	0.0	46.2	53.8

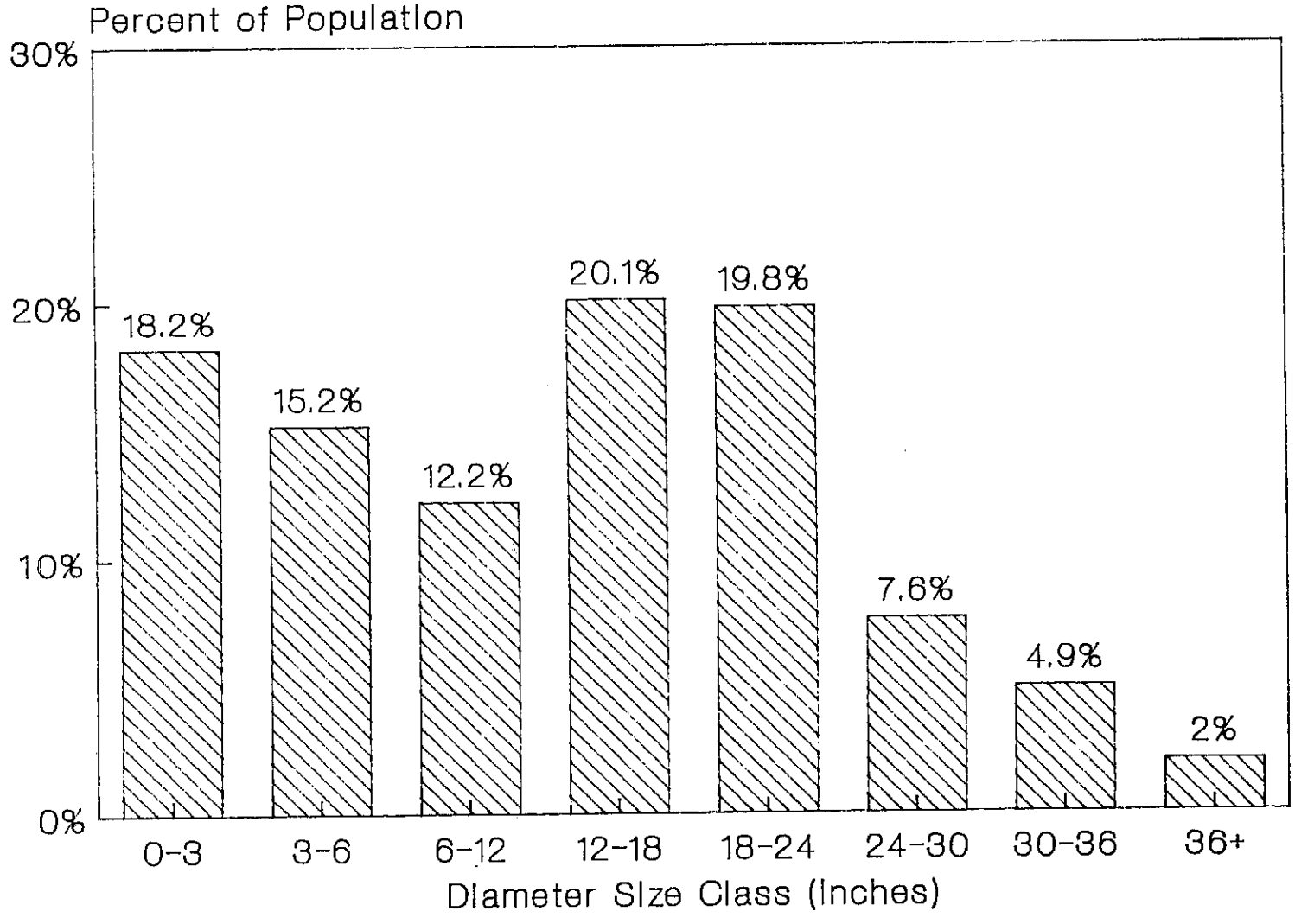
Franklin, IN (1989)

Table 6. Summary of Street Tree Maintenance Requirements by Diameter (COFF)

Maintenance Category	Diameter Size Class (inches)									
	0-3	3-6	6-12	12-18	18-24	24-30	30-36	36+	Total	Percent
Removal	1	0	0	1	1	2	1	1	7	2.3
Safety Prune High Priority	0	0	1	13	19	12	5	4	54	17.8
Safety Prune Low Priority	0	0	1	11	6	2	2	0	22	7.3
Large Tree Prune	1	10	27	36	34	7	7	1	123	40.6
Small Tree Prune	53	36	8	0	0	0	0	0	97	32.0
Total	55	46	37	61	60	23	15	6	303	100.0

Franklin, IN (1989)

Figure 5. Street Tree Size Class Profile



Franklin, IN (COFF, 1989)

of the street tree population consisted of large trees, with diameters greater than 24 inches DBH. This size class distribution reflects a maturing urban forest, and is likely a result of past tree planting activities by homeowners along the major thoroughfares within the city.

E. PLANTING NEEDS AND LOCATIONS

Approximately 43 percent (227 sites) of the acceptable street tree locations on the right-of-way of the COFF study area were vacant and classified as planting sites. This information highlights the need to establish an active street tree planting program in this area. This will ensure that all planting sites will become occupied and that all street trees removed are replaced. As this street tree population continues to mature, more sugar, silver and red maples will need to be removed. The City should plant young trees immediately, to allow time for establishment prior to the inevitable removals. If the number of plantings does not equal the number of removals the study area will gradually lose its urban forest to senescence and death.

The planting sites were subdivided by tree size at maturity, and by surface type (Table 7). From a cost standpoint, it is important to evaluate planting sites based on surface type. Planting sites with grass are more economical for tree planting than asphalt or concrete.

Of 227 planting sites, 125 (55 percent) were in grassy areas and 102 (45 percent) were in concrete.

The detailed planting plan for the COFF area is found under separate cover.

F. TREE MAINTENANCE REQUIREMENTS

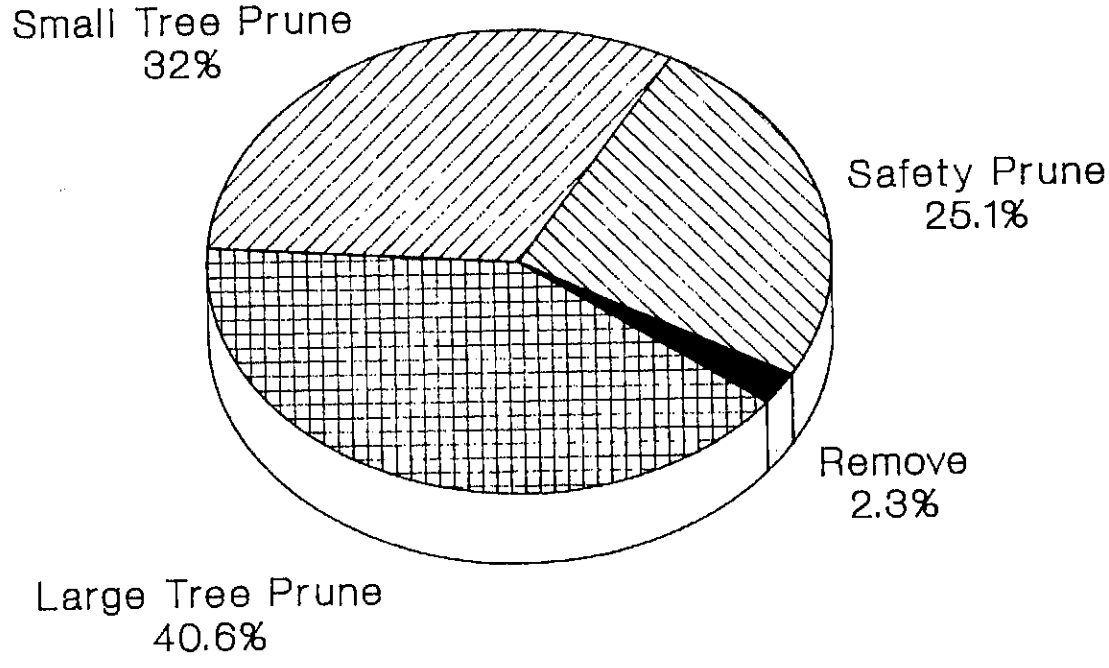
This section analyzes the removal, pruning and clearance requirements noted within the COFF study area. A summary of the street tree maintenance requirements observed in the COFF area is seen in Figure 6. Detailed maintenance information by diameter

Table 7. Planting Site Summary (COFF)

Planting Site Classification	Number of Planting Sites
Planting Site Large Grass	60
Planting Site Medium Concrete	2
Planting Site Medium Grass	28
Planting Site Small Concrete	100
Planting Site Small Grass	37
Total	227

Franklin, IN (1989)

Figure 6. Street Tree Maintenance Needs



Franklin, IN (COFF, 1989)

class is found in Table 6.

Inventory maintenance data should be used as a basis for prioritizing trimming and removal needs. This information will allow the City to implement cost-effective street tree maintenance strategies by presenting an accurate evaluation of current and future maintenance needs.

The following is a discussion of the maintenance requirements and their priorities within the COFF study area street tree population.

Removals

The causes for street tree decline and death may be natural or man-induced. Natural causes include disease, insects, drought and frosts. Man-induced causes include physical injury due to vehicles, vandalism, poisoning and root disturbance. There are three main reasons why street trees should be removed. First, to reduce the potential for injury to people and property; second, to eliminate breeding sites for insects and diseases; and third, to maintain the aesthetic quality. All street trees recommended for removal should be inspected and scheduled for removal as soon as possible.

A total of 7 street trees (2.3 percent) were recommended for removal. Of these, 6 street trees (85.7 percent) were greater than 18 inches DBH. This suggests a high mortality rate for mature street trees, possibly due to lack of a regularly scheduled maintenance program. The development and implementation of a more intensive maintenance program for all City street trees will improve the overall health and longevity of each tree, as well as reduce the City's liability.

Trees in urban areas face a considerable amount of stress. Urban soils are usually compacted and low in nutrients. Availability of water is often reduced due to paving or cementing of the surface areas. Ambient temperature is increased due to reflection of solar energy by asphalt, concrete, and brick

surfaces. Air pollution, use of salt for de-icing of roads, physical damage on trunks, and competition for space with automobiles all make it difficult for the tree to survive. Under such harsh urban conditions, street trees require considerable maintenance to prosper.

The condition rating for the street trees noted for removal varied from fair to dead. About 14 percent of the suggested removals were actually dead. The remainder were classified as "poor" (72 percent) or, in some cases, "fair" (14 percent). Most removals in poor condition were larger trees with hazardous deadwood. Therefore, more than 86 percent of all trees identified as "removal" are hazardous and represent increased liability to the City. Other street trees rated as "fair" which were recommended for safety prunes could decline and need removal over the next growing season or two. This can be determined upon inspection and a decision made by an experienced arborist.

A listing of all street trees noted for removal is found in Appendix C.

Safety Pruning

There were 76 street trees (25.1 percent) in the COFF study area identified as requiring a safety prune (Figure 6, Table 6). Trees in this maintenance category were prioritized based on the size of the dead branches. Trees with deadwood or hanging branches greater than four inches in diameter were classified as a high priority. There were 54 street trees in this category. The remaining 22 safety prunes had dead or hanging limbs between two and four inches in diameter.

These street trees were found to be in various stages of decline and the larger ones had the potential of causing personal injury or property damage. This reflects the need to establish a systematic city-wide trimming program in order to reduce the potential for injury to property or people in the most cost effective manner. A listing of all street trees which required a safety prune is found in Appendix D.

Large and Small Tree Pruning

Trees in the routine prune category were prioritized based on the size of the tree. There were 123 large street trees (40.6 percent) requiring pruning and 97 low growing or young street trees (32.0 percent) identified as requiring shaping from the ground with a pole pruner.

Many of the small trees in this maintenance category were planted in the past 10 years, were less than 20 feet tall, and required minimal corrective pruning. Large trees which require routine pruning can develop deadwood and safety problems if neglected for an extended period.

These street trees must be placed on a systematic pruning schedule. This will improve the health of the population and reduce the number of street trees requiring special service for removal or safety prunes.

G. CLEARANCE REQUIREMENTS

Street trees that required clearance trimming were identified. The three categories of clearance trimming were:

1) street trees obstructing traffic control signs (stop signs or stop lights),

2) street trees obstructing vehicular or pedestrian traffic flow, and

3) street trees obstructing the illumination of street lights.

The results of this category are summarized in Table 8. There were 37 street trees (12.2 percent) that required trimming for pedestrian or vehicular clearance. More importantly, there was 1 street tree that obstructed the view of a traffic control device (stop sign, yield sign, traffic light, etc.). This tree should be inspected and trimmed for clearance immediately.

An annual survey of the street tree population to identify those trees obstructing the view of traffic control devices is

Table 8. Summary of Tree Clearance Requirements (COFF)

Type of Clearance	Number of Trees
Light Clearance	0
Sign Clearance	1
Vehicle/Pedestrian Clearance	37

Franklin, IN (1989)

recommended. The location of all street trees requiring clearance for sign visibility is listed in Appendix E.

H. CONDITION RATINGS

Condition ratings were determined for each street tree to judge the overall health of the urban forest in the COFF study area. The results are shown in Table 4 (page 20) and Figure 7. Trees were rated using criteria adapted from the International Society of Arboriculture's guide for appraising amenity plants (7th Edition, Table 1).

Trees which were dead or poor were recommended for removal. In general, street trees rated as "poor" are expected to deteriorate rapidly in the near future. Some street trees rated as "fair" can be expected to live and maintain an acceptable status for several years but may need extensive maintenance to reduce liability. "Fair" street trees will also decline over time unless considerable maintenance (pruning and fertilizing) is performed. At times, the preferred maintenance option for a street tree rated "fair" is removal.

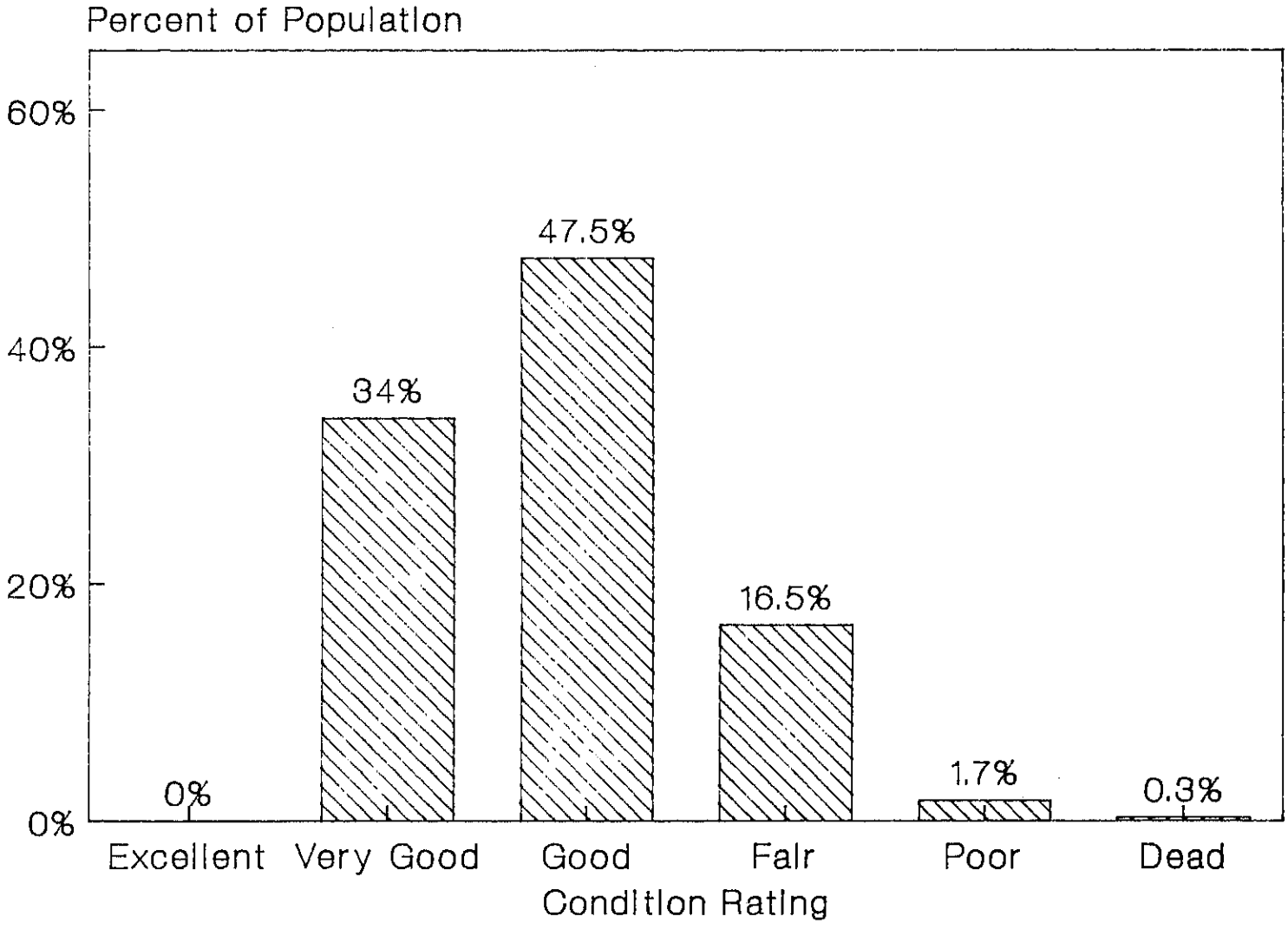
Trees rated as good can be expected to live well into the future but not without systematic maintenance which will greatly increase their value and even improve their rating.

Trees rated as very good or excellent have little need for maintenance at present and can be expected to need limited maintenance in the future. These are the ideal street trees that can be expected to thrive for years to come.

The COFF study area had one street tree (0.3 percent) rated as "dead" and 5 (1.6 percent) rated as "poor". There were 50 street trees (16.5 percent) rated as "fair". Nearly half of the street trees in this area (144 trees) were evaluated as "good" and another 34 percent (103 trees) were ranked in "very good" condition (Figure 7).

That 18.5 percent of the population in this study area rated less than good indicates a lack of systematic maintenance and

Figure 7. Condition Rating Profile



Franklin, IN (COFF, 1989)

poor pruning practices, which resulted in structurally weakened trees. Some of these poorly trimmed street trees were located under utility wires.

The overall condition of the street trees in this area could be much higher. Many of those rated as "poor", "fair", and "good" would be in much better condition if they had had periodic maintenance. Overall condition ratings will be improved in the future by implementation of a systematic maintenance schedule.

The overall condition rating profile would improve if the 227 planting sites were filled with desirable species. The key factor in maintaining a healthy urban forest is systematic maintenance. Without implementation of a routine maintenance program the overall condition of the street tree population in this area will deteriorate as the street tree population declines.

According to the inventory data, the street trees were in predominantly "fair" to "good" condition. These trees had some major deadwood, an indication of some insects, disease and decay, and a moderate growth rate. The street trees rated in "poor" condition had considerable numbers of problems, and death is expected within the next several years.

I. OVERHEAD WIRES

The presence of overhead electric wires was noted for 40 street trees (13.2 percent) and 36 planting sites (11.9 percent).

In many cases, where street trees were pruned due to overhead electric wires, improper pruning techniques were practiced. Such pruning resulted in street trees which are now unattractive in appearance and structurally weakened. This can be prevented in the future by selecting the proper species (low growing) for sites under electric wires. Industry-developed guidelines for proper pruning techniques are presented in a later section.

IV. CITY-WIDE MANAGEMENT PLAN

A. URBAN FORESTRY GOALS AND OBJECTIVES

The establishment of a comprehensive street tree management program in Franklin requires a commitment by the City, the Street Tree Board, and the COFF Board to meet defined goals.

It is the responsibility of all three groups to assure that street trees enhance the quality of life and make this study area a desirable place to live and work by providing or contracting street tree care services.

These tree care services include:

1. Remove hazardous street trees on public rights-of-way.
2. Trim street trees to clear traffic signals and signs, street lights, pedestrian and vehicular traffic, and building clearance.
3. Perform comprehensive systematic trimming (according to National Arborist Association Class III Standards) of all identified safety hazard street trees as soon as possible.
4. Plant new street trees to replace those which have been removed and to increase the street tree population by planting available sites identified in the inventory.
5. Plant or require the planting of street trees on newly developed streets and inspect plantings on behalf of the City.
6. Manage the species composition of the street tree population to increase diversity and minimize the risk of a catastrophic loss of street trees.
7. Establish a routine systematic trimming (NAA Class II) cycle for all street trees on the City's rights-of way.
8. Lead the development of standard systems and common data bases to effectively manage all the street trees located on the City's right-of-way.
9. Provide public information and educational programs regarding the care of street trees to citizens and school children.

10. Provide a forum for the exchange and communication of new ideas regarding street tree care within all concerned agencies.

11. Act as a "resident expert" resource to address critical issues related to street trees and to advise and consult in species selection and landscaping for City projects.

These primary responsibilities can be met by implementing the recommendations presented in this report.

B. NEED FOR A PART-TIME ARBORIST

To meet the objectives outlined above it is essential to provide the necessary resources in the form of leadership and knowledge. Many of the problems that exist with the street tree population today could be avoided in the future with proper urban forestry leadership and expertise.

ACRT recommends that Franklin hire a part-time arborist, either in-house, shared with neighboring communities, or on a contract basis. This person would be responsible for implementing policy and managing resources to ensure that citizens receive maximum benefits from the street tree population.

Immediate priorities of the part-time arborist include:

1. working with the Citizens Organized for Franklin's Future (COFF) to prepare the street tree bid specifications, and to contract and oversee the street tree planting for the downtown area and the main east/west City corridor;

2. completing all backlogged priority requests and maintenance needs identified in the inventory;

3. establishing a working street tree management information system utilizing the inventory database;

4. establishing a systematic pruning cycle for street tree maintenance; and

5. working with the Franklin Street Tree Board to establish good public relations.

The scope of this position would include assisting with policy formulation and making decisions regarding the management of all tree vegetation controlled by the City. Responsibilities would also include developing budgets, administering contracts, responding to service requests, developing plans for maintenance, maintaining positive public relations, and coordinating cooperative efforts between other governmental agencies.

The successful candidate for Franklin's part-time arborist position should hold a four-year or two-year degree in Urban Forestry, or a closely related field, and have two years experience in the field of Urban Forestry/Arboriculture at a supervisory or managerial level. A minimum of six years of Urban Forestry management or supervisory experience may be substituted for the degree, but some formal education in related subjects would be required. Communications and public relations skills are required in order to work productively with the diverse organizations involved with urban forestry issues.

C. SYSTEMATIC TREE MAINTENANCE PROGRAM

Franklin has been pruning street trees only for sign, light, and vehicle/pedestrian clearance. All removals and storm damage pruning have been performed on contract. Currently, upon receipt of a service request, an inspection is conducted by the Street Department Commissioner or his foreman and maintenance is performed as required.

Operating on a storm damage and service request basis has an advantage in that is maximizes responsiveness to landowners. A person calls in, or street tree storm damage is identified, and the request is handled in a timely fashion. There are, however, numerous disadvantages to operating strictly on a service request basis, or in response to storm damage. ACRT recommends that as much work as possible be performed on a systematic street by street schedule.

A systematic pruning program should be divided into two phases, based upon tree size. Large trees require the use of a bucket truck or manual access. Small trees allow shaping from the ground with a pole pruner. Based on the inventory, the City needs to prune 123 large trees on a five year cycle. All trees should be pruned to the National Arborist Association (NAA) Class 2 (medium prune) standards (Appendix F) and to minimum clearance specifications when possible (Figure 8). Crews should systematically proceed from street to street and ensure that all trees in a neighborhood are up to specifications.

Small trees require training or shaping to ensure proper growth habit. These small trees should be pruned to a single central leader to promote the development of strong scaffold limbs. Also, all rubbing, crossing, interfering, dead, dying or broken branches should be removed. These trees will be pruned by a person on the ground using a pole pruner. The inventory identified 97 small trees requiring pruning. These small trees, as well as future plantings, should be pruned at least once every five years.

The major advantages of implementing a systematic maintenance program are described below:

* Reduced municipal liability. Cities that implement systematic inspection and maintenance procedures are more effective at identifying and removing hazardous conditions. Additionally, when faced with litigations involving street tree-related injury or damage, the courts have looked favorably upon cities or utilities that have a systematic approach to dealing with their street trees, as opposed to relying on crisis management to identify hazardous conditions.

* Reduced cost per street tree trimmed. The cost per tree trimmed in a systematic fashion is one-half or less the cost of a tree trimmed by "hot-spotting". The contractor tree

crew productivity will increase because crews remain in specified areas based on the work schedule. When systematic maintenance is performed, a larger percentage of time is spent working on street trees rather than driving to the work site. Crews working in designated areas can plan for efficient traffic control and moving of parked cars.

Crew supervision is more effective when workers are easily located. Systematic trimming allows managers to measure crew productivity by comparing actual work performed with industry averages.

Skilled pruning of young trees prevents the development of structural problems and reduces future tree care costs. This will also limit the City's liability through a decrease in the number of safety hazards which could develop as the trees mature. By trimming small trees at regular intervals, many problems can be avoided. It is also less costly to trim a small tree with a pole pruner two or three times than to climb and prune a large tree once. There will also be fewer tree mortalities through the early identification and correction of disease and insect problems.

* All street trees in greatest need receive maintenance. When crews are working on a systematic basis, they can go down the street and work on every tree that needs maintenance. When crews are "hot-spotting", they may drive past hazardous conditions to work on a service request that is not a hazardous condition.

* Improved public relations. When the public realizes the benefits of a systematic street tree maintenance program, they will be supportive of the program. The overall condition of the street trees will improve, resulting in higher appraised tree value and increased property values. An improved tree appearance also enhances the aesthetic quality of the City.

* Improved urban environment. Maximum amounts of shade and cooling, noise and glare reduction, and pollution control benefits are provided by a healthy urban forest. Additionally, the potential for storm damage to trees and the likelihood of resultant power outages caused by failure of weak or dead limbs is reduced.

D. IMMEDIATE TREE MAINTENANCE NEEDS

There are several categories of maintenance identified in this area which need to be given special consideration. These maintenance needs are important from a safety and liability standpoint in the management of the City's street trees. These categories include: sign clearance problems, removals and safety pruning. An annual hazard street tree survey to identify these special problems should be incorporated into Franklin's street tree program. It is important to address these concerns in a timely manner. A failure to do so could be considered negligence on the part of the City.

A major benefit of surveying for sign clearances, removals, and safety prunes on an annual basis and correcting the problems in a timely manner is that the number of service requests will be reduced.

Sign Clearance

Vegetation which obstructs the traffic control signs (stop, yield, etc.) in this area need to be removed such that the signs are visible at all times. Sign clearance is the highest priority maintenance because an obstructed traffic control sign is a major liability every time a car passes that sign. Whenever a vehicle approaches a sign which is partially or completely concealed by tree limbs there is an increased chance of an accident. To reduce the City's liability the signs need to be cleared and visibility maintained.

Only 1 street tree was identified during the inventory as obstructing traffic control signs (Table 8, Appendix E). This trees should be trimmed as soon as possible. In addition, this priority task (sign clearance) should continue to be performed on a timely basis as problems are identified, either by annual hazard tree surveys or by service requests.

Removals

Street tree removals are the next priority safety hazard. Trees (especially trees greater than 12 inches in diameter) identified for removal are more dangerous than trees requiring safety pruning. These street trees also project a poor image of the street tree program if left standing.

The average life of a street tree varies from 20 years to hundreds of years. The stresses imposed by the urban environment often shorten the otherwise longer life span of many species, including maples, ash, and sycamores resulting in a reduction of the life span of street trees to 20-50 years. Provisions must be in place to remove dead and dying street trees in a timely manner. Tree removal includes the removal of stumps, to prevent pedestrian injury and to preclude interference with future plantings.

There were 7 street trees recommended for removal in this area. ACRT recommends the removal of these street trees during the next year. There is no reason other than lack of funds to postpone removal of these trees. Dead and dying street trees become more hazardous, more expensive to remove, and more of an eyesore to the public the longer they remain on the right-of-way.

The estimated average cost per street tree removal will be between $250 and $300. In order to generate the lowest price per removal the work should be bidded out among local tree care companies, so that the work will be completed in their off season (December through March).

A street tree removal bid package should be developed to

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list the specifications which must be met by the contractor. The Franklin Street Tree Board or a part-time City Arborist should develop the removal list, the removal specifications, and the bid package; as well as, determine the lowest and best bid, and oversee the work of the contractor.

A street tree removal specification should include the following parameters:

*Scope of work to be completed

*Identification of involved parties, such as contractor and contract administrator

*Work procedures, especially starting and ending work dates

*Bid performance bond

*Listing of street trees to be removed by address, diameter, and species (to avoid confusion the scientific name of each tree as well as the common name

With development and adherence to the street tree removal specifications the City will complete the removals at the lowest possible price while receiving high quality work.

ACRT estimates that about 10 street trees will require removal annually for the next five years within this area. In the long term (20 years or more) the number of removals will increase as the street tree population matures. Trees identified in this part of the inventory that required removal are listed in Appendix C.

Safety Pruning

Safety pruning is an extensive task which should be started as soon as possible. Trees identified for safety pruning all had major deadwood, broken branches, or hangers in the crown of the street tree that could cause property damage or bodily injury.

ACRT recommends that all safety pruning be completed as soon as possible. There were 76 safety trims identified within this area. ACRT recommends all safety pruning, identified in the inventory, be performed within first year.

All street trees should be pruned to the National Arborist Association (NAA) Class 2 (medium prune) standards (Appendix F) and to minimum clearance specifications when possible (Figure 8). Many street trees observed during the inventory were incompletely pruned. When a tree is pruned, the entire tree should be trimmed to specifications.

If these street trees are pruned to specifications in a timely manner the City will realize several major benefits, including enhanced condition of the trees, enhanced longevity of many of the mature trees, and an increase in the dollar value of the street trees.

Hazard Tree Survey

An annual hazard street tree survey should be performed by the City to assure that sign clearance problems, removals, and trees requiring safety pruning are identified in a timely manner. It is important to address these problems proactively, rather than react to citizen reports. A failure to do so could be considered negligent on the part of the City.

The survey should be performed by a qualified inspector between early July and mid-September. During this time the size and amount of deadwood and insect and disease problems are more easily identifiable. Every street in the City should be surveyed and the location and work requirement of every hazardous street tree recorded. Since only hazardous street trees are of

interest, five to ten street miles can be covered every hour. At this time any sign, vehicle, pedestrian, or light clearance need can be identified.

E. PLANTING PROGRAM

The future of the urban forest in Franklin depends on an active, progressive replacement and reforestation program. Thus ACRT recommends that Franklin initiate an aggressive street tree planting program. The street tree planting rate must be at least 1.2 to 1.5 times the removal rate in order to maintain the current population of approximately 303 street trees in this area. This rate will not increase the size of the overall street tree population. It will merely maintain the current level. If the removal rate for this area is going to be 10 street trees per year for the next several years, then about 15 street trees per year should be planted.

The average estimated cost per a two inch diameter street tree to be planted by a contractor will be about $200. ACRT does not recommend planting of one inch street trees since they will be more prone to vandalism and their survival rate will be lower than for two inch diameter trees. For those street trees to be planted in high vandalism areas a three inch diameter tree should be considered. The average estimated cost for a tree this size to be planted by a contractor will be about $300. Planting must be based on the available funding which will allow the most trees to be planted. ACRT recommends that the street trees to be planted in this study area have a diameter of two to two and one-half inches. The street tree planting program should be contracted out in order to attain good street trees and the lowest and best bid.

For those trees to be planted in concrete the average estimated cost for breaking up the concrete will be between $50 and $100 per planting site. Again a bid package should be developed. This work should be contracted out to local excavating contractors, since it was found that local nursery and

landscape companies perform this type of work on a time and material basis.

The tree planters within this area should be moved, if possible, to those businesses with overhangs (see the detailed planting volume). It is suggested that annual flowers be planted. This task will take effort to ensure that the flowers are watered and receive the proper maintenance. If the City employees can not provide time for this task, the local Garden club, boy scout troop, or girl scout troop should be contacted to see if they would provide the needed services. Another option is to plant viburnum's. ACRT recommends that annual flowers or viburnum's be planted in place of the existing plant material, since they are better adapted to the growing conditions available in the containers.

An annual planting rate of 28 street trees will allow 13 street trees for replacement and approximately 15 new street trees to begin filling the 227 vacant planting sites. At the end of five years, this area should have obtained a 75 percent stocking rate, which is the desired urban forest stocking rate.

A recommended species list for planting in Franklin has been prepared by ACRT (Appendix G). The City Arborist should change this list over time because a street tree planting list is based upon actual performance of species and cultivars. The City Arborist will evaluate other cultivars and varieties that are successful street trees in central Indiana and are available through local nurseries that should be added to the list. The City should also develop a list of undesirable species that should not be planted. A recommended list of undesirable species is included in Appendix I. Maples should not be planted at this time until this genus comprises less than 20 percent of the street tree population.

The street tree planting program in this area should incorporate the following guidelines:

* Plant street trees in grass sites. The City will get the best survival and growth rates by planting in the grass planting sites.

* Plant street trees in residential areas. Planting street trees in residential areas will increase public support for the street tree program, increase property values, and enhance the environment of the neighborhoods.

* Plant street trees in low tree density areas. Trees should be planted in areas with a high percentage of vacant planting sites, for example, in new developments and in the north end of the City. This guideline must be used in conjunction with the above guidelines.

* Plant street trees in high visibility areas. Franklin needs to plant street trees in high visibility areas, many of which will be concrete and asphalt planting sites. The City should, however, only plant street trees in these areas if the resources required to maintain these trees are available. For example, this will include preparation of a suitable planting site by removing the concrete or asphalt, filling the tree well with a backfill consisting of topsoil and peat, fertilizing, and periodic watering as necessary. If the City cannot commit these resources, these street trees should not be planted because they will not survive.

* Plant small or medium sized species under electric wires. Plantings must be planned such that trees and wires will not occupy the same space. Without such planning line clearance operations increase, costing both utilities and citizens, and often resulting in mis-shapen street trees.

Although it will be more expensive to plant in concrete and asphalt than in grass, cost alone should not be the only criterion used to prioritize planting. Other factors, such as visibility to the public, must be considered in deciding which sites should be planted first. ACRT recommends that future plantings be concentrated in downtown areas and newer developments, to provide a more uniform street tree distribution throughout the City.

New plantings should be centrally located within the available tree lawn whenever possible. Central placement of new street trees can prevent sidewalk elevation and curb damage. After planting, paving should not extend over the roots and **vehicle parking must not occur on tree lawns.**

A post-planting care program is necessary to ensure continued health of newly planted trees. If staking is used, it must be removed after one growing season. Staking left in place longer than one season girdles the tree as its diameter increases with growth.

All planting should be contracted to a reputable firm. Nursery stock should be carefully selected using the ANSI Standard for Nursery Stock (ANSI Z60.1, Appendix J). The minimum size of new street trees should be two inch caliper balled and burlapped (B&B). Larger street trees (three inch caliper or larger) are recommended for potentially high vandalism areas.

If plantings are being made by street or blockside, the City should contract for the entire planting. The contract should include a provision for the City Arborist to inspect the street trees before delivery to the site, a guarantee that the trees will be alive and growing one year after planting, and a bid performance bond of two or three percent. By requiring this guarantee and performance bond, the City can be assured that the street tree will be replaced if it dies. Homeowners and business owners should be notified of the planting, and encouraged to assist in the maintenance of the young trees.

If the street tree is planted at the request of a resident, the adjacent homeowners should be encouraged to help with watering and street tree care. A door hanger encouraging the homeowner to "Adopt a Tree" should be used (see Appendix K). The hanger should include watering instructions and tree care procedures. The species of street tree should be written on the hanger as well as the phone number of the urban forestry office.

Planting specifications are found later in this report. Contractors and landowners should adhere to these planting standards to ensure maximum survival of the street trees.

F. LONG RANGE SYSTEMATIC TRIM CYCLE

The street trees in this area should be started on a systematic pruning program in Year 1. Pruning should be done during the dormant season, that is, after the first freeze but before the buds open. In addition, contract pruning is often cheaper at this time of year, because it is the off-season for most tree care companies.

Ideally, a trim cycle should be implemented where each street tree is pruned as needed once every five years. Young trees would benefit from a three year trim cycle. Minimally, the street trees should be pruned on a ten year cycle. Trimming should be done on an area basis to minimize travel time and maximize productivity.

The advantages of an area based systematic trim cycle are:

* Improved overall condition of street trees resulting in higher appraised real value;

* Increased property values due to improved condition and higher dollar values for the street tree population;

* Lower cost per street tree trimmed compared to pruning only for sign clearance and storm damage on a "hot spot" basis;

* Improved cost-effectiveness by pruning street trees when they are smaller and can be pruned at a minimal cost;

* Lower municipal liability from potential street tree related injuries or damages resulting from hazardous street tree conditions;

* Fewer priority service requests;

* Reduced potential storm damage to street trees and possibility of power outages caused by failure of weak or dead limbs;

* Improved street tree appearance and enhanced aesthetic value to the City;

* Fewer street tree mortalities through the early identification and correction of disease and insect problems;

* Improved urban environment including maximum amounts of shade and cooling, noise and glare reduction, and pollution control; and

* Improved public relations.

A systematic trimming program within this area should begin as soon as possible. A routine trimming program of young street trees in the prune-to-shape category should be an integral part of this program. There were 97 street trees identified as requiring shaping from the ground with a pole pruner. Skilled pruning of young street trees prevents the development of future structural problems and reduces future tree care costs. This will also limit the City's liability through a decrease in the number of safety hazards which could develop as the street trees mature. By trimming small trees at regular intervals, many problems can be avoided. It is also more cost efficient to trim a small tree with a pole pruner two or three times than to climb and prune a large tree once.

Large street trees that need a bucket truck or rope/saddle for routine trimming should be pruned to NAA Class II Medium Prune specifications (Appendix F).

G. SERVICE REQUESTS

Citizen service requests for street tree work will always occur. If the high priority maintenance requirements identified in the inventory are performed in a timely manner, the number of citizen calls will decrease over time.

The City Arborist must establish a service request procedure to prioritize the work depending upon severity of the problem. City management must support the policy of only performing service request work when it is high priority.

ACRT recommends that all service requests be inspected to determine the extent of the work. The inspector should have a working knowledge of species performance, and be familiar with hazard street tree identification. He/she should also be experienced with insects and diseases (especially decay) of street trees. The inspector will also have personal contact with property owners. He/she should have strong and effective communication skills and a thorough knowledge of the City's policy regarding service requests. ACRT recommends that the City Arborist perform all the inspections, to uniformly respond to all requests.

The following service request procedure is recommended:

a) Incoming service request calls should be taken by the City Arborist and kept on inspection/work order cards.

b) The City Arborist should visit each site and categorize the request as:

***Immediate priority (24 hours response time).**

***High priority (response within ten days).**

***Routine (to be handled within next five-year trim cycle).**

c) **Those service requests requiring immediate and high priority response are completed. Routine priority requests are entered into the Tree Manager™** system to be handled when work will routinely be conducted in that area of the City.

d) All inspection/work order cards should be sent to ACRT on a monthly or bi-monthly basis to be entered into the **Tree Manager™** system as service requests or work histories.

H. DOLLAR VALUE OF THE STREET TREES

The total street tree value for the street trees in this area was calculated using the International Society of Arboriculture's formula in "Valuation of Landscape Trees, Shrubs, and Other Plants: A Guide to the Methods and Procedures for Appraising Amenity Plants". This method for evaluating plants considers the size, the desirability of the species for the geographical area, the condition and the location. This is the industry-accepted formula for evaluating landscape street trees and has also been recognized by the courts.

The total value for all street trees in this area was estimated to be $460,000, with an average street tree value of $1,500.

As a tree gets larger, its value increases in proportion to the square of its radius. A tree with a four-inch radius is potentially worth four times as much as a tree with a two-inch radius. As trees grow, their value increases logarithmically. A two-inch diameter sugar maple, under favorable site conditions, could grow to four-inches in diameter within six years.

The value of a tree is based upon replacement of the tree with a comparable specimen. When a tree is too large to be transplanted, the value is based upon the equivalent replacement to achieve similar benefits.

Street Tree Value and Real Estate Value

A recent publication by the Toronto Real Estate board states that street trees are at the "top of the list" as features which make a residential property attractive to potential buyers. The "setting" of a property includes much more than the lot under consideration. The entire street and neighborhood are considered and well-treed streets are a definite selling point. The Journal of Arboriculture has reported studies showing trees can contribute 15 percent to real estate value (January 1983, "Two Methods of Valuating Trees on Residential Sites"). Another

article found urban trees contributed six percent to real estate value (November 1980, "The Contribution of Trees to Residential Property Value").

A well-planned, comprehensive street tree program in Franklin will make a positive impact on real estate values in the City.

I. FIVE YEAR STREET TREE MAINTENANCE SCHEDULE

A recommended five year street tree care maintenance schedule is presented in Table 9. This schedule presents the number of trees that will require maintenance during each of the next five years if ACRT's recommendations are followed.

The following assumptions made in this model:

a. There will be a mortality rate of approximately two to three percent. This is based on the current inventory and average street tree mortality rates in other cities.

b. All removals and all safety prunes identified during the 1989 inventory will be done in Year 1.

c. The number of safety prunes will decrease significantly when a systematic pruning program is implemented. The model starts with 76 safety prunes in Year 1 (based on the 1989 inventory) and decreases to 24 safety prunes by Year 5.

d. The removals and safety prunes will be identified by service requests and an annual Hazard Tree Survey.

e. Small street trees that can be pruned from the ground with a pole pruner will be pruned on a three year cycle to correct structural problems and encourage proper growth form.

Table 9. Recommended Schedule of Street Tree Maintenance Operations (COFF)

Operation	Number of Trees				
	Year 1	Year 2	Year 3	Year 4	Year 5
Removals[1]	7	8	8	9	10
Safety Trims[2]	76	57	43	32	24
Systematic Pruning					
Small Trees[3]	36	39	43	46	49
Large Trees[4]	42	44	45	47	49
Planting[5]	28	28	28	28	28

[1]Based on a projected mortality rate of approximately three percent (including new trees).

[2]The number of safety trims will decrease each year if a systematic pruning program is implemented.

[3]Refer to Table 12 (3 year trim cycle)

[4]Refer to Table 13 (5 year trim cycle)

[5]This planting schedule includes replacing removals at a rate of 120 percent plus new plantings to fill empty sites identified in the inventory.

Franklin, IN (1989)

f. Large street trees that require a bucket truck or manual climbing will be pruned on a five year cycle.

g. The recommended planting schedule includes replacing removals at a rate of 120 percent plus new plantings to fill empty sites identified in the inventory. The model assumes a constant planting rate of 28 street trees per year. At this rate, a 75 percent stocking rate will be achieved within five years.

This schedule will result in approximately 400 street trees in this area by the end of five years. During this time, ACRT expects the number of requests for service and the number of problems identified in an annual hazard street tree survey to drop steadily. During this time frame, it is important for the City to commit to a systematic approach to street tree maintenance.

Based on these assumptions, man-hour budgets for this schedule were calculated for each maintenance operation. Planting was not included in the man-hour budget calculation.

J. FIVE YEAR STREET TREE MAINTENANCE BUDGET (MAN-HOURS)

The estimated man-hours required for removals in Years 1 through 5 are presented in Table 10. A total of 104 man-hours will be required in Year 1, followed by an average of 130 man-hours per year for Years 2 through 5.

The total number of man-hours required in Years 1 through 5 of the recommended schedule for safety pruning are presented in Table 11. This task will require 411 man-hours in Year 1, followed by an annual average of 211 man-hours in Years 2 through 5.

The average annual number of man-hours required for Years 1 through 5 for systematic pruning of small street trees on a three year cycle is 21 (Table 12). For large street trees on a five year cycle, the same calculation is 114 man-hours (Table 13).

The five year man-hour budget summary for these maintenance requirements is shown in Table 14. The total requirements for this optimal schedule are 638 man-hours for Year 1, decreasing annually to 426 man-hours by Year 5. The decrease is due to fewer service requests and other emergency street tree care requirements which take disproportionately more time than performing "proactive" systematic pruning which prevents many of these problems.

The five year planting budget is shown in Table 15. The annual planting cost over the next five years will be $5,600 for the recommended number of new plantings. These costs are based upon a contractor planting two and one half inch caliper trees for an average cost of $200 per tree, including the planting stock, the transportation, installation, and guarantee of all planting stock for a period of one year.

K. USE OF CONTRACTORS FOR COMPLETION OF WORK

The man-hour requirements for all recommended street tree care tasks are summarized in Table 14. Approximately 638 man-hours in Year 1 are needed to maintain the street tree population. This decreases to an average of approximately 426 man-hours per year during the following years.

Currently there is no street tree crew. Therefore, the current man-power required for planting, removals, safety prunes, large tree prunes, and small tree prunes **must** be contracted. Contracting will ensure that industry-based performance standards are met. It will be more cost effective to contract tasks which require specialized but costly equipment.

Bids for planting should be requested from local landscaping firms and nurseries. The bid method is the most cost effective way to plant large quantities of trees.

A good street tree planting bid contains a listing of specifications which must be met. These specifications will ensure that street trees are quality stock, are planted properly, are guaranteed for one year, and that the lowest price per tree

Table 10. Five Year Man-Hour Budget for Removals (COFF)

Diameter Class (inches)	Percent of Removals in Each Size Class[1]	Man-Hour Per Tree (Removals)[2]	Man-Hours Per Size Class				
			Year 1 (7 Trees)[1]	Year 2 (8 Trees)[3]	Year 3 (8 Trees)[3]	Year 4 (9 Trees)[3]	Year 5 (10 Trees)[3]
0 - 6	14.3	2.1	2	2	2	3	3
6 - 12	0.0	3.7	0	0	0	0	0
12 - 18	14.3	6.9	7	8	8	9	10
18 - 24	14.3	11.9	12	14	14	15	17
24 - 30	28.5	15.8	32	36	36	41	45
30 - 36	14.3	20.4	20	23	23	26	29
36+	14.3	31.0	31	35	35	40	44
		Total	104	118	118	134	148

[1]Based on results of 1989 inventory.

[2]Industry-based performance standards.

[3]Projected mortality based urban tree performance in comparable situations, plus mortality rate of newly planted trees.

Franklin, IN (1989)

Table 11. Five Year Man-Hour Budget for Safety Trimming (COFF).

Diameter Class (DBH)	Percent of Size Class Requiring Safety Trim	Man-Hour Per Tree (Safety Trim)	Man-Hours Per Size Class[1]				
			Year 1 (76 Trees)	Year 2 (57 Trees)	Year 3 (43 Trees)	Year 4 (32 Trees)	Year 5 (24 Trees)
0 - 6	0.0	1.4	0	0	0	0	0
6 - 12	2.6	2.1	3	3	2	2	1
12 - 18	31.6	3.1	74	56	42	31	24
18 - 24	32.9	4.7	118	88	66	49	37
24 - 30	18.4	7.1	99	74	56	42	31
30 - 36	9.2	9.3	65	48	37	27	21
36+	5.3	12.8	52	39	29	22	16
		Total	411	308	232	173	130

[1]Man-Hours = Number of trees x percent of size class x man-hours per tree.

Franklin, IN (1989)

Table 12. Five Year Man-Hour Budget for Systematic Pruning of Small Street Trees on a Three-Year Cycle (COFF)

Year	Number of Small Trees	New Plantings (Add)	Removals[1] (Subtract)	Trees That Become Large Trees	Total	Number of Trees to Trim Per Year[2] (33% of Total)	Man-Hours Per Year for Pruning (0.5 hr/tree)
1	97	28	1	15	109	36	18
2	109	28	3	15	119	39	20
3	119	28	3	15	129	43	21
4	129	28	3	15	139	46	23
5	139	28	4	15	149	49	25

[1]Estimated 2-3 percent mortality rate of young trees.

[2]Three year trim cycle.

Franklin, IN (1989)

Table 13. Five Year Man-Hour Budget for Systematic Pruning of Large Street Trees on a Five Year Cycle (COFF)

Year	Number of Large Trees	Removals (Subtract)	New Large Trees[1] (Add)	Total	Number of Trees to Trim Per Year[2] (20% of Total)	Man-Hours Per Year for Pruning[3]
1	199	6	15	208	42	105
2	208	5	15	218	44	110
3	218	5	15	228	45	113
4	228	6	15	237	47	118
5	237	6	15	246	49	123

[1]Trees that grow to the point where bucket truck is required to perform complete Class II prune. (Note that these trees are subtracted in the Small Tree Model in Table 32).

[2]Five year trim cycle.

[3]2.5 man-hours per trim (industry based average performance standard).

Franklin, IN (1989)

Table 14. Five Year Man-Hour Budget Summary (COFF)

Year	Number of Man-Hours Annually				
			Systematic Pruning		
	Removals	Safety Trimming	Small Trees	Large Trees	Total
1	104	411	18	105	638
2	118	308	20	110	556
3	118	232	21	113	484
4	134	173	23	118	448
5	148	130	25	123	426

Franklin, IN (1989)

Table 15. Five Year Dollar Budget for Street Tree Planting (COFF)

Year	Number To Be Planted	Total Costs*
1	28	5,600
2	28	5,600
3	28	5,600
4	28	5,600
5	28	5,600

*Average cost of $200 per tree.

Franklin, IN (1989)

is obtained. A street tree planting specification package must be developed and administered. The Franklin Street Tree Board or a part-time City Arborist should develop the planting list, develop the planting specifications, develop a bid package, determine the lowest and best bid, and oversee the work of the contractor who receives the bid.

A street tree planting specification should include the following parameters:

* Scope of work
* Identification of involved parties, such as contractor and contract administrator
* Material specifications
* Work procedures, especially starting and ending dates for planting
* Procedures to follow in the event substitutions of defined planting stock become necessary
* List of inspections such as nursery and contractor
* Guarantee
* List of rejections such as trees and planting depths
* Bid performance bond
* List of trees to be planted, by address. For accuracy and to avoid confusion this listing should include the scientific name, qualifications regarding acceptable diameter of stock, and transplant requirements, that is, whether bare-root stock or balled and burlapped (B&B) will be used.
* Bid sheet

With development of and adherence to the street tree planting specifications the City will complete the tree planting at the lowest possible price while receiving high quality street trees.

The street tree removals and pruning should also be let for bid. These bid requests should contain a list of performance specifications and require a bid performance bond, normally two or three percent of the total dollar value of the work to be done. To save the City money the street tree removals and prunings should be performed during the winter months, December-March. The rates are lower at this time because it is the non-peak work season for tree maintenance. An alternative for routine pruning of small trees is to hire a crew of summer interns under the supervision of the City Arborist to perform this task.

L. INVENTORY UPDATING AND REPORTING SYSTEM

It is essential to maintain an accurate database to prepare useful budgets and work schedules. Therefore, it is necessary for the workers and staff involved with the management of the street trees to become familiar with the **Tree Manager™** program. These key people must know how to report what is done to any street tree or planting site and provide the information to the data processor. It is necessary to start this process immediately, before the inventory becomes out dated.

The **Tree Manager™** system includes a system for generating trimming reports for individual street trees. These reports should be taken into the field by the crews and work information written on the printouts after the work is performed. The information must then be returned to the office where it can be added to the database by the operator.

It should be the responsibility of the City Arborist to see that the **Tree Manager™** system is adopted as soon as possible. He/she should instruct the crews on the proper completion of the service reports and ensure they are submitted in a timely manner. The City Arborist should also see that trees are removed from the database as they are removed by the contractor, and added to the database as they are planted. These steps must be followed to maintain a useful database.

M. PUBLIC RELATIONS

Public support and involvement are necessary components of any successful urban forestry program. Notable examples are "TreePeople" in Los Angeles and "Friends of the Urban Forest" in San Francisco. Both of these groups were formed with the primary emphasis on reforestation of the urban environment.

Such outstanding and successful programs do not develop overnight. Public relations efforts on the part of the street tree board and City administration may help spur public interest and activity. A public support and involvement system within the City of Franklin will:

* keep street trees in the public eye;
* encourage the use of permits;
* increase the involvement of residential neighborhood groups; and
* help establish and maintain an annual fund raising program for urban forestry activities.

The City Arborist should work to develop the following programs:

1. **"Tree City, USA"** - Franklin should apply for "Tree City, USA" status from the National Arbor Day Foundation. The requirements are:
   * A legally constituted tree body (i.e., Street Tree Board)
   * A community tree ordinance
   * An active, comprehensive, community forestry program supported by a minimum of $1.00 per capita
   * Arbor Day proclamation and public commemorative tree planting.

2. **"Adopt-A-Tree"** - When a tree is planted on a residential tree lawn, the resident should be encouraged to help with watering and tree care. A door hanger encouraging the

homeowner to "Adopt-A-Tree" should be used. The door hanger should include identification of the tree, watering instructions and tree care procedures such as pruning of small trees, removal of staking materials, fertilization, and maintenance of the mulch layer. A telephone number to call in the event of questions should also be included. A sample "Adopt-A-Tree" leaflet is presented in Appendix K.

3. **Arbor Day** - Use the annual Arbor Day to celebrate trees. Get the public involved in planting trees and learning proper tree care. Use this time to help with the fund raising. Coordinate an Arbor Day 5 km foot race and charge an entrance fee.

4. **Education** - Develop a slide program and a series of posters on the importance of urban forests, suitable for presentation in elementary or junior high schools. Sponsor a poster contest. Work with local 4-H or FFA groups to engender interest in community forestry. Involve the school children when new plantings are to be placed near their schools. Allow them to help dig the hole and fill soil back in around the tree. This "hands-on" experience engenders a sense of ownership which will reduce the amount of vandalism to trees.

5. **Newspaper Column** - Use the newspaper to increase public awareness. A regular "Urban Trees" column could provide tips on all aspects of tree care and announcements of urban forestry related events or programs.

As community groups develop, the City Arborist should be available for evening meetings and presentations. Excellent slide presentations are available on the importance of urban forests and other appropriate topics for adult citizen groups.

With the potential for fluctuations in municipal budgets some municipalities have developed private "Tree Trusts". These 501(C)(3) non-profit corporations can be established to receive donations, memorials and bequests. Many uses of trust funds can be specified. Typical uses are street tree planting, extraordinary street tree care, and employee/public education about street tree care. The trust is not intended to replace budgetary allocations, but may augment them and provide for higher quality street tree care for the entire community. Trusts may be set up as matching funds to encourage both private and public participation.

ACRT recommends that Franklin maintain the inventory on a continual basis. If it is not used for a period of several years it will be increasingly difficult to use. The plantings and maintenance work that is completed this year within this area must be recorded in the "Franklin Update Listing" provided by ACRT for the City.

N. TRIMMING AROUND POWER LINES

Federal law requires that tree workers, other than qualified line clearance tree trimmers, must maintain 10 feet of clearance from wires energized over 750 volts. Therefore, Franklin workers are not allowed to work in this 10-foot area, and agreements must be made with Public Service Indiana (PSI) to trim trees near the wires.

A close working relationship should exist between Franklin and PSI. There are benefits for both through cooperation.

PSI will benefit by:

* Elimination of planting large-growing species under power lines.
* Directional pruning of existing street trees under wires to avoid future problems.
* Removal of problem street trees under wires.

The City will benefit from a cooperative program also. The goals should include:

* A street tree replacement program paid for in part by PSI to remove potentially hazardous street trees and replace them with low growing species.

* Coordination of trimming and removal programs to reduce Franklin workload.

* Cost-sharing for planting compatible, low growing under-species beneath overhead electric wires.

V. WORK SPECIFICATIONS

A. GENERAL PRUNING

Four categories of pruning were recommended in this inventory. Briefly, these categories are:

Safety Prune. Safety pruning is the removal of dead, diseased, insect infested, or obviously weak or heavy branches, two inches in diameter or greater, or less than two inches if the branch is broken off and a potential hazard.

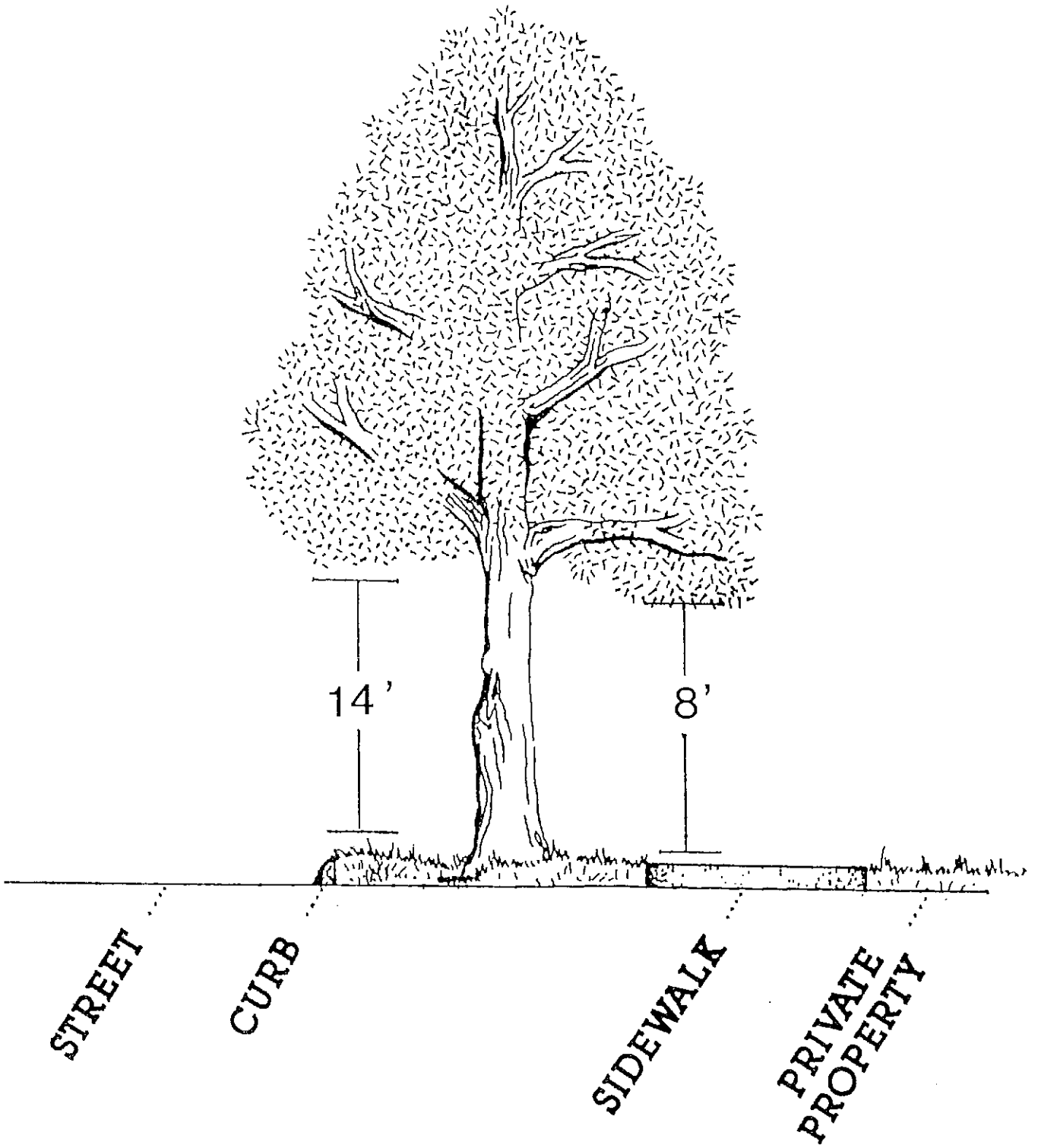
Large Tree Prune. Routine pruning of large trees consists of the removal of dead, dying, diseased, insect infested, interfering, objectionable and weak branches. An occasional branch, up to one inch in diameter, may remain within the main leaf area where it is not practical to remove it. Routine pruning is equivalent to a National Arborist Association Class II Medium Prune (Appendix F).

Small Tree Prune. Training or pruning of small trees consists of the removal of dead, dying, diseased, insect infested, interfering or conflicting, and weak branches, and trees in this category are young and/or low-growing trees that can be pruned by a person on the ground using a pole pruner. Workers should trim trees to a single stem without potentially weak "V" crotches, unless other growth forms are more desirable in certain locations.

Trimming for Clearance. To provide for traffic clearance, low branches should be removed to a height of 14 feet above curb-grade. Low branches overhanging sidewalks should be removed to a height of 8 feet from the center of the sidewalk (Figure 8). Trees in the vicinity of street lights, light standards, and signs should be trimmed so that the lights are visible and/or will provide maximum illumination.

FIGURE 8

PRUNING SPECIFICATIONS FOR CLEARANCE



B. BASIC PRUNING TECHNIQUES

The following basic techniques are recommended for proper tree pruning operations:

* All cuts should be made sufficiently close to the trunk or parent limb without cutting into the branch collar or leaving a protruding stub. This encourages proper closing of the wood within a minimum time (see Figure 9).

* Limbs and branches larger than six inches diameter should be lowered using ropes or other mechanical devices to prevent damage to personnel and property (exhibits, sidewalks, streets, etc.).

* Weak, undesirable, crossing or rubbing branches should be removed if this does not leave a large hole in the general outline of the tree.

* Old pruning injuries that are not closing properly should be bark traced where necessary to assist future callus development without disturbing existing callus or decay compartmentalization.

* Young trees should be shaped early to promote sound structural growth and an attractive functional growth habit.

* Generally, young trees should be pruned to a single central leader in a manner that promotes the development of strong scaffold limbs. Certain species do not develop single leaders and with these trees, the strongest leaders should be selected. If V-crotches are developing, one of the two branches should be removed.

Size reduction of tops, sides, or individual limbs can be

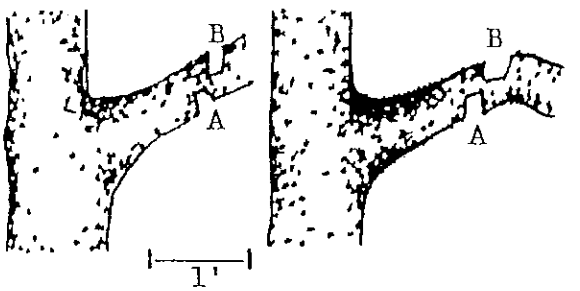
FIGURE 9

PROPER PRUNING CUTS

STEP 1

In pruning any sizeable tree member, first remove most of the branch's weight with two cuts:

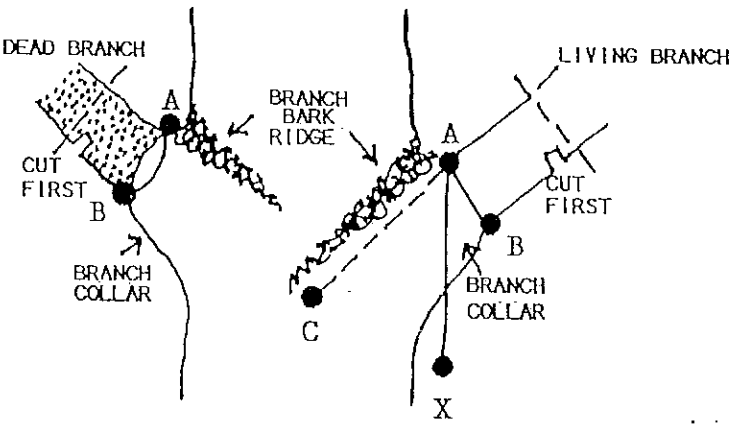
1. Undercut branch at Point A about one foot from main stem.
2. Make a second cut at Point B one or two inches beyond cut A. Point B is always farther from the main stem than Point A.



STEP 2

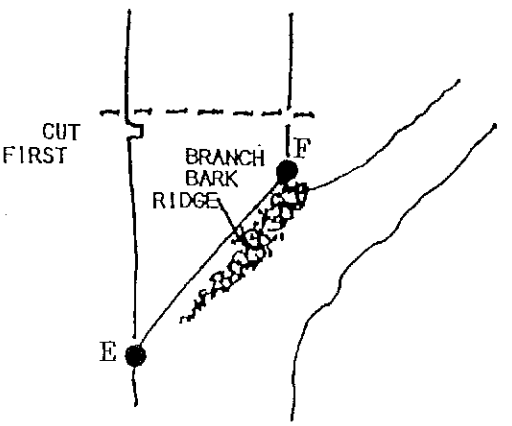
Note the Branch Bark Ridge and Branch Collar in the illustration. These areas vary substantially in appearance on different species; the difference is especially notable on hardwood vs. softwood trees.

The final pruning cut is made between points A & B.



PRUNING TO REDUCE SIZE

This process involves removal of larger branches back to a point (D-E) where a smaller branch joins the stem. Locate the Branch Bark Ridge, and make the cut-without disturbing the Ridge- from Point E to Point F at approximately the same angle as the Branch Bark Ridge.



performed by pruning back to a strong lateral crotch. This is shown in Figure 9, "Pruning to Reduce Size". This is the recommended practice for utility line interference or when there is unusual and rapid tree growth. Such drastic pruning is also sometimes necessary after a hurricane or severe wind storm when large branches or major portions of the tree are severely damaged and potentially endanger human life and property.

Branches are cut back to a crotch with a side branch not less than one-third the diameter of the branch being removed. Wounds made by splitting limbs should be cleaned of torn and broken wood fibers and bark traced to ensure proper callus formation. Unaffected branches should also be cut back to a side branch, as explained above, to balance cuts made on broken branches particularly to reduce exposure to future high winds. When such severe pruning must be done, the immediate effect may appear undesirable, but carefully planned pruning within a few years can help fill the gaps and result in a well-shaped tree.

The pruning standards accepted by professional arborists are found in Appendix F.

C. UNACCEPTABLE TRIMMING PRACTICES

The following trimming techniques are not acceptable for Franklin's street tree maintenance:

* Topping is a technique where cuts are made in an internodal area. This type of pruning results in excessive sucker growth the next season. These new branches are often weak and never develop into healthy laterals because they arose from adventitious buds, and there is no firm connection with the main wood of the tree. Trimming procedures that cut back to three inch (or larger) stubs weaken the structure of the tree as well as deter from the beauty of the natural form of the tree.

* Framing is a pruning technique which removes many of the inside branches and results in clusters of small branches at the ends of main branches. This picturesque landscaping pruning technique is not recommended for Franklin trees because it is extremely time consuming and very costly. Additionally, high winds often result in limb breakage.

* Roundovers or "shearing" is a technique where branches are trimmed to present a "sheared" appearance over the total surface of the crown or just on top. This type of pruning places cuts anywhere along a branch (not necessarily at the base of the limb) and results in severe suckering. These suckers have a weak structural attachment.

D. TREE PLANTING TECHNIQUES

If trees are to grow and thrive, proper planting techniques must be followed. Five points are important to assure rapid recovery from transplanting:

* Handling from nursery to planting site
* Time of year
* Size, vigor, and condition of street trees
* Size of planting hole, soil moisture, fertilizer and water
* Post-planting care

The street trees should be transported from the nursery without desiccation of any part of the plant, particularly the roots. Open truck shipments should be protected by a tarpaulin securely fastened in the front to prevent drying out in transport. If the trees cannot be planted immediately, they should be watered and placed in a cool, shady location, such as inside a garage or barn, to protect against sunlight and wind. Trees should not be transported to the planting site and left exposed to the sun for long periods of time before planting.

Although trees may be transplanted any time of the year, spring (March) and fall (October) are the best time to plant most

trees. Trees planted at this time have a much better chance of survival because some root growth has taken place prior to summer. If the root system is adequate, water will be absorbed and transported to the foliage in sufficient quantities to meet the transpiration requirements. Without an adequate root system the leaves will wilt and may die.

The size and condition of the trees to be planted is important. Trees should be at least two inches in diameter, four and one-half feet above the ground. Trees of smaller caliper are too easily broken and do not have enough stored energy to withstand adverse planting sites. Trees should have a good terminal bud, normal twig growth from the previous year, and no loose or damaged bark. Slightly crooked trees are acceptable since the crook will disappear as the tree grows. Forked trees are not acceptable.

Although it is not uncommon to have 25 to 80 percent root loss when transplanting bareroot trees and shrubs, it is not advisable to prune any top growth. The terminal buds on the ends of branches contain growth-regulating chemicals required for root growth. Recent research has concluded that when these buds are pruned, root growth is not stimulated because the input of the regulating chemical to the roots is reduced. Newly planted trees will have a better shape and form if they are not pruned. This practice does not apply to "corrective pruning". Dead, damaged, or misshapen branches can create a serious problem at a later date, and these should be pruned at transplanting time. It is important that pruning be done in such a manner as to maintain the natural form of the tree. Balled-and-burlapped stock and container-grown trees only require corrective pruning. However, the lower branches of street trees should be trimmed a year prior to planting and two years after planting to provide clearance for vehicular and pedestrian traffic.

The underground environment where a tree is planted will determine to a great extent how well the tree will do above ground. Many landscapers follow a simple rule: "For a nickel

plant, dig a dollar hole." The planting hole should be dug one to two feet wider and six to 12 inches deeper than the container. The sod and stones should be discarded.

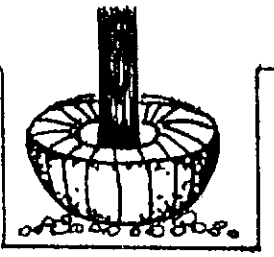
Before setting the tree in the planting hole, the hole should be partially filled with prepared soil (Figure 10). The soil should be firmed and backfilled until the tree will stand at the same depth or slightly higher than it stood at the nursery. The former soil mark is usually visible on the tree trunk. The remainder of the planting hole can now be filled with the prepared soil. Compact the soil (but not excessively) around the roots by hand or foot. When the hole is two-thirds full, fill the hole with water. When the water has drained, resume filling the hole. A water saucer should be built on the surface of the soil where the root ball ends. This water saucer should only be present during the first year after planting, to promote root development. To encourage the roots to disperse away from the trunk, remove the water saucer after the first year if it has not disappeared by then.

Mulching around the tree will help reduce water loss through evaporation and weed growth. A two- to four-inch layer of chipper residue, bark, rotted sawdust, or pine straw can be used for this purpose. Plastic should not be used as a mulch. Keep grass and weeds cleared from newly planted trees and shrubs. Two or three slow release fertilizer packets should be incorporated into the planting hole before the tree is planted.

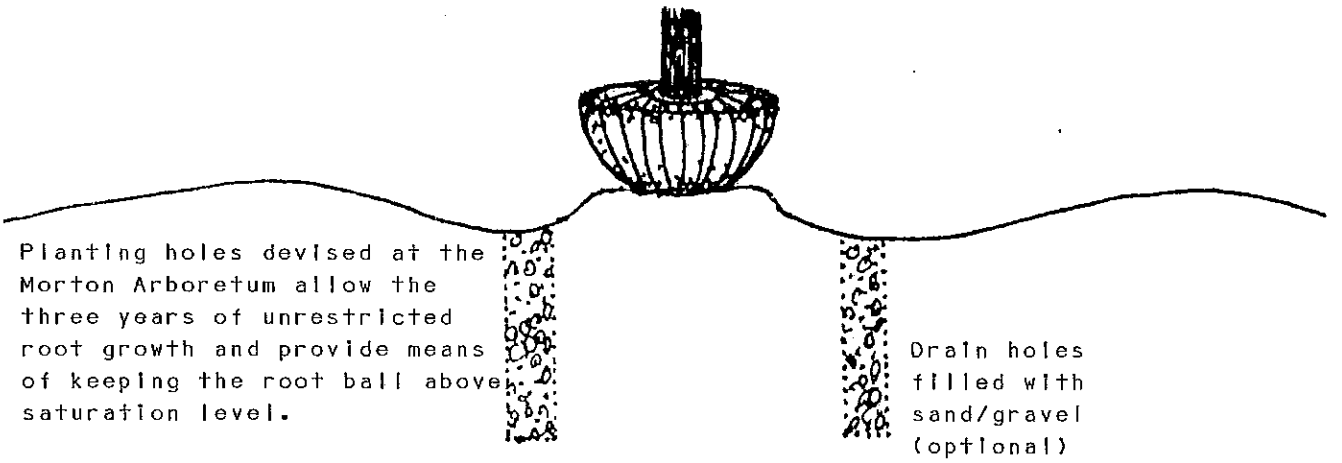
Post-planting care starts as soon as a tree is planted. The main stem of thin barked deciduous trees should be wrapped with burlap or tree wrap paper to protect against sun scald. Wrap the paper starting at the topsoil line and wrap to the large branches (the uppermost portion of the stem need not be wrapped since it will be shaded by foliage). Each spiral should overlap one-half the width of the strip so that a double thickness is applied. The tree wrap should then be bound with cord, biodegradable string or staples. This tree wrap should be removed after one growing season.

FIGURE 10

Proper Methods for Planting
Balled and Containerized Trees

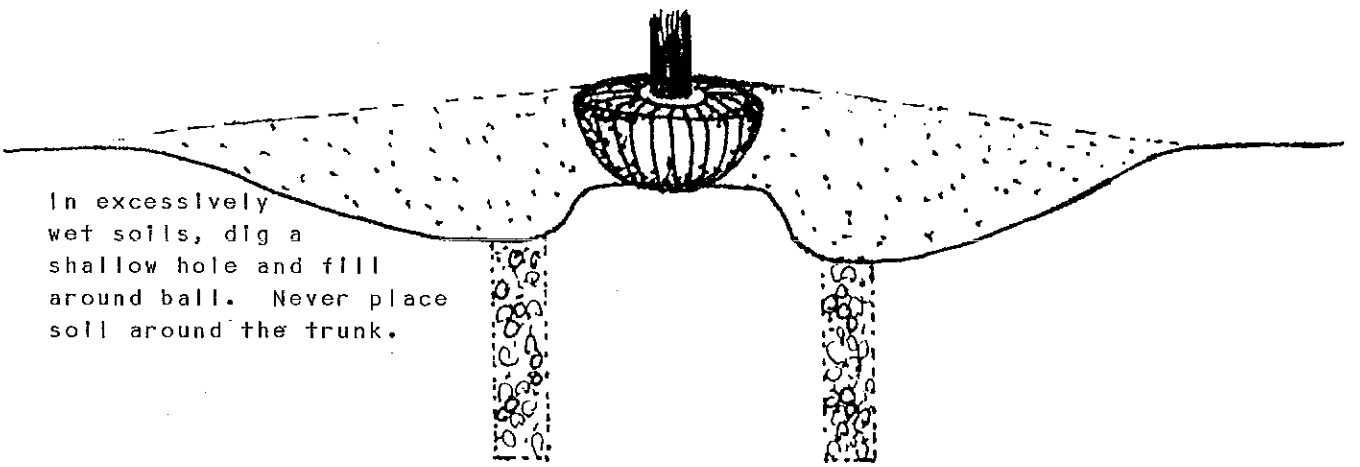


Conventional planting holes restrict root growth and retain excess water in the root zone.

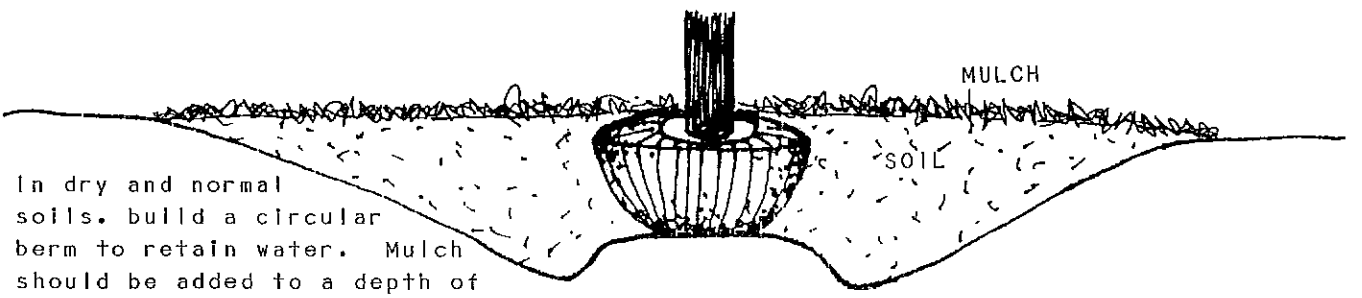


Planting holes devised at the Morton Arboretum allow the three years of unrestricted root growth and provide means of keeping the root ball above saturation level.

Drain holes filled with sand/gravel (optional)



In excessively wet soils, dig a shallow hole and fill around ball. Never place soil around the trunk.



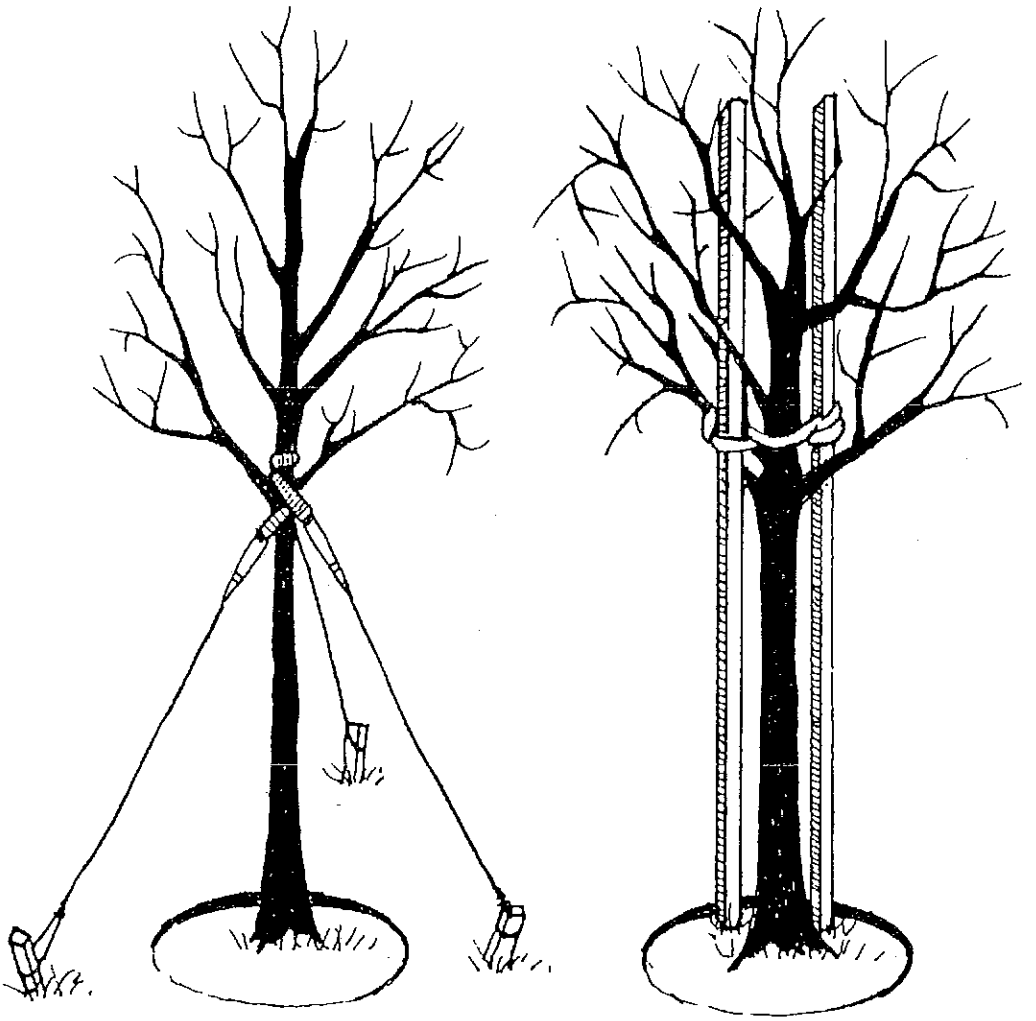
In dry and normal soils. build a circular berm to retain water. Mulch should be added to a depth of 2-4 inches to retain moisture and keep the soil cool.

The newly planted tree may be braced to keep it in an upright position (Figure 11). Bracing should be done in such a manner that the trunk can move three to six inches with the wind. This allows the roots to become established to prevent the tree from blowing over. Braces should be removed after one year.

Post-planting care should include at least two stops at each tree during the first year: the first visit in June, the second in August or early September. The mulch cover is checked; dilute liquid fertilizer may be added at the June visit; the trees should be watered if needed, and the trunk wrap should be checked. At least one visit per year in midsummer is adequate in subsequent years. The same operations should be performed in addition to pruning side branches to shape the crown and maintain vehicle, pedestrian, and sign clearance on a three year cycle.

FIGURE 11

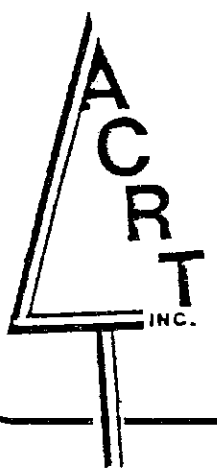
METHODS OF BRACING TREES



USING THREE GUY WIRES:

USING STAKES:

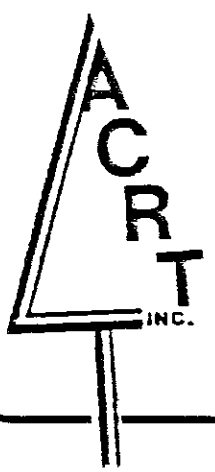
APPENDIX
A



COFF Street Tree Inventory
Street Name Listing

Street Name
CROWELL ST
E COURT ST
E JEFFERSON ST
E KING ST
E MADISON ST
E MONROE ST
E WAYNE ST
FORSYTHE ST
HENRY ST
HOUGHMAN ST
N HOME AVE
N MAIN ST
N WATER ST
ORCHARD LN
S HOME AVE
S JACKSON ST
S MAIN ST
S WATER ST
W COURT ST
W JEFFERSON ST
W MADISON ST
W MONROE ST
W WAYNE ST

APPENDIX
B



APPENDIX B

TREE SPECIES LISTING

The following listing contains all genera and species identified in the street tree inventory of the City of Franklin. The listing is arranged alphabetically by species code, which is constructed from the first two letters of the genus and species names. The listing contains both common and scientific names of the taxa, and the species value.

Species value is a concept based on both the species and its geographical location. It is a measure of how well or how poorly a species performs in a particular area of the country. A species value of 1.0 would be used to rank an excellent street tree species growing in a geographical area for which it is perfectly suited. A species value of 0.0 would be used to rank a tree unsuited for use both as a street tree and in the geographical area in which it is growing. Most street trees rank between the extreme values.

COFF Street Tree Inventory
Species Listing

Species Code	Common Name	Scientific Name	Species Value
AC	MAPLE SPECIES	ACER SPECIES	0.8
ACNE	BOXELDER	ACER NEGUNDO	0.3
ACPL	NORWAY MAPLE	ACER PLATANOIDES	0.8
ACRU	RED MAPLE	ACER RUBRUM	0.7
ACSA1	SILVER MAPLE	ACER SACCHARINUM	0.4
ACSA2	SUGAR MAPLE	ACER SACCHARUM	0.8
AEHI	COMMON HORSECHESTNUT	AESCULUS HIPPOCASTANUM	0.6
CACA	AMERICAN HORNBEAM	CARPINUS CAROLINIANA	0.8
CASP	CATALPA	CATALPA SPECIOSA	0.3
CECA	REDBUD	CERCIS CANDANENSIS	0.7
CEOC	HACKBERRY	CELTIS OCCIDENTALIS	0.8
CO	DOGWOOD	CORNUS SPECIS	0.8
CRPH	WASHINGTON HAWTHORNE	CRATAEGUS PHAENOPYRUM	0.7
FASY	EUROPEAN BEECH	FAGUS SYLVATICA	0.8
FRPE	GREEN ASH	FRAXINUS PENNSYLVANICA	0.8
GLTR	HONEYLOCUST	GLEDITSIA TRIACANTHOS	0.8
JUNI	BLACK WALNUT	JUGLANS NIGRA	0.8
LIST	AMERICAN SWEETGUM	LIQUIDAMBAR STYRACIFLUA	0.8
LITU	TULIPTREE	LIRIODENDRON TULIPIFERA	0.8
MA	CRABAPPLE	MALUS SPECIES	0.6
MG	MAGNOLIA	MAGNOLIA SPECICES	0.8
PIPU	COLORADO BLUE SPRUCE	PICEA PUNGENS	0.7
PLAC	LONDON PLANETREE	PLATANUS ACERIFOLIA	0.7
PRPE	COMMON PEACH	PRUNUS PERSICA	0.6
PYCA	CALLERY PEAR	PYRUS CALLERYANA	0.6
QUPA	PIN OAK	QUERCUS PALUSTRIS	0.7
QURU	RED OAK	QUERCUS RUBRA	0.8
SP	OTHER	OTHER	0.5
THOC	ARBORVITAE	THUJA OCCIDENTALIS	0.5
THOCP	ARBORVITAE IN PLANTER	THUJA OCCIDENTALIS-PLANTER	0.2
TIAM	BASSWOOD	TILIA AMERICANA	0.6
TICO	LITTLELEAF LINDEN	TILIA CORDATA	0.9
ULAM	AMERICAN ELM	ULMUS AMERICANA	0.4
ULPU	SIBERIAN ELM	ULMUS PUMILA	0.4

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
CROWELL ST	1	1	SUGAR MAPLE	18	SAFETY L	G			C		384
CROWELL ST	1	2	PLANTING SITE LARGE GRASS	0							385
CROWELL ST	1	3	PLANTING SITE LARGE GRASS	0							386
CROWELL ST	1	3	PLANTING SITE LARGE GRASS	0							387
CROWELL ST	1	5	PLANTING SITE LARGE GRASS	0							388
CROWELL ST	1	5	PLANTING SITE LARGE GRASS	0							389
CROWELL ST	1	6	PLANTING SITE LARGE GRASS	0							390
CROWELL ST	3	6	PLANTING SITE LARGE GRASS	0							391
CROWELL ST	53	24	SILVER MAPLE	12	PRUNE SM	G			C		403
CROWELL ST	58	4	PLANTING SITE LARGE GRASS	0							404
E COURT ST	9	21	PLANTING SITE SMALL CONCRETE	0							617
E COURT ST	9	24	MAGNOLIA	6	PRUNE SM	G					618
E COURT ST	25	1	PLANTING SITE SMALL CONCRETE	0							619
E COURT ST	25	5	PLANTING SITE SMALL CONCRETE	0							620
E COURT ST	49	4	PLANTING SITE SMALL CONCRETE	0							621
E COURT ST	55	1	PLANTING SITE SMALL CONCRETE	0							622
E COURT ST	63	1	PLANTING SITE SMALL CONCRETE	0							623
E JEFFERSON ST	2	6	PLANTING SITE SMALL CONCRETE	0							635
E JEFFERSON ST	2	21	PLANTING SITE SMALL CONCRETE	0							636
E JEFFERSON ST	18	4	PLANTING SITE SMALL CONCRETE	0							637
E JEFFERSON ST	40	6	PLANTING SITE SMALL CONCRETE	0							638
E JEFFERSON ST	50	3	PLANTING SITE SMALL CONCRETE	0							639
E JEFFERSON ST	50	7	PLANTING SITE SMALL CONCRETE	0							640
E JEFFERSON ST	55	5	PLANTING SITE SMALL CONCRETE	0							641
E JEFFERSON ST	71	7	ARBORVITAE IN PLANTER	3	PRUNE SM	F					642
E JEFFERSON ST	72	7	ARBORVITAE IN PLANTER	3	PRUNE SM	F					643
E JEFFERSON ST	77	2	PLANTING SITE SMALL CONCRETE	0							644
E JEFFERSON ST	80	1	PLANTING SITE SMALL CONCRETE	0							645
E JEFFERSON ST	80	6	PLANTING SITE SMALL CONCRETE	0							646
E JEFFERSON ST	89	3	PLANTING SITE SMALL CONCRETE	0							647
E JEFFERSON ST	89	6	PLANTING SITE SMALL CONCRETE	0							648
E JEFFERSON ST	98	11	PLANTING SITE SMALL CONCRETE	0							649
E JEFFERSON ST	99	21	PLANTING SITE SMALL CONCRETE	0							650
E JEFFERSON ST	100	6	PLANTING SITE SMALL CONCRETE	0							651
E JEFFERSON ST	100	22	PLANTING SITE SMALL CONCRETE	0							652
E JEFFERSON ST	101	1	PLANTING SITE SMALL CONCRETE	0							653
E JEFFERSON ST	101	3	PLANTING SITE SMALL CONCRETE	0							654
E JEFFERSON ST	101	5	PLANTING SITE SMALL CONCRETE	0							655
E JEFFERSON ST	101	9	PLANTING SITE SMALL CONCRETE	0							656
E JEFFERSON ST	101	11	PLANTING SITE MEDIUM CONCRETE	0							657
E JEFFERSON ST	101	12	PLANTING SITE MEDIUM CONCRETE	0							658
E JEFFERSON ST	114	7	ARBORVITAE IN PLANTER	3	PRUNE SM	F					659
E JEFFERSON ST	136	1	PLANTING SITE SMALL CONCRETE	0							660
E JEFFERSON ST	148	1	PLANTING SITE SMALL CONCRETE	0							661
E JEFFERSON ST	149	7	PLANTING SITE SMALL CONCRETE	0							662
E JEFFERSON ST	151	5	ARBORVITAE IN PLANTER	3	PRUNE SM	F					663
E JEFFERSON ST	152	6	PLANTING SITE SMALL CONCRETE	0							664

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
E JEFFERSON ST	155	3	PLANTING SITE SMALL CONCRETE	0							665
E JEFFERSON ST	165	2	PLANTING SITE SMALL CONCRETE	0							666
E JEFFERSON ST	176	1	PLANTING SITE SMALL CONCRETE	0							667
E JEFFERSON ST	176	7	PLANTING SITE SMALL CONCRETE	0							668
E JEFFERSON ST	197	5	PLANTING SITE SMALL CONCRETE	0							669
E JEFFERSON ST	197	20	PLANTING SITE MEDIUM GRASS	0							670
E JEFFERSON ST	197	22	RED MAPLE	18	SAFETY H	G					671
E JEFFERSON ST	197	24	PLANTING SITE MEDIUM GRASS	0							672
E JEFFERSON ST	198	3	PLANTING SITE SMALL CONCRETE	0							673
E JEFFERSON ST	198	8	GREEN ASH	24	SAFETY L	G					674
E JEFFERSON ST	198	11	PLANTING SITE LARGE GRASS	0							675
E JEFFERSON ST	200	2	LITTLELEAF LINDEN	3	PRUNE SM	V					676
E JEFFERSON ST	201	8	CALLERY PEAR	6	PRUNE SM	G					678
E JEFFERSON ST	201	9	SUGAR MAPLE	3	PRUNE SM	V					679
E JEFFERSON ST	201	10	SUGAR MAPLE	3	PRUNE SM	V					680
E JEFFERSON ST	201	11	CALLERY PEAR	6	PRUNE SM	V					681
E JEFFERSON ST	201	12	CALLERY PEAR	6	PRUNE SM	V					682
E JEFFERSON ST	201	13	CALLERY PEAR	6	PRUNE SM	V					683
E JEFFERSON ST	210	5	PLANTING SITE LARGE GRASS	0							684
E JEFFERSON ST	216	7	PLANTING SITE LARGE GRASS	0							685
E JEFFERSON ST	223	2	NORWAY MAPLE	12	PRUNE SM	V			C		686
E JEFFERSON ST	249	3	ARBORVITAE IN PLANTER	3	PRUNE LG	V					687
E JEFFERSON ST	250	4	PLANTING SITE LARGE GRASS	0							688
E JEFFERSON ST	251	1	TULIPTREE	30	SAFETY H	V			C		689
E JEFFERSON ST	251	5	NORWAY MAPLE	24	SAFETY H	F			C		690
E JEFFERSON ST	285	3	PLANTING SITE LARGE GRASS	0							691
E JEFFERSON ST	285	23	SUGAR MAPLE	24	PRUNE LG	G					692
E JEFFERSON ST	300	20	PLANTING SITE LARGE GRASS	0							693
E JEFFERSON ST	301	1	LITTLELEAF LINDEN	3	PRUNE SM	V					694
E JEFFERSON ST	301	4	RED MAPLE	30	SAFETY L	G			C		695
E JEFFERSON ST	301	7	AMERICAN SWEETGUM	12	PRUNE SM	V					696
E JEFFERSON ST	301	8	NORWAY MAPLE	12	PRUNE LG	V	S				697
E JEFFERSON ST	301	9	RED OAK	24	SAFETY L	G					698
E JEFFERSON ST	301	10	PIN OAK	24	PRUNE LG	V					699
E JEFFERSON ST	301	12	PLANTING SITE MEDIUM GRASS	0							700
E JEFFERSON ST	370	4	PLANTING SITE LARGE GRASS	0							701
E JEFFERSON ST	396	3	SILVER MAPLE	24	PRUNE LG	G					705
E JEFFERSON ST	396	5	SUGAR MAPLE	24	SAFETY H	F					706
E JEFFERSON ST	398	1	SUGAR MAPLE	24	PRUNE LG	G					707
E JEFFERSON ST	425	6	PLANTING SITE SMALL GRASS	0						W	710
E JEFFERSON ST	436	5	PLANTING SITE SMALL GRASS	0							711
E JEFFERSON ST	447	4	PLANTING SITE SMALL GRASS	0						W	712
E JEFFERSON ST	459	2	PLANTING SITE SMALL GRASS	0						W	713
E JEFFERSON ST	459	5	PLANTING SITE SMALL GRASS	0						W	714
E JEFFERSON ST	462	5	PLANTING SITE LARGE GRASS	0							715
E JEFFERSON ST	481	3	PLANTING SITE SMALL GRASS	0						W	716
E JEFFERSON ST	498	6	SILVER MAPLE	24	PRUNE LG	G					717

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
E JEFFERSON ST	499	2	SILVER MAPLE	18	REMOVE	P				W	720
E JEFFERSON ST	501	3	PLANTING SITE SMALL GRASS	0						W	723
E JEFFERSON ST	549	3	PLANTING SITE SMALL GRASS	0						W	724
E JEFFERSON ST	597	2	SILVER MAPLE	24	PRUNE LG	G				W	725
E JEFFERSON ST	597	5	SILVER MAPLE	18	PRUNE LG	G				W	726
E JEFFERSON ST	598	2	PLANTING SITE LARGE GRASS	0							727
E JEFFERSON ST	598	5	PLANTING SITE LARGE GRASS	0							728
E JEFFERSON ST	600	7	PLANTING SITE LARGE GRASS	0							729
E JEFFERSON ST	601	2	RED MAPLE	3	PRUNE SM	V				W	730
E JEFFERSON ST	601	4	RED MAPLE	3	PRUNE SM	V				W	731
E JEFFERSON ST	601	7	SUGAR MAPLE	24	SAFETY H	G				W	732
E JEFFERSON ST	666	4	PLANTING SITE LARGE GRASS	0							735
E JEFFERSON ST	670	4	PLANTING SITE LARGE GRASS	0							736
E JEFFERSON ST	690	6	RED MAPLE	24	PRUNE LG	G					737
E JEFFERSON ST	700	3	NORWAY MAPLE	3	PRUNE SM	V					738
E JEFFERSON ST	700	6	SILVER MAPLE	3	PRUNE SM	V					739
E JEFFERSON ST	701	4	SUGAR MAPLE	30	SAFETY H	G			C		740
E JEFFERSON ST	720	3	RED MAPLE	3	PRUNE SM	V				W	742
E JEFFERSON ST	740	3	PLANTING SITE SMALL GRASS	0						W	743
E JEFFERSON ST	740	6	PLANTING SITE SMALL GRASS	0						W	744
E JEFFERSON ST	749	3	PLANTING SITE MEDIUM GRASS	0							745
E JEFFERSON ST	749	5	PLANTING SITE MEDIUM GRASS	0							746
E JEFFERSON ST	750	2	PLANTING SITE SMALL GRASS	0						W	747
E JEFFERSON ST	751	1	SILVER MAPLE	18	PRUNE LG	V					748
E JEFFERSON ST	751	5	PLANTING SITE MEDIUM GRASS	0							749
E JEFFERSON ST	798	2	PLANTING SITE SMALL GRASS	0						W	750
E JEFFERSON ST	798	6	SUGAR MAPLE	18	PRUNE LG	F				W	751
E JEFFERSON ST	799	2	SUGAR MAPLE	12	PRUNE LG	G					754
E JEFFERSON ST	800	5	PLANTING SITE MEDIUM GRASS	0							755
E JEFFERSON ST	801	5	SUGAR MAPLE	24	PRUNE LG	G					761
E JEFFERSON ST	847	2	RED MAPLE	36	REMOVE	P					765
E JEFFERSON ST	847	5	NORWAY MAPLE	18	SAFETY H	F					766
E JEFFERSON ST	850	3	PLANTING SITE MEDIUM GRASS	0							767
E JEFFERSON ST	850	5	PLANTING SITE MEDIUM GRASS	0							768
E JEFFERSON ST	852	7	GREEN ASH	6	PRUNE LG	V					769
E JEFFERSON ST	855	5	PLANTING SITE MEDIUM GRASS	0							770
E JEFFERSON ST	897	2	REDBUD	12	PRUNE LG	G					771
E JEFFERSON ST	897	7	SUGAR MAPLE	24	SAFETY H	F					772
E JEFFERSON ST	900	1	RED MAPLE	24	SAFETY H	F					778
E JEFFERSON ST	900	3	PLANTING SITE MEDIUM GRASS	0							779
E JEFFERSON ST	900	6	BLACK WALNUT	3	PRUNE SM	G					780
E JEFFERSON ST	901	5	RED MAPLE	24	SAFETY H	F					781
E JEFFERSON ST	949	2	RED MAPLE	18	PRUNE LG	G					784
E JEFFERSON ST	949	7	SUGAR MAPLE	18	PRUNE LG	G					785
E JEFFERSON ST	950	5	SUGAR MAPLE	30	PRUNE LG	V					786
E JEFFERSON ST	951	3	PLANTING SITE MEDIUM GRASS	0							787
E JEFFERSON ST	997	21	PLANTING SITE LARGE GRASS	0							788

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
E JEFFERSON ST	998	4	SUGAR MAPLE	24	PRUNE LG	V					789
E JEFFERSON ST	998	8	SUGAR MAPLE	24	PRUNE LG	G					790
E JEFFERSON ST	998	9	SUGAR MAPLE	24	SAFETY H	F					791
E JEFFERSON ST	998	11	PLANTING SITE LARGE GRASS	0							792
E JEFFERSON ST	998	13	PLANTING SITE LARGE GRASS	0							793
E JEFFERSON ST	1001	10	SILVER MAPLE	30	PRUNE LG	F				W	796
E KING ST	1000	6	SILVER MAPLE	12	PRUNE LG	G					923
E KING ST	1004	3	MAPLE	3	PRUNE SM	V					928
E KING ST	1008	6	SUGAR MAPLE	6	PRUNE SM	V					929
E KING ST	1010	4	SUGAR MAPLE	12	PRUNE SM	V					930
E KING ST	1050	1	NORWAY MAPLE	12	SAFETY L	G					931
E KING ST	1050	3	PLANTING SITE LARGE GRASS	0							932
E KING ST	1050	6	SILVER MAPLE	30	SAFETY H	G					933
E KING ST	1057A	3	PLANTING SITE SMALL GRASS	0						W	934
E KING ST	1058	1	SIBERIAN ELM	18	PRUNE LG	G					935
E KING ST	1058	6	SUGAR MAPLE	6	PRUNE SM	V					936
E KING ST	1061	2	SILVER MAPLE	30	SAFETY H	F				W	937
E KING ST	1061	3	SUGAR MAPLE	18	PRUNE LG	G				W	938
E KING ST	1061	5	SILVER MAPLE	30	SAFETY L	G				W	939
E KING ST	1065	1	SILVER MAPLE	18	SAFETY H	F				W	940
E KING ST	1065	2	COLORADO BLUE SPRUCE	18	PRUNE LG	G				W	941
E KING ST	1065	4	SUGAR MAPLE	18	SAFETY H	F				W	942
E KING ST	1065	6	COLORADO BLUE SPRUCE	18	PRUNE LG	V				W	943
E KING ST	1066	2	SUGAR MAPLE	12	PRUNE LG	G					944
E KING ST	1066	4	SUGAR MAPLE	18	SAFETY H	F					945
E KING ST	1066	5	AMERICAN HORNBEAM	12	PRUNE LG	V					946
E KING ST	1067	3	GREEN ASH	24	SAFETY L	F				W	947
E KING ST	1067	4	GREEN ASH	18	SAFETY L	F				W	948
E KING ST	1067	5	PLANTING SITE SMALL GRASS	0						W	949
E KING ST	1067	7	SUGAR MAPLE	18	SAFETY L	F				W	950
E KING ST	1068	3	PLANTING SITE LARGE GRASS	0							951
E KING ST	1095	3	PLANTING SITE SMALL GRASS	0						W	952
E KING ST	1095	7	SILVER MAPLE	24	PRUNE LG	F				W	953
E KING ST	1096	2	PLANTING SITE LARGE GRASS	0							954
E KING ST	1100	7	SILVER MAPLE	18	PRUNE LG	G					955
E KING ST	1100	7	SILVER MAPLE	18	PRUNE LG	G					956
E KING ST	1100	7	SILVER MAPLE	18	PRUNE LG	G					957
E KING ST	1133	7	GREEN ASH	6	PRUNE SM	G				W	958
E KING ST	1175	4	SILVER MAPLE	18	PRUNE LG	G				W	959
E KING ST	1200	3	PLANTING SITE LARGE GRASS	0							960
E MADISON ST	48	1	SILVER MAPLE	12	PRUNE LG	V			C		968
E MADISON ST	48	6	PLANTING SITE MEDIUM GRASS	0							969
E MADISON ST	49	1	BASSWOOD	30	SAFETY H	G					970
E MADISON ST	49	1	BASSWOOD	30	SAFETY H	G					971
E MADISON ST	60	1	SUGAR MAPLE	24	PRUNE LG	V					972
E MADISON ST	60	6	SUGAR MAPLE	24	PRUNE LG	V					973
E MADISON ST	99	2	LITTLELEAF LINDEN	3	PRUNE SM	V					974

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
E MADISON ST	99	3	PLANTING SITE LARGE GRASS	0							975
E MADISON ST	99	5	SUGAR MAPLE	24	PRUNE LG	G					976
E MADISON ST	99	6	SUGAR MAPLE	24	SAFETY L	G					977
E MADISON ST	99	7	SUGAR MAPLE	24	SAFETY H	G					978
E MADISON ST	99	22	HONEYLOCUST	12	PRUNE LG	V				C	979
E MADISON ST	100	2	GREEN ASH	6	PRUNE SM	V					980
E MADISON ST	100	3	GREEN ASH	6	PRUNE SM	V					981
E MADISON ST	100	4	RED MAPLE	36	PRUNE LG	G					982
E MADISON ST	100	4	RED MAPLE	18	SAFETY H	F					983
E MADISON ST	100	5	GREEN ASH	6	PRUNE SM	V					984
E MADISON ST	100	6	GREEN ASH	6	PRUNE SM	V					985
E MADISON ST	100	7	GREEN ASH	6	PRUNE SM	V					986
E MADISON ST	100	19	RED MAPLE	18	PRUNE LG	G					987
E MADISON ST	100	20	RED MAPLE	30	SAFETY H	G					988
E MADISON ST	100	21	RED MAPLE	30	PRUNE LG	G					989
E MADISON ST	100	22	GREEN ASH	3	PRUNE SM	V					990
E MADISON ST	100	23	GREEN ASH	3	PRUNE SM	V					991
E MADISON ST	100	24	RED MAPLE	36	PRUNE LG	G					992
E MADISON ST	150	6	GREEN ASH	6	PRUNE SM	V					993
E MADISON ST	150	31	SUGAR MAPLE	18	PRUNE LG	G					994
E MADISON ST	151	1	AMERICAN SWEETGUM	3	PRUNE SM	G					995
E MADISON ST	151	5	OTHER	3	PRUNE SM	V					996
E MADISON ST	199	3	AMERICAN SWEETGUM	3	PRUNE SM	V					997
E MADISON ST	199	5	HONEYLOCUST	12	PRUNE LG	V					998
E MADISON ST	201	8	RED MAPLE	24	SAFETY L	G					1002
E MADISON ST	201	10	PLANTING SITE MEDIUM GRASS	0							1003
E MADISON ST	201	12	PLANTING SITE MEDIUM GRASS	0							1004
E MADISON ST	250	8	SIBERIAN ELM	18	SAFETY H	G					1014
E MADISON ST	250	12	PLANTING SITE LARGE GRASS	0							1015
E MADISON ST	275	20	SUGAR MAPLE	24	PRUNE LG	G					1021
E MADISON ST	275	24	HONEYLOCUST	6	PRUNE LG	V					1022
E MONROE ST	1	15	PLANTING SITE SMALL CONCRETE	0							1047
E MONROE ST	1	16	PLANTING SITE SMALL CONCRETE	0							1048
E MONROE ST	1	18	PLANTING SITE SMALL CONCRETE	0							1049
E MONROE ST	1	19	MAGNOLIA	6	PRUNE SM	G					1050
E MONROE ST	3	5	PLANTING SITE SMALL CONCRETE	0							1051
E MONROE ST	3	7	PLANTING SITE SMALL CONCRETE	0							1052
E MONROE ST	3	9	PLANTING SITE SMALL CONCRETE	0							1053
E MONROE ST	3	11	PLANTING SITE SMALL CONCRETE	0							1054
E MONROE ST	3	13	PLANTING SITE SMALL CONCRETE	0							1055
E MONROE ST	49	26	MAGNOLIA	6	PRUNE SM	V					1056
E MONROE ST	87A	2	PLANTING SITE SMALL CONCRETE	0							1057
E MONROE ST	87A	6	PLANTING SITE SMALL CONCRETE	0							1058
E MONROE ST	97	5	PLANTING SITE SMALL CONCRETE	0							1059
E MONROE ST	100A	2	PLANTING SITE SMALL CONCRETE	0							1060
E MONROE ST	100A	5	PLANTING SITE SMALL CONCRETE	0							1061
E MONROE ST	100A	6	PLANTING SITE SMALL CONCRETE	0							1062

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
E MONROE ST	101	12	WASHINGTON HAWTHORNE	6	PRUNE SM	G					1063
E MONROE ST	121	5	PLANTING SITE MEDIUM GRASS	0							1064
E MONROE ST	149	3	SILVER MAPLE	18	PRUNE LG	G			C		1065
E MONROE ST	153	1	SILVER MAPLE	24	PRUNE LG	G					1066
E MONROE ST	199	2	SILVER MAPLE	24	SAFETY H	G					1067
E MONROE ST	199	5	PLANTING SITE MEDIUM GRASS	0							1068
E MONROE ST	199	19	SUGAR MAPLE	36	PRUNE LG	G					1069
E MONROE ST	199	21	SILVER MAPLE	3	PRUNE SM	G					1070
E MONROE ST	199	23	SILVER MAPLE	3	PRUNE SM	V					1071
E MONROE ST	201	3	SUGAR MAPLE	12	PRUNE SM	V					1072
E MONROE ST	201	5	GREEN ASH	6	PRUNE SM	V					1073
E MONROE ST	201	6	TULIPTREE	3	PRUNE SM	V					1074
E MONROE ST	201	9	PLANTING SITE LARGE GRASS	0							1075
E MONROE ST	244	2	COMMON PEACH	3	PRUNE SM	V					1076
E MONROE ST	245	2	RED MAPLE	24	PRUNE LG	G					1077
E MONROE ST	248	1	AMERICAN ELM	36	SAFETY L	G					1078
E MONROE ST	252	3	GREEN ASH	3	PRUNE SM	V					1079
E MONROE ST	260	3	PLANTING SITE MEDIUM GRASS	0							1080
E MONROE ST	290	1	RED MAPLE	24	PRUNE LG	G			C		1081
E MONROE ST	290	3	SILVER MAPLE	18	PRUNE LG	G					1082
E MONROE ST	290	5	RED MAPLE	18	PRUNE LG	G					1083
E MONROE ST	290	9	RED MAPLE	18	PRUNE LG	F					1084
E MONROE ST	290	10	RED MAPLE	18	SAFETY L	F					1085
E MONROE ST	290	11	RED MAPLE	18	PRUNE LG	G					1086
E MONROE ST	290	13	SUGAR MAPLE	30	PRUNE LG	G					1087
E MONROE ST	291	3	PLANTING SITE SMALL GRASS	0						W	1088
E MONROE ST	299	5	PLANTING SITE SMALL GRASS	0						W	1089
E MONROE ST	300	2	SILVER MAPLE	12	PRUNE SM	G			C		1090
E MONROE ST	300	4	PLANTING SITE LARGE GRASS	0							1091
E MONROE ST	301	4	PLANTING SITE SMALL GRASS	0						W	1092
E MONROE ST	303	1	NORWAY MAPLE	3	PRUNE SM	G				W	1093
E MONROE ST	303	6	PLANTING SITE SMALL GRASS	0						W	1094
E MONROE ST	326A	1	PLANTING SITE LARGE GRASS	0							1095
E MONROE ST	326A	6	PLANTING SITE LARGE GRASS	0							1096
E MONROE ST	352	2	SILVER MAPLE	24	PRUNE LG	G			C		1097
E MONROE ST	352	6	SILVER MAPLE	30	REMOVE	P					1098
E MONROE ST	360	2	GREEN ASH	6	PRUNE SM	V					1099
E MONROE ST	360	5	GREEN ASH	6	PRUNE SM	V					1100
E MONROE ST	360	7	GREEN ASH	6	PRUNE SM	G					1101
E MONROE ST	800	1	RED MAPLE	24	SAFETY H	F					1102
E MONROE ST	800	7	RED MAPLE	36	SAFETY H	F					1103
E WAYNE ST	45	7	SUGAR MAPLE	30	SAFETY H	F					1109
E WAYNE ST	49	5	PLANTING SITE LARGE GRASS	0							1110
E WAYNE ST	50A	1	RED MAPLE	30	REMOVE	P					1111
E WAYNE ST	50A	4	HACKBERRY	6	PRUNE SM	G					1112
E WAYNE ST	51	5	PLANTING SITE LARGE GRASS	0							1113
E WAYNE ST	55	3	NORWAY MAPLE	18	SAFETY H	G					1114

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
E WAYNE ST	55	7	RED MAPLE	18	PRUNE LG	G			C		1115
E WAYNE ST	99	5	PLANTING SITE LARGE GRASS	0							1116
E WAYNE ST	101	1	PLANTING SITE LARGE GRASS	0							1117
E WAYNE ST	101	2	PLANTING SITE LARGE GRASS	0							1118
E WAYNE ST	101	3	PLANTING SITE LARGE GRASS	0							1119
E WAYNE ST	101	4	PLANTING SITE LARGE GRASS	0							1120
E WAYNE ST	101	6	PLANTING SITE LARGE GRASS	0							1121
E WAYNE ST	120A	4	SUGAR MAPLE	24	PRUNE LG	G			C		1122
E WAYNE ST	150	2	REDBUD	3	PRUNE SM	V					1123
E WAYNE ST	150	6	RED MAPLE	24	PRUNE LG	V			C		1124
FORSYTHE ST	19	3	PLANTING SITE SMALL GRASS	0						W	1200
FORSYTHE ST	30	5	PLANTING SITE LARGE GRASS	0							1201
FORSYTHE ST	36	3	SUGAR MAPLE	24	SAFETY L	V					1202
FORSYTHE ST	38	2	SUGAR MAPLE	30	SAFETY H	G			C		1203
FORSYTHE ST	38	5	SUGAR MAPLE	24	PRUNE LG	G					1204
FORSYTHE ST	53	2	SILVER MAPLE	36	PRUNE LG	F				W	1205
FORSYTHE ST	62	5	PLANTING SITE LARGE GRASS	0							1206
FORSYTHE ST	77	3	PLANTING SITE SMALL GRASS	0						W	1207
FORSYTHE ST	98	5	SUGAR MAPLE	18	SAFETY L	F					1208
FORSYTHE ST	98	6	RED MAPLE	36	SAFETY H	F					1209
FORSYTHE ST	98	8	SILVER MAPLE	24	PRUNE LG	G					1211
FORSYTHE ST	98	13	SILVER MAPLE	30	PRUNE LG	G					1215
FORSYTHE ST	99	3	AMERICAN ELM	24	PRUNE LG	G				W	1216
FORSYTHE ST	99	6	SUGAR MAPLE	18	SAFETY L	F				W	1217
FORSYTHE ST	100	1	PLANTING SITE MEDIUM GRASS	0							1218
FORSYTHE ST	100	2	SUGAR MAPLE	18	PRUNE LG	V					1219
FORSYTHE ST	100	3	PLANTING SITE MEDIUM GRASS	0							1220
FORSYTHE ST	100	5	RED MAPLE	30	SAFETY H	F					1221
FORSYTHE ST	100	6	RED OAK	18	SAFETY L	G					1222
FORSYTHE ST	100	7	SILVER MAPLE	24	REMOVE	D					1223
FORSYTHE ST	180A	6	PLANTING SITE MEDIUM GRASS	0							1231
FORSYTHE ST	180A	7	SUGAR MAPLE	18	SAFETY H	G					1232
FORSYTHE ST	180A	7	GREEN ASH	42	SAFETY H	G					1233
FORSYTHE ST	249	6	GREEN ASH	42	SAFETY H	G					1234
FORSYTHE ST	255	2	GREEN ASH	24	PRUNE LG	G				W	1235
FORSYTHE ST	276	5	PLANTING SITE MEDIUM GRASS	0							1241
FORSYTHE ST	286	3	PLANTING SITE MEDIUM GRASS	0							1242
HENRY ST	6	8	HONEYLOCUST	3	PRUNE SM	V			C		1409
HENRY ST	6	9	HONEYLOCUST	3	PRUNE SM	V			C		1410
HENRY ST	6	11	SILVER MAPLE	36	PRUNE LG	G				W	1411
HENRY ST	6	13	SILVER MAPLE	42	SAFETY H	G				W	1412
HOUGHMAN ST	99	8	RED MAPLE	24	PRUNE LG	G					1543
HOUGHMAN ST	99	9	RED MAPLE	24	PRUNE LG	G					1544
HOUGHMAN ST	99	12	RED MAPLE	42	REMOVE	P					1545
N HOME AVE	49	2	BOXELDER	12	PRUNE LG	G					2040
N HOME AVE	50	1	SUGAR MAPLE	24	PRUNE LG	G					2041
N HOME AVE	50	3	SUGAR MAPLE	18	SAFETY L	G					2042

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
N HOME AVE	70	2	PLANTING SITE MEDIUM GRASS	0							2043
N HOME AVE	98	1	RED MAPLE	30	SAFETY H	G					2044
N HOME AVE	98	5	LONDON PLANETREE	18	PRUNE LG	G					2045
N HOME AVE	151	16	PLANTING SITE LARGE GRASS	0							2050
N HOME AVE	199	17	PLANTING SITE SMALL GRASS	0							2053
N MAIN ST	25	7	PLANTING SITE SMALL CONCRETE	0							2089
N MAIN ST	49	7	COMMON HORSECHESTNUT	36	PRUNE LG	G			C		2090
N MAIN ST	98	10	PLANTING SITE SMALL CONCRETE	0							2091
N MAIN ST	98	12	PLANTING SITE SMALL CONCRETE	0							2092
N MAIN ST	99	21	PLANTING SITE SMALL GRASS	0							2093
N MAIN ST	99	23	PLANTING SITE SMALL GRASS	0							2094
N MAIN ST	100	20	RED MAPLE	36	SAFETY L	G					2095
N MAIN ST	100	23	GREEN ASH	12	PRUNE LG	G					2096
N MAIN ST	101	9	CRABAPPLE	6	PRUNE SM	G					2097
N MAIN ST	101	12	CRABAPPLE	6	PRUNE SM	G			C		2098
N WATER ST	40	3	PLANTING SITE SMALL CONCRETE	0							2219
N WATER ST	49	2	NORWAY MAPLE	6	PRUNE SM	V					2220
N WATER ST	49	5	NORWAY MAPLE	12	PRUNE LG	G					2221
N WATER ST	51	3	PLANTING SITE MEDIUM GRASS	0							2222
N WATER ST	51	6	EUROPEAN BEECH	6	PRUNE SM	V			C		2223
N WATER ST	60	1	RED MAPLE	3	PRUNE SM	V					2224
N WATER ST	60	7	OTHER	3	PRUNE SM	V					2225
N WATER ST	99	1	LITTLELEAF LINDEN	3	PRUNE SM	V					2226
N WATER ST	99	3	TULIPTREE	3	PRUNE SM	V					2227
N WATER ST	99	4	TULIPTREE	6	PRUNE SM	V					2228
N WATER ST	99	5	LITTLELEAF LINDEN	3	PRUNE SM	V					2229
N WATER ST	99	19	GREEN ASH	12	PRUNE LG	G					2230
N WATER ST	99	20	SILVER MAPLE	18	PRUNE LG	V					2231
N WATER ST	99	22	LONDON PLANETREE	12	PRUNE LG	G					2232
N WATER ST	99	23	GREEN ASH	12	PRUNE LG	G					2233
N WATER ST	100	2	COMMON HORSECHESTNUT	18	SAFETY L	G					2234
N WATER ST	100	3	COMMON HORSECHESTNUT	18	PRUNE LG	G					2235
N WATER ST	100	5	SUGAR MAPLE	24	PRUNE LG	G					2236
N WATER ST	100	6	PLANTING SITE LARGE GRASS	0							2237
N WATER ST	100	20	LITTLELEAF LINDEN	3	PRUNE SM	V					2238
N WATER ST	100	23	PLANTING SITE LARGE GRASS	0							2239
N WATER ST	151	1	SUGAR MAPLE	30	PRUNE LG	G					2240
N WATER ST	151	5	SUGAR MAPLE	3	PRUNE SM	V					2241
N WATER ST	151	7	SILVER MAPLE	42	PRUNE LG	G					2242
N WATER ST	195	5	SILVER MAPLE	36	SAFETY H	G					2243
N WATER ST	198	4	RED MAPLE	18	SAFETY H	F					2244
N WATER ST	198	5	SILVER MAPLE	18	PRUNE LG	G					2245
N WATER ST	198	6	RED MAPLE	24	PRUNE LG	V					2246
N WATER ST	199	3	SUGAR MAPLE	12	PRUNE LG	V					2247
N WATER ST	199	6	SUGAR MAPLE	6	PRUNE LG	V					2248
ORCHARD LN	1000	11	PLANTING SITE SMALL GRASS	0						W	2317
ORCHARD LN	1000	12	PLANTING SITE SMALL GRASS	0						W	2318

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

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ORCHARD LN	1000	24	SIBERIAN ELM	42	SAFETY H	F				W	2319
S HOME AVE	50	3	PLANTING SITE LARGE GRASS	0							2554
S HOME AVE	51	1	SUGAR MAPLE	12	PRUNE LG	G					2555
S HOME AVE	51	5	SUGAR MAPLE	18	SAFETY L	G					2556
S HOME AVE	54	5	PLANTING SITE LARGE GRASS	0							2557
S HOME AVE	98	4	PLANTING SITE LARGE GRASS	0							2558
S HOME AVE	98	19	PLANTING SITE MEDIUM GRASS	0							2559
S HOME AVE	98	21	SILVER MAPLE	36	PRUNE LG	G					2560
S HOME AVE	99	2	SILVER MAPLE	18	PRUNE LG	F					2561
S HOME AVE	99	3	RED MAPLE	12	PRUNE SM	G					2562
S HOME AVE	99	5	RED MAPLE	18	PRUNE LG	G					2563
S HOME AVE	99	6	SILVER MAPLE	12	PRUNE LG	G					2564
S HOME AVE	99	8	SILVER MAPLE	3	PRUNE SM	V			C		2565
S HOME AVE	99	11	SILVER MAPLE	6	PRUNE SM	V			C		2566
S HOME AVE	144	2	SILVER MAPLE	24	SAFETY H	G					2567
S HOME AVE	144	5	AMERICAN SWEETGUM	3	PRUNE SM	G					2568
S HOME AVE	149	1	SUGAR MAPLE	24	SAFETY H	F					2569
S HOME AVE	149	3	SUGAR MAPLE	18	PRUNE LG	G					2570
S HOME AVE	149	6	SUGAR MAPLE	18	SAFETY H	F					2571
S HOME AVE	150	1	RED MAPLE	24	SAFETY H	G					2572
S HOME AVE	150	4	RED MAPLE	18	PRUNE LG	G					2573
S HOME AVE	151	1	SUGAR MAPLE	18	SAFETY H	G					2574
S HOME AVE	151	5	TULIPTREE	3	PRUNE SM	G					2575
S HOME AVE	170A	1	NORWAY MAPLE	3	PRUNE SM	G					2576
S HOME AVE	170A	2	NORWAY MAPLE	24	SAFETY H	G					2577
S HOME AVE	179	4	AMERICAN SWEETGUM	24	PRUNE LG	G					2578
S HOME AVE	179	6	DOGWOOD	3	PRUNE SM	V					2579
S HOME AVE	183	3	GREEN ASH	24	PRUNE LG	G					2580
S HOME AVE	183	5	PIN OAK	12	PRUNE LG	G			C		2581
S HOME AVE	198	3	SUGAR MAPLE	24	SAFETY H	F					2582
S HOME AVE	198	6	SUGAR MAPLE	12	SAFETY H	F					2583
S HOME AVE	198	20	SUGAR MAPLE	18	PRUNE LG	V			C		2584
S HOME AVE	198	23	SUGAR MAPLE	12	PRUNE LG	V					2585
S HOME AVE	198	24	SUGAR MAPLE	12	PRUNE LG	V			C		2586
S JACKSON ST	78	5	PLANTING SITE SMALL CONCRETE	0							2660
S JACKSON ST	100	4	PLANTING SITE SMALL CONCRETE	0							2661
S JACKSON ST	168	3	SUGAR MAPLE	18	SAFETY H	F					2662
S MAIN ST	198	20	ARBORVITAE	6	PRUNE LG	V				W	2668
S MAIN ST	198	21	PLANTING SITE SMALL GRASS	0						W	2669
S MAIN ST	199	9	PLANTING SITE SMALL GRASS	0						W	2670
S MAIN ST	199	10	PLANTING SITE SMALL GRASS	0						W	2671
S MAIN ST	200	11	PLANTING SITE LARGE GRASS	0							2672
S MAIN ST	201A	20	PLANTING SITE LARGE GRASS	0							2673
S WATER ST	40	7	PLANTING SITE SMALL CONCRETE	0							2704
S WATER ST	63	6	PLANTING SITE SMALL CONCRETE	0							2705
S WATER ST	86	17	PLANTING SITE SMALL CONCRETE	0							2706
S WATER ST	86	20	PLANTING SITE SMALL CONCRETE	0							2707

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
S WATER ST	86	21	PLANTING SITE SMALL CONCRETE	0							2708
S WATER ST	86	23	PLANTING SITE SMALL CONCRETE	0							2709
S WATER ST	111	1	WASHINGTON HAWTHORNE	6	PRUNE SM	G					2710
S WATER ST	111	6	WASHINGTON HAWTHORNE	6	PRUNE SM	G					2711
S WATER ST	150	2	PLANTING SITE MEDIUM GRASS	0							2712
S WATER ST	150	5	NORWAY MAPLE	18	SAFETY L	G			C		2713
S WATER ST	151	1	NORWAY MAPLE	12	PRUNE LG	G			C		2714
S WATER ST	151	5	SUGAR MAPLE	12	PRUNE LG	V			C		2715
S WATER ST	165	2	SILVER MAPLE	6	PRUNE SM	V					2716
S WATER ST	165	3	SILVER MAPLE	6	PRUNE SM	V					2717
S WATER ST	165	5	SILVER MAPLE	6	PRUNE SM	V					2718
S WATER ST	165	7	NORWAY MAPLE	6	PRUNE SM	V					2719
S WATER ST	198	2	RED MAPLE	24	SAFETY H	F					2720
S WATER ST	198	5	SUGAR MAPLE	18	PRUNE LG	V			C		2721
S WATER ST	198	6	REDBUD	12	PRUNE SM	G					2722
S WATER ST	198	19	SUGAR MAPLE	24	SAFETY H	G					2723
S WATER ST	198	20	SUGAR MAPLE	24	PRUNE LG	V			C		2724
S WATER ST	198	22	REDBUD	6	PRUNE LG	G			C		2725
S WATER ST	199	5	PLANTING SITE MEDIUM GRASS	0							2726
S WATER ST	199A	10	PLANTING SITE LARGE GRASS	0							2727
W COURT ST	2	2	PLANTING SITE SMALL CONCRETE	0							2946
W COURT ST	2	23	PLANTING SITE SMALL CONCRETE	0							2947
W COURT ST	52	7	PLANTING SITE SMALL CONCRETE	0							2948
W COURT ST	100000A	1	HONEYLOCUST	6	PRUNE LG	V					2949
W COURT ST	100000A	2	HONEYLOCUST	6	PRUNE LG	V					2950
W COURT ST	100000A	4	HONEYLOCUST	6	PRUNE LG	V					2951
W COURT ST	100000A	5	HONEYLOCUST	6	PRUNE LG	V					2952
W COURT ST	100000A	7	HONEYLOCUST	6	PRUNE LG	V					2953
W JEFFERSON ST	1	1	MAGNOLIA	6	PRUNE SM	G			C		2954
W JEFFERSON ST	1	2	PLANTING SITE SMALL CONCRETE	0							2955
W JEFFERSON ST	1	2	ARBORVITAE IN PLANTER	3	PRUNE SM	F					2956
W JEFFERSON ST	1	3	PLANTING SITE SMALL CONCRETE	0							2957
W JEFFERSON ST	1	5	PLANTING SITE SMALL CONCRETE	0							2958
W JEFFERSON ST	1	6	PLANTING SITE SMALL CONCRETE	0							2959
W JEFFERSON ST	1	7	ARBORVITAE IN PLANTER	3	PRUNE SM	F					2960
W JEFFERSON ST	1	7	PLANTING SITE SMALL CONCRETE	0							2961
W JEFFERSON ST	1	9	MAGNOLIA	3	PRUNE SM	V					2962
W JEFFERSON ST	1	10	MAGNOLIA	3	PRUNE SM	V					2963
W JEFFERSON ST	1	13	MAGNOLIA	3	PRUNE SM	V					2964
W JEFFERSON ST	34	2	PLANTING SITE SMALL CONCRETE	0							2965
W JEFFERSON ST	34	3	PLANTING SITE SMALL CONCRETE	0							2966
W JEFFERSON ST	34	5	PLANTING SITE SMALL CONCRETE	0							2967
W JEFFERSON ST	34	7	PLANTING SITE SMALL CONCRETE	0							2968
W JEFFERSON ST	34	11	PLANTING SITE SMALL CONCRETE	0							2969
W JEFFERSON ST	50	1	ARBORVITAE IN PLANTER	3	PRUNE SM	F					2970
W JEFFERSON ST	50	3	PLANTING SITE SMALL CONCRETE	0							2971
W JEFFERSON ST	98	3	ARBORVITAE IN PLANTER	3	PRUNE SM	F					2972

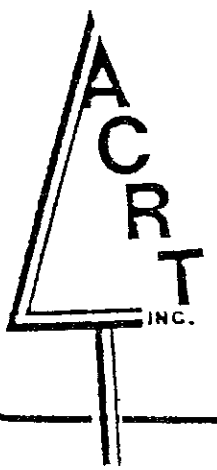
COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
W JEFFERSON ST	98	4	PLANTING SITE SMALL CONCRETE	0							2973
W JEFFERSON ST	98	6	PLANTING SITE SMALL CONCRETE	0							2974
W JEFFERSON ST	98	19	PLANTING SITE SMALL GRASS	0						W	2975
W JEFFERSON ST	98	22	CALLERY PEAR	3	PRUNE SM	V				W	2976
W JEFFERSON ST	98	22	CALLERY PEAR	6	PRUNE SM	V				W	2977
W JEFFERSON ST	98	23	CALLERY PEAR	3	PRUNE SM	V				W	2978
W JEFFERSON ST	98	23	CALLERY PEAR	3	PRUNE SM	V				W	2979
W JEFFERSON ST	99	1	PLANTING SITE SMALL CONCRETE	0							2980
W JEFFERSON ST	99	12	PLANTING SITE SMALL CONCRETE	0						W	2981
W JEFFERSON ST	102	1	PLANTING SITE SMALL CONCRETE	0							2982
W JEFFERSON ST	102	3	PLANTING SITE SMALL CONCRETE	0							2983
W JEFFERSON ST	102	5	PLANTING SITE SMALL CONCRETE	0							2984
W JEFFERSON ST	148	2	ARBORVITAE IN PLANTER	3	REMOVE	F					2985
W JEFFERSON ST	148	5	PLANTING SITE SMALL CONCRETE	0							2986
W JEFFERSON ST	150	1	PLANTING SITE SMALL CONCRETE	0							2987
W JEFFERSON ST	151	5	PLANTING SITE SMALL CONCRETE	0							2988
W JEFFERSON ST	151	7	PLANTING SITE SMALL CONCRETE	0							2989
W JEFFERSON ST	176	2	PLANTING SITE SMALL CONCRETE	0							2990
W JEFFERSON ST	188	6	PLANTING SITE SMALL CONCRETE	0							2991
W JEFFERSON ST	198	5	PLANTING SITE SMALL CONCRETE	0							2992
W JEFFERSON ST	237	4	PLANTING SITE SMALL CONCRETE	0							2993
W JEFFERSON ST	237	5	PLANTING SITE SMALL CONCRETE	0							2994
W JEFFERSON ST	237	7	PLANTING SITE SMALL CONCRETE	0							2995
W JEFFERSON ST	847	4	PLANTING SITE SMALL GRASS	0						W	3007
W JEFFERSON ST	851	3	PLANTING SITE SMALL GRASS	0						W	3008
W JEFFERSON ST	853	4	PLANTING SITE SMALL GRASS	0						W	3009
W JEFFERSON ST	882	3	CATALPA	24	PRUNE LG	G					3010
W JEFFERSON ST	882	5	CATALPA	30	PRUNE LG	F					3011
W JEFFERSON ST	885	2	SUGAR MAPLE	12	PRUNE LG	G				W	3012
W JEFFERSON ST	885	4	RED MAPLE	36	SAFETY H	F				W	3013
W JEFFERSON ST	887	1	RED MAPLE	36	SAFETY H	F				W	3014
W JEFFERSON ST	890	1	HACKBERRY	12	PRUNE LG	G				W	3015
W JEFFERSON ST	890	4	PLANTING SITE LARGE GRASS	0							3016
W JEFFERSON ST	898	5	PLANTING SITE LARGE GRASS	0							3017
W MADISON ST	48	4	HONEYLOCUST	12	PRUNE LG	V			C		3111
W MADISON ST	48	7	HONEYLOCUST	3	PRUNE SM	V					3112
W MADISON ST	99	9	PLANTING SITE SMALL GRASS	0							3113
W MADISON ST	99	11	PLANTING SITE SMALL GRASS	0							3114
W MONROE ST	1	6	PLANTING SITE SMALL CONCRETE	0							3181
W MONROE ST	1	20	PLANTING SITE SMALL CONCRETE	0						W	3182
W MONROE ST	1	22	PLANTING SITE SMALL CONCRETE	0						W	3183
W MONROE ST	49	2	PLANTING SITE SMALL CONCRETE	0							3184
W MONROE ST	77	2	PLANTING SITE SMALL CONCRETE	0							3185
W MONROE ST	77	9	PLANTING SITE SMALL CONCRETE	0						W	3186
W MONROE ST	77	11	PLANTING SITE SMALL CONCRETE	0						W	3187
W WAYNE ST	49	2	PLANTING SITE LARGE GRASS	0							3188
W WAYNE ST	49	5	PLANTING SITE LARGE GRASS	0							3189

COFF Street Tree Inventory
Listing of All Trees and Planting Sites

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
W WAYNE ST	50	7	SUGAR MAPLE	24	SAFETY H	F			C	W	3190
W WAYNE ST	51	3	PLANTING SITE LARGE GRASS	0							3191
W WAYNE ST	60A	3	PLANTING SITE SMALL GRASS	0						W	3192
W WAYNE ST	60A	7	PLANTING SITE SMALL GRASS	0						W	3193
W WAYNE ST	82	1	NORWAY MAPLE	24	SAFETY H	G					3194
W WAYNE ST	83	5	PLANTING SITE LARGE GRASS	0							3195
W WAYNE ST	84	1	SILVER MAPLE	30	SAFETY H	G			C		3196
W WAYNE ST	84	5	NORWAY MAPLE	18	PRUNE LG	G					3197
W WAYNE ST	99	4	PLANTING SITE LARGE GRASS	0							3198
W WAYNE ST	99	8	HACKBERRY	18	PRUNE LG	G					3199
W WAYNE ST	99	9	NORWAY MAPLE	12	PRUNE LG	G					3200
W WAYNE ST	99	12	HACKBERRY	18	PRUNE LG	G					3201
W WAYNE ST	99	12	GREEN ASH	18	PRUNE LG	V					3202

APPENDIX
C



TREE SPECIES LISTING

The following listing contains all genera and species identified in the street tree inventory of the City of Franklin. The listing is arranged alphabetically by species code, which is constructed from the first two letters of the genus and species names. The listing contains both common and scientific names of the taxa, and the species value.

Species value is a concept based on both the species and its geographical location. It is a measure of how well or how poorly a species performs in a particular area of the country. A species value of 1.0 would be used to rank an excellent street tree species growing in a geographical area for which it is perfectly suited. A species value of 0.0 would be used to rank a tree unsuited for use both as a street tree and in the geographical area in which it is growing. Most street trees rank between the extreme values.

TREE LISTING FORMAT

STREET — Actual street name, with compass directions appearing at the beginning

ADDRESS — Building number as it appears on the plat maps or in the telephone directory. "A" indicates address was assigned.

CELL NUMBER — Refers to the location of a tree on a property (see Figure 2)

1- 7	=	Front of property
8-12	=	Right side of property
13-19	=	Rear of property
20-24	=	Left side of property
25-31	=	Median strip or on a vacant lot opposite an addressed lot

SPECIES — Common name

DIAMETER — Diameter to the nearest inch of a tree at 4 1/2 feet above ground, grouped into size classes

3	=	0- 3"
6	=	4- 6"
12	=	7-12"
18	=	13-18"
24	=	19-24"
30	=	25-30"
36	=	31-36"
42	=	>36"

TREE LISTING FORMAT (Continued)

MAINTENANCE Maintenance requirements

- REMOVE = Removal
- SAFETY H = High Priority Safety Prune
- SAFETY L = Low Priority Safety Prune
- PRUNE LG = Large Tree Pruning
- PRUNE SM = Small Tree Pruning

CONDITION Condition ratings

- D = Dead
- P = Poor
- F = Fair
- G = Good
- V = Very Good
- E = Excellent

SIGN CLEARANCE S

LIGHT CLEARANCE L

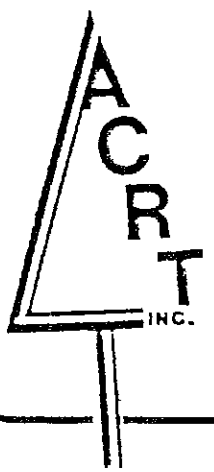
VEHICLE/PEDESTRIAN CLEARANCE C

OVERHEAD WIRES W

COFF Street Tree Inventory
Removal Listing

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
E JEFFERSON ST	499	2	SILVER MAPLE	18	REMOVE	P				W	95
E JEFFERSON ST	847	2	RED MAPLE	36	REMOVE	P					125
E MONROE ST	352	6	SILVER MAPLE	30	REMOVE	P					271
E WAYNE ST	50A	1	RED MAPLE	30	REMOVE	P					279
FORSYTHE ST	100	7	SILVER MAPLE	24	REMOVE	D					312
HOUGHMAN ST	99	12	RED MAPLE	42	REMOVE	P					326
W JEFFERSON ST	148	2	ARBORVITAE IN PLANTER	3	REMOVE	F					483

APPENDIX
D



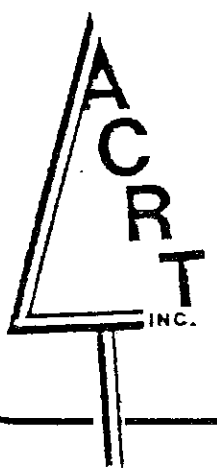
COFF Street Tree Inventory
Safety Prune Listing

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
CROWELL ST	1	1	SUGAR MAPLE	18	SAFETY L	G			C		1
E JEFFERSON ST	197	22	RED MAPLE	18	SAFETY H	G					54
E JEFFERSON ST	198	8	GREEN ASH	24	SAFETY L	G					57
E JEFFERSON ST	251	1	TULIPTREE	30	SAFETY H	V			C		71
E JEFFERSON ST	251	5	NORWAY MAPLE	24	SAFETY H	F			C		72
E JEFFERSON ST	301	4	RED MAPLE	30	SAFETY L	G			C		77
E JEFFERSON ST	301	9	RED OAK	24	SAFETY L	G					80
E JEFFERSON ST	396	5	SUGAR MAPLE	24	SAFETY H	F					85
E JEFFERSON ST	601	7	SUGAR MAPLE	24	SAFETY H	G				W	105
E JEFFERSON ST	701	4	SUGAR MAPLE	30	SAFETY H	G			C		111
E JEFFERSON ST	847	5	NORWAY MAPLE	18	SAFETY H	F					126
E JEFFERSON ST	897	7	SUGAR MAPLE	24	SAFETY H	F					132
E JEFFERSON ST	900	1	RED MAPLE	24	SAFETY H	F					133
E JEFFERSON ST	901	5	RED MAPLE	24	SAFETY H	F					136
E JEFFERSON ST	998	9	SUGAR MAPLE	24	SAFETY H	F					144
E KING ST	1050	1	NORWAY MAPLE	12	SAFETY L	G					152
E KING ST	1050	6	SILVER MAPLE	30	SAFETY H	G					154
E KING ST	1061	2	SILVER MAPLE	30	SAFETY H	F				W	158
E KING ST	1061	5	SILVER MAPLE	30	SAFETY L	G				W	160
E KING ST	1065	1	SILVER MAPLE	18	SAFETY H	F				W	161
E KING ST	1065	4	SUGAR MAPLE	18	SAFETY H	F				W	163
E KING ST	1066	4	SUGAR MAPLE	18	SAFETY H	F					166
E KING ST	1067	3	GREEN ASH	24	SAFETY L	F				W	168
E KING ST	1067	4	GREEN ASH	18	SAFETY L	F				W	169
E KING ST	1067	7	SUGAR MAPLE	18	SAFETY L	F				W	171
E MADISON ST	49	1	BASSWOOD	30	SAFETY H	G					184
E MADISON ST	49	1	BASSWOOD	30	SAFETY H	G					185
E MADISON ST	99	6	SUGAR MAPLE	24	SAFETY L	G					191
E MADISON ST	99	7	SUGAR MAPLE	24	SAFETY H	G					192
E MADISON ST	100	4	RED MAPLE	18	SAFETY H	F					197
E MADISON ST	100	20	RED MAPLE	30	SAFETY H	G					202
E MADISON ST	201	8	RED MAPLE	24	SAFETY L	G					213
E MADISON ST	250	8	SIBERIAN ELM	18	SAFETY H	G					216
E MONROE ST	199	2	SILVER MAPLE	24	SAFETY H	G					240
E MONROE ST	248	1	AMERICAN ELM	36	SAFETY L	G					251
E MONROE ST	290	10	RED MAPLE	18	SAFETY L	F					258
E MONROE ST	800	1	RED MAPLE	24	SAFETY H	F					275
E MONROE ST	800	7	RED MAPLE	36	SAFETY H	F					276
E WAYNE ST	45	7	SUGAR MAPLE	30	SAFETY H	F					277
E WAYNE ST	55	3	NORWAY MAPLE	18	SAFETY H	G					282
FORSYTHE ST	36	3	SUGAR MAPLE	24	SAFETY L	V					295
FORSYTHE ST	38	2	SUGAR MAPLE	30	SAFETY H	G			C		296
FORSYTHE ST	98	5	SUGAR MAPLE	18	SAFETY L	F					301
FORSYTHE ST	98	6	RED MAPLE	36	SAFETY H	F					302
FORSYTHE ST	99	6	SUGAR MAPLE	18	SAFETY L	F				W	306
FORSYTHE ST	100	5	RED MAPLE	30	SAFETY H	F					310
FORSYTHE ST	100	6	RED OAK	18	SAFETY L	G					311

COFF Street Tree Inventory
Safety Prune Listing

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
FORSYTHE ST	180A	7	SUGAR MAPLE	18	SAFETY H	G					314
FORSYTHE ST	180A	7	GREEN ASH	42	SAFETY H	G					315
FORSYTHE ST	249	6	GREEN ASH	42	SAFETY H	G					316
HENRY ST	6	13	SILVER MAPLE	42	SAFETY H	G				W	323
N HOME AVE	50	3	SUGAR MAPLE	18	SAFETY L	G					329
N HOME AVE	98	1	RED MAPLE	30	SAFETY H	G					331
N MAIN ST	100	20	RED MAPLE	36	SAFETY L	G					341
N WATER ST	100	2	COMMON HORSECHESTNUT	18	SAFETY L	G					360
N WATER ST	195	5	SILVER MAPLE	36	SAFETY H	G					369
N WATER ST	198	4	RED MAPLE	18	SAFETY H	F					370
ORCHARD LN	1000	24	SIBERIAN ELM	42	SAFETY H	F				W	377
S HOME AVE	51	5	SUGAR MAPLE	18	SAFETY L	G					380
S HOME AVE	144	2	SILVER MAPLE	24	SAFETY H	G					391
S HOME AVE	149	1	SUGAR MAPLE	24	SAFETY H	F					393
S HOME AVE	149	6	SUGAR MAPLE	18	SAFETY H	F					395
S HOME AVE	150	1	RED MAPLE	24	SAFETY H	G					396
S HOME AVE	151	1	SUGAR MAPLE	18	SAFETY H	G					398
S HOME AVE	170A	2	NORWAY MAPLE	24	SAFETY H	G					401
S HOME AVE	198	3	SUGAR MAPLE	24	SAFETY H	F					406
S HOME AVE	198	6	SUGAR MAPLE	12	SAFETY H	F					407
S JACKSON ST	168	3	SUGAR MAPLE	18	SAFETY H	F					413
S WATER ST	150	5	NORWAY MAPLE	18	SAFETY L	G			C		429
S WATER ST	198	2	RED MAPLE	24	SAFETY H	F					436
S WATER ST	198	19	SUGAR MAPLE	24	SAFETY H	G					439
W JEFFERSON ST	885	4	RED MAPLE	36	SAFETY H	F				W	500
W JEFFERSON ST	887	1	RED MAPLE	36	SAFETY H	F				W	501
W WAYNE ST	50	7	SUGAR MAPLE	24	SAFETY H	F			C	W	518
W WAYNE ST	82	1	NORWAY MAPLE	24	SAFETY H	G					522
W WAYNE ST	84	1	SILVER MAPLE	30	SAFETY H	G			C		524

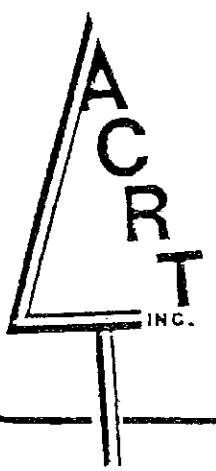
APPENDIX
E



COFF Street Tree Inventory
Sign Clearance Listing

Street	Address	Cell Number	Species Name	DBH	Maintenance Needs	Condition	Sign Clear	Light Clear	Vehicle Clear	Ovhd Wires	Serial Number
E JEFFERSON ST	301	8	NORWAY MAPLE	12	PRUNE LG	V	S				79

APPENDIX
F



NATIONAL ARBORIST ASSOCIATION

Pruning Standards For Shade Trees

(Revised 1979)

These standards are provided by the National Arborist Association to assist you in writing contract specifications. N.A.A. member companies are highly qualified to accomplish the pruning in compliance with the specifications that best satisfy your budget and other needs. It is recognized that regional practices may dictate variations in this standard.

W. P. LANPHEAR, Chairman
Standard Practices Committee

INTRODUCTION

Pruning is to be performed by tree workers who, through related training and on-the-job experience, are familiar with the techniques and hazards of this work including trimming, maintenance, repairing or removal, and equipment used in such operations. The use of climbing spurs or irons is not approved in pruning operations on live trees. This type of work is a potentially hazardous occupation and is to be undertaken only by trained personnel or under the supervision of trained personnel, all of whom are covered with workers compensation, property damage, public liability and completed operations insurance.

There are four classes of pruning:

CLASS I FINE PRUNING

Fine pruning shall consist of the removal of dead, dying, diseased, interfering, objectionable, obstructing, and weak branches, as well as selective thinning to lessen wind resistance. The removal of such described branches is to include those on the main trunks, as well as those inside the leaf area. An occasional branch, up to 1/2" diameter, as described above, may remain within the main leaf area to its full length when it is not practical to remove it.

The following specifications shall apply:

a. All cuts shall be made sufficiently close to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. (See diagram A) Clean cuts shall be made at all times.

b. It is necessary to precut branches too heavy to handle to prevent splitting or peeling the bark. Where necessary, to prevent tree or property damage, branches shall be lowered to the ground by proper ropes or equipment.

c. Remove the weaker or least desirable of crossed or rubbing branches. Such removal should not leave large holes in the general outline of the tree.

d. Treatment of cuts and wounds, with tree wound dressing, is optional except where open wounds in certain trees may attract insects that carry disease or allow fungus invasion. If such treatment is made, materials non-toxic to the cambium layer must be used, and care taken to treat only the exposed wood with a thin coat of dressing.

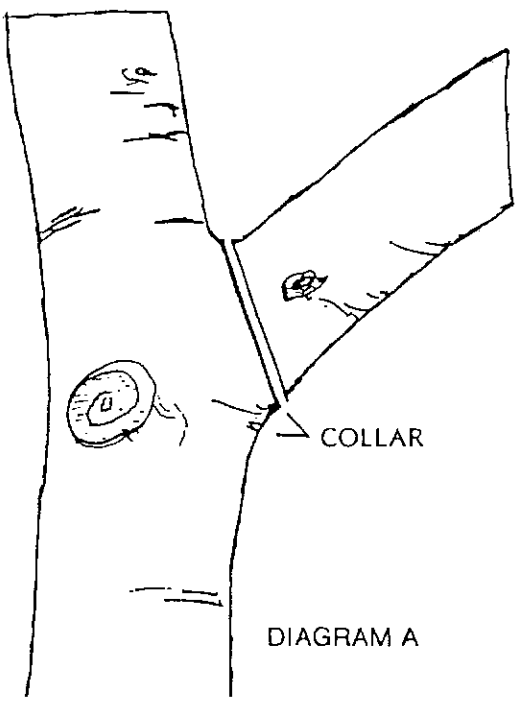


DIAGRAM A

e. On trees known to be diseased, tools are to be disinfected with methyl alcohol at 70% (denatured wood alcohol diluted appropriately with water) or Chlorox solution after each cut and between trees where there is known to be a danger of transmitting the disease on tools.

f. Old injuries are to be inspected. Those not closing properly and where the callus growth is not already completely established, should be traced where appropriate. If desired, for cosmetic purposes, the wound may be treated with a thin coat of wound dressing.

g. Where practical, all visible girdling roots shall be treated as follows:
   1. Cut root at either end.
   2. Notch root in center with a chisel.
   3. Remove entire root without injuring the bark or parent stem.

h. The presence of any structural weakness, disease conditions decayed trunk or branches, split crotches or branches, should be reported in writing to a supervisor and/or the owner, and corrective measures recommended.

CLASS II MEDIUM PRUNING

Medium pruning shall consist of the removal of dead, dying, diseased, interfering, objectionable and weak branches on the main trunks as well as those within the leaf area. An occasional branch up to one inch in diameter may remain within the main leaf area where it is not practical to remove it.

The following specifications shall apply:

a. All cuts shall be made sufficiently close to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. (See diagram A) Clean cuts shall be made at all times.

b. It is necessary to precut branches too heavy to handle to prevent splitting or peeling the bark. Where necessary, to prevent tree or property damage, branches shall be lowered to the ground by proper ropes or equipment.

c. Treatment of cuts and wounds, with tree wound dressing, is optional except where open wounds in certain trees may attract insects that carry disease or allow fungus invasion. If such treatment is made, materials non-toxic to the cambium layer must be used, and care taken to treat only the exposed wood with a thin coat of dressing.

d. On trees known to be diseased, tools are to be disinfected with methyl alcohol at 70% (denatured wood alcohol diluted appropriately with water) or Chlorox solution after each cut and between trees where there is known to be a danger of transmitting the disease on tools.

e. Old injuries are to be inspected. Those not closing properly and where the callus growth is not already completely established should be traced where appropriate. If desired, for cosmetic purposes, the wound may be treated with a thin coat of wound dressing.

f. All girdling roots visible to the eye are to be reported to a supervisor and/or the owner.

g. The presence of any structural weakness, disease conditions, decayed trunk or branches, split crotches or branches, should be reported in writing to a supervisor and/or the owner, and corrective measures recommended.

CLASS III COARSE PRUNING

Coarse pruning shall consist of the removal of dead, diseased or obviously weak branches, two inches in diameter or greater.

The following specifications shall apply:

a. All cuts shall be made sufficiently close to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. (See diagram A) Clean cuts shall be made at all times.

b. It is necessary to precut branches too heavy to handle to prevent splitting or peeling the bark. Where necessary, to prevent tree or property damage, branches shall be lowered to the ground by proper ropes or equipment.

c. Treatment of cuts and wounds, with tree wound dressing is optional except where open wounds in certain trees may attract insects that carry disease or allow fungus invasion. If such treatment is made, materials non-toxic to the cambium layer must be used, and care taken to treat only the exposed wood with a thin coat of dressing.

d. On trees known to be diseased, tools are to be disinfected with methyl alcohol at 70% (denatured wood alcohol appropriately diluted with water) or Chlorox solution after each cut and between trees where there is known to be a danger of transmitting the disease on tools.

e. The presence of any structural weakness, disease conditions, decayed trunk or branches, split crotches or branches, should be reported in writing to a supervisor and/or owner and corrective measures should be recommended.

CLASS IV CUTTING BACK OR DROP CROTCH PRUNING

Cutting back or drop crotch pruning shall consist of the reduction of tops, sides, underbranches or individual limbs. This practice is to be undertaken only in cases of utility line interference, or where certain portions of the roots or root systems have been severed or severely damaged, or when there is unusual and rapid tree growth, where it is necessary to reduce the top sides or underbranches, or for specific topiary training or dwarfing.

The following specifications shall apply:

a. All cuts shall be made sufficiently close to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. (See diagram A) Clean cuts shall be made at all times.

b. It is necessary to precut branches too heavy to handle to prevent splitting or peeling the bark. Where necessary, to prevent tree or property damage, branches shall be lowered to the ground by proper ropes or equipment.

c. Remove the weaker or least desirable or crossed or rubbing branches. Such removal should not leave large holes in the general outline of the tree.

d. Treatment of cuts and wounds, with tree wound dressing, is optoinal except where open wounds in certain trees may attract insects that carry disease or allow fungus invasion. If such treatment is made, materials non-toxic to the cambium layer must be used, and care taken to treat only the exposed wood with a thin coat of dressing.

e. Old injuries are to be inspected. Those not closing properly and where the callus growth is not already completely established should be traced where appropriate. If desired, for cosmetic purposes, the wound may be treated with a thin coat of wound dressing.

f. Generally, in reducing size (cutting back), not more than one-third of the total area should be reduced at a single operation. When cutting back trees, only drop crotch as much as necessary. Where practical, avoid cutting back to small suckers. All effort should be made to cut back to a lateral, one-third of the diameter of the cut being made.

g. In reducing overall size, attention is to be given to the symmetrical appearance. Top is to be higher and sides reduced in order to maintain a tree-like form.

h. When cutting back trees, one should have in mind to make them shapely and typical of their species.

i. On thin bark trees, just enough limbs shall be removed to get the effect wanted without admitting too much sunlight to the trunk of the tree or the top of large branches. Care should be taken with the following species: Lindens, maples, beeches, apple, oaks, and other trees susceptible to sunscald, growing in different geographical areas. The above damage may be minimized by doing work on susceptible species during the dormant season.

j. In lifting the lower bottom branches of trees for underclearance, care should be given to symmetrical appearance, and cuts should not be made so large that they will prevent normal sap flow.

k. Periodical drop crotching or cutting back of silver maples, poplars, and other trees with brittle and soft wood is an established practice and has proven beneficial in maintaining the safety of these trees over long periods of growth. Other trees with soft and brittle wood growing in different geographic areas may be specifically named when it is common practice to control the growth by cut-back.

l. An alternate method in some situations for maintaining the safety of these trees would be cabling and bracing as described under that standard.

TERMINOLOGY

BRANCH COLLAR	Wood tissue that forms around the base of a branch between the main stem and the branch. Usually as a branch begins to die the branch collar begins to increase in size.
CALLUS	New growth made by the cambium layer around all of a wound.
CAMBIUM LAYER	Growing point between the bark and sapwood.
CLOSURE	Refers to the roll of the callus growth around the wound area.
THE CUT	The exposed wood area that remains after the branch has been removed.
CUT BACK	Specified reduction of the overall size of the tree or individual branches, but may include the overall reduction of the sides as well as the top of the tree.
DORMANT	A condition of non-active growth. Decidious trees are considered to be dormant from the time the leaves fall until new foliage begins to appear.
GIRDLING ROOTS	Located above or below ground level, whose circular growth around the base of the trunk or over the individual roots applies pressure to the bark area, thereby choking or restricting the flow of sap.
LIFTING	The removal of lower branches for underclearance.
PARENT STEM	The main trunk system of the tree.
PRECUT or PRECUTTING	The removal of the branch at least 6" beyond the finished cut, to prevent splitting into parent stem or branch.
PRUNING	The removal of dead, dying, diseased, live interfering, objectionable and weak branches in a scientific manner.
SAP FLOW	The definite course assumed by sap in its movement through a tree.
SCARS or INJURIES	Natural or man-made lesions of the bark in which wood is exposed.
SUCKERS	Abnormal growth of small branches usually not following the general pattern of the tree.
THINNING OUT	The removal of live branches to reduce wind resistance and to create more space.
TOPPING	Means the same as Cut Back.
TRACING	Careful cutting of the bark along the lines of sap flow to encourage closure and to be the outline of the wound area.
TRIMMING:	The same as pruning.

National Arborist Association
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APPENDIX
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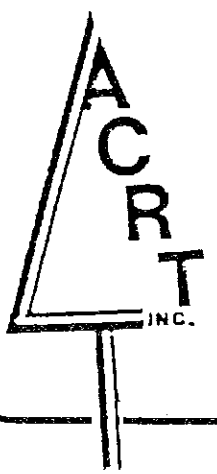

APPENDIX G

Recommended Tree Species for Planting

This list is provided as a guide to help you choose the most appropriate tree for any urban situation. There is no ONE perfect tree. The most successful course is to match the planting site limitations with the right tree for that spot. Each site must be evaluated and possible restrictions on tree species noted. These restrictions include rooting space, soil texture and pH, drainage, exposure, overhead wires, and surrounding building surfaces.

The trees appearing on this listing have different requirements and tolerances. These species all should do well in the urban forest environment of ~~Franklin~~. Prior to selection of any particular species or variety, further research should be undertaken to insure that the site will satisfy the specific requirements of the plant. All final planting decisions must rest with the Franklin Street Tree Board or the City Arborist.

Small Street Tree Varieties Suitable to Plant Under Overhead Utility Wires

1. Acer campestre
   Hedge Maple
   25-35'
   Rounded and dense, often branched to the ground
   Dark green leaf color in summer; yellow-green or yellow in the fall
   Good for planting under utility wires

2. Amelanchier arborea
   Downy Serviceberry
   15-20'
   Rounded crown, multi-stemmed
   Medium to dark green leaf color in summer; fall color ranges from yellow to apricot-orange
   One of the finest small trees for fall color; white flowers in mid-late April

3. Carpinus caroliniana
   American Hornbeam
   20-30'
   Wide-spreading, flat or round topped crown
   Dark green leaf color in summer; yellow, orange and scarlet in fall

4. Crataegus crus-galli inermis
   Thornless Cockspur Hawthorn
   20-30'
   Low, spreading, but susceptible to cedar hawthorn rust
   Single stem, dark green glossy foliage
   White flowers in June producing small red fruit

5. Crataegus phaenopyrum 'Treeform'
   Washington Hawthorn
   20-30'
   Low spreading, disease resistant
   Moderate growth rate, attractive white flowers
   Glossy foliage and long-lasting scarlet fruit
   Best used in areas where thorns are not a problem

6. Crataegus viridis 'Winter King'
   Green Hawthorn
   20-35'
   Rounded habit; almost a vase-shaped branching structure
   White flowers; red fruits; purple and scarlet foliage in fall

7. Evodia daniellii
   Korean Evodia
   25-30'
   Medium to fast growth rate
   Small white flowers
   Excellent summer foliage, flower and fruit characters

8. Ilex opaca 'Treeform'
   American Holly
   20-30'
   Moderate growth rate, densely pyramidal in youth
   Glossy green leaves, white flowers, red berry-like fruits in fall

9. Koelreuteria paniculata
   Varnishtree or Goldenrain-tree
   30-40'
   Globe shaped, rapid grower, drought tolerant
   Attractive yellow flowers in summer and tiny fruits
   Yellow autumn foliage
   Low maintenance
   Choice specimen where space is limited

10. Magnolia soulangiana
    Saucer Magnolia
    20-30'
    Pyramidal shape, low branched
    White to pink to purplish flowers in March/April

11. Magnolia stellata
    Star Magnolia
    15-20'
    Dense tree with close-set leaves and stems
    White flowers; slow growth rate

12. Oxydendrum arboreum
    Sourwood
    25-30'
    Pyramidal shape, slow growth rate
    Lustrous dark green foliage; white fragrant drooping flowers in June/early July; yellowish fall fruits

13. Syringa reticulata 'Ivory Silk'
    Japanese Tree Lilac
    20-30'
    Oval to rounded crown
    Sturdy and compact; flowers at a young age
    Showy white fragrant flowers opening in mid-June
    Cherry-like bark

Medium Trees That Do Well in City Conditions

14. Aesculus carnea 'Briotii'
    Red Horsechestnut
    30-40'
    Rounded to broad-rounded crown
    Lustrous dark green leaves; rose-red flowers in May are spectacular

15. Betula nigra 'Heritage'
    River Birch
    30-40'
    Pyramidal when young, rounded when mature; vigorous
    Leathery dark green leaves; salmon-white bark
    Thrives in hotter climates; resistant to bronze birch borer

16. Betula pendula
    European white birch
    40-50'
    Pyramidal in youth; rounded when mature
    Medium to fast growing; white bark

17. Carpinus betulus 'Fastigiata'
    Pyramidal European Hornbeam
    40-60'
    Pyramidal, slow grower
    Narrow, dense tree with clean dark green foliage

18. Celtis occidentalis
    Common Hackberry
    40-60'
    Broad top with ascending arching branches when mature
    Fleshy, orange-red to dark purple rounded fruit
    Good for park and large area use

19. Cercidiphyllum japonicum
    Katsura-tree
    40-80'
    Symmetrical with beautiful spring and autumn foliage
    Forms a very dense crown
    Susceptible to leaf scorch in hot environments

20. Cladrastis lutea
    American Yellowwood
    30-50'
    Rounded crown, medium growth rate
    White fragrant flowers; bright green foliage
    Disease resistant

21. Eucommia ulmoides
    Hardy Rubber Tree
    40-60'
    Rounded, broad spreading tree; lustrous dark green leaves
    Excellent shade tree

22. Fraxinus excelsior 'Hessei'
    European Ash
    40-60'
    Upright, oval to rounded, seedless, good pest resistance
    Straight, sturdy trunk; little fall color; leaves stay green late into fall

23. Fraxinus ornus
    Flowering Ash
    40-50'
    Rounded spreading crown; showy fragrant flowers borne on 5" panicles

24. Ostrya virginiana
    American Hophornbeam
    30-50'
    Narrow conical, pyramidal with rapid growth while young
    Develops horizontal or drooping branches which form a rounded outline as it matures
    Handsome, beech-like foliage turning yellow in autumn
    Shaggy bark, low maintenance, pest free
    Very difficult to transplant; slow growth rate
    Male catkins usually grouped in threes and visible throughout winter

25. Phellodendron amurense
    Amur Corktree
    30-50'
    Rapid grower, tropical appearing tree, pest free
    Glossy foliage and interesting corky bark

26. Pyrus calleryana 'Aristocrat' and 'Redspire'
    Callery pear
    30-50'
    Handsome ornamental; good street tree
    Resistant to fire blight
    'Bradford' cultivar no longer recommended due to tendency for severe limb breakage

27. Quercus imbricaria
    Shingle oak
    40-60'
    Round-topped when overgrown
    Leaves remain on tree well into fall

28. Sophora japonica
    Scholartree
    50-70'
    Upright, spreading with a broadly rounded crown; rapid grower
    Creamy white, mildly fragrant flowers; yellow-green, attractive fruit, resembling a pod, turning yellow-brown in autumn
    Tolerates drought, salt, compaction and wide pH

29. Tilia americana 'Redmond'
    'Redmond' Linden
    60-70'
    Broad oval, rapid grower
    Fragrant flowers in June, large glossy leaves
    Very susceptible to Japanese beetles

30. Tilia euchlora
    Crimean Linden
    40-60'
    Drought resistant
    Handsome, with smooth glossy leaves and of good habit

31. Zelkova serrata 'Green Vase'
    Japanese Zelkova
    60-70'
    Vase-shaped, rapid grower
    Large bright or dark green elm-shaped leaves which turn bronze or rusty red in autumn
    Tolerant of atmospheric pollution and heat reflection from pavement
    Needs full sun

Large Street Tree Varieties

32. Fagus grandifolia
American Beech
50-80'
Straight trunk with wide spreading crown
Moderate growth rate
Beautiful golden bronze autumn foliage color

33. Fraxinus americana 'Autumn Purple'
'Autumn Purple' White Ash
50-80'
Spreading, moderate growth rate
Showy purple fall color

34. Fraxinus pennsylvanica 'Summit'
Green Ash
60-100'
Straight trunked, moderate growth rate
Pointed narrow-oval crown of attractive glossy foliage

35. Ginkgo biloba (Salisburia)
Ginkgo, Maidenhair-tree
60-100'
Wide-spreading with large massive picturesque branches when mature; pyramidal when young
Thrives under extreme city conditions
Excellent yellow autumn color
Only male trees should be planted; they will not bear foul smelling fruit

36. Gleditsia triacanthos inermis
Thornless Honeylocust
30-100'
Short trunk with an open spreading crown
Fast grower
Yellow autumn foliage; leaves fall early

37. Gleditsia triacanthos inermis 'Continental'
'Continental' Honeylocust
40-100'
Narrow crown, vigorous variety
Bears exceptionally large, finely cut leaves of a dark blue-green color
Thornless and virtually seedless

38. Gleditsia triacanthos inermis 'Skyline'
    'Skyline' Honeylocust
    40-100'
    Narrow crown, rapid grower
    Dark green foliage with a more compact texture
    Autumn foliage yellow
    Few fruits
    Drought resistant

39. Gleditsia triacanthos inermis 'Shademaster'
    'Shademaster' Honeylocust
    40-100'
    Broad, oval, rapid grower, no fruits
    Yellow autumn foliage
    Drought resistant

40. Larix decidua
    European Larch
    70-80'
    Pyramidal, horizontal branches
    Yellow autumn foliage can be spectacular; fruit is a cone

41. Nyssa sylvatica
    Sourgum; Tupelo
    50-80'
    Pyramidal when young; irregularly rounded or flat-topped when mature; horizontal branches
    Slow to medium growth rate
    Autumn foliage fluorescent yellow, turning orange, scarlet and purple
    Not for heavily polluted areas

42. Platanus acerifolia
    London Planetree
    70-100'
    Cultivar 'Bloodgood' is resistant to Anthracnose
    Spreading, rapid grower
    Fuzzy leaves in May and June
    Drought resistant, yet tolerates moist sites

43. Quercus palustris
    Pin Oak
    50-90'
    Columnar, moderate growth rate; glossy foliage
    Tolerates moist sites
    Excellent autumn foliage
    Iron chlorosis a serious problem in high pH soils

44. Quercus robur 'Fastigiata'
    English Oak
    75-100'
    Medium growth rate; dark green foliage
    Deeply furrowed grayish bark

45. Quercus rubra
    Northern Red Oak
    60-100'
    Rounded, fast growing
    Good russet-red to bright red autumn foliage
    Excellent tree when properly grown

46. Taxodium distichum
    Baldcypress
    50-80'
    Deciduous conifer

47. Tilia cordata 'Greenspire'
    Littleleaf Linden
    60-90'
    Pyramidal to rounded; maintains a single leader;
        densely branched in old age
    Medium growth rate; fragrant yellowish flowers
    Does well under difficult conditions

APPENDIX
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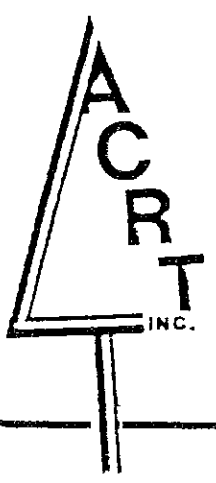

APPENDIX H

EXPERIMENTAL TREE SPECIES FOR PLANTING

Small Street Tree Varieties

1. Cornus kousa
   - Japanese Dogwood
   - 20-30'
   - Vase-shaped, disease resistant, slow growing
   - Dense, lustrous foliage; small clusters of white to pinkish flowers; raspberry-like fruit
   - Prefers well drained soil

2. Cornus mas
   - Cornelian-cherry Dogwood
   - 20-25'
   - Medium growth rate; beautiful yellow flowers
   - No serious pest problems; prefers well drained soil

3. Malus species
   - Red Flowering Cultivars
     - "Centurion" - highly resistant to diseases
     - "Indian Magic"
   - Pink Flowering Cultivars
     - "Beverly"
     - "Pink Beauty" - very resistant to diseases
     - "Sentinel"
   - White Flowering Cultivars
     - "Red Jewel"
     - "White Angel" - heavy fruit loads
     - "White Candle" - good upright type

Medium Street Tree Varieties

4. Corylus colurna
   - Turkish Hazelnut
   - 50-70'
   - Yellow autumn color
   - Relatively pest free; tolerant of drought and other stresses

5. Prunus serrulata 'Kwanzan'
   - Japanese Flowering Cherry
   - 20-35'
   - Upright habit
   - Good orange-bronze autumn foliage; double deep pink flowers

6. Sassafras albidum
   Sassafras
   30-60'
   Flat-topped, irregular, round-oblong head at maturity
   Yellow, fragrant flowers
   Medium growth rate

Large Trees

7. Ulmus parvifolia
   Lacebark Elm; Chinese Elm
   40-80'
   Excellent, tough, durable tree for almost any situation
   Decorative mottled, exfoliating bark

APPENDIX
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APPENDIX I

UNDESIRABLE TREE SPECIES FOR PLANTINGS

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Boxelder	*Acer negundo*	Weak wooded Aggressive shallow roots
Silver Maple	*Acer saccharinum*	Weak wooded Aggressive shallow roots
Ailanthus	*Ailanthus altissima*	Weak wooded
Paper Birch	*Betula papyrifera*	Borers, leaf miners
Cottonwood	*Populus deltoides*	Weak wooded
Lombardy Poplar	*Populus nigra* 'Italia'	Insects and diseases
Quaking Aspen	*Populus tremuloides*	Weak wooded
American Elm	*Ulmus americana*	Insects and diseases
Siberian Elm	*Ulmus pumila*	Weak wooded

Note: The planting of maples (genus *Acer*) should be limited for several years due to the predominance of maples.

APPENDIX
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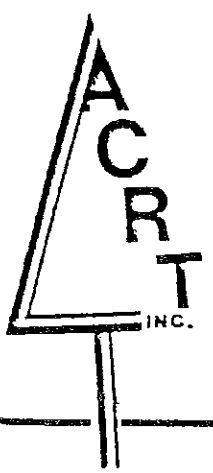
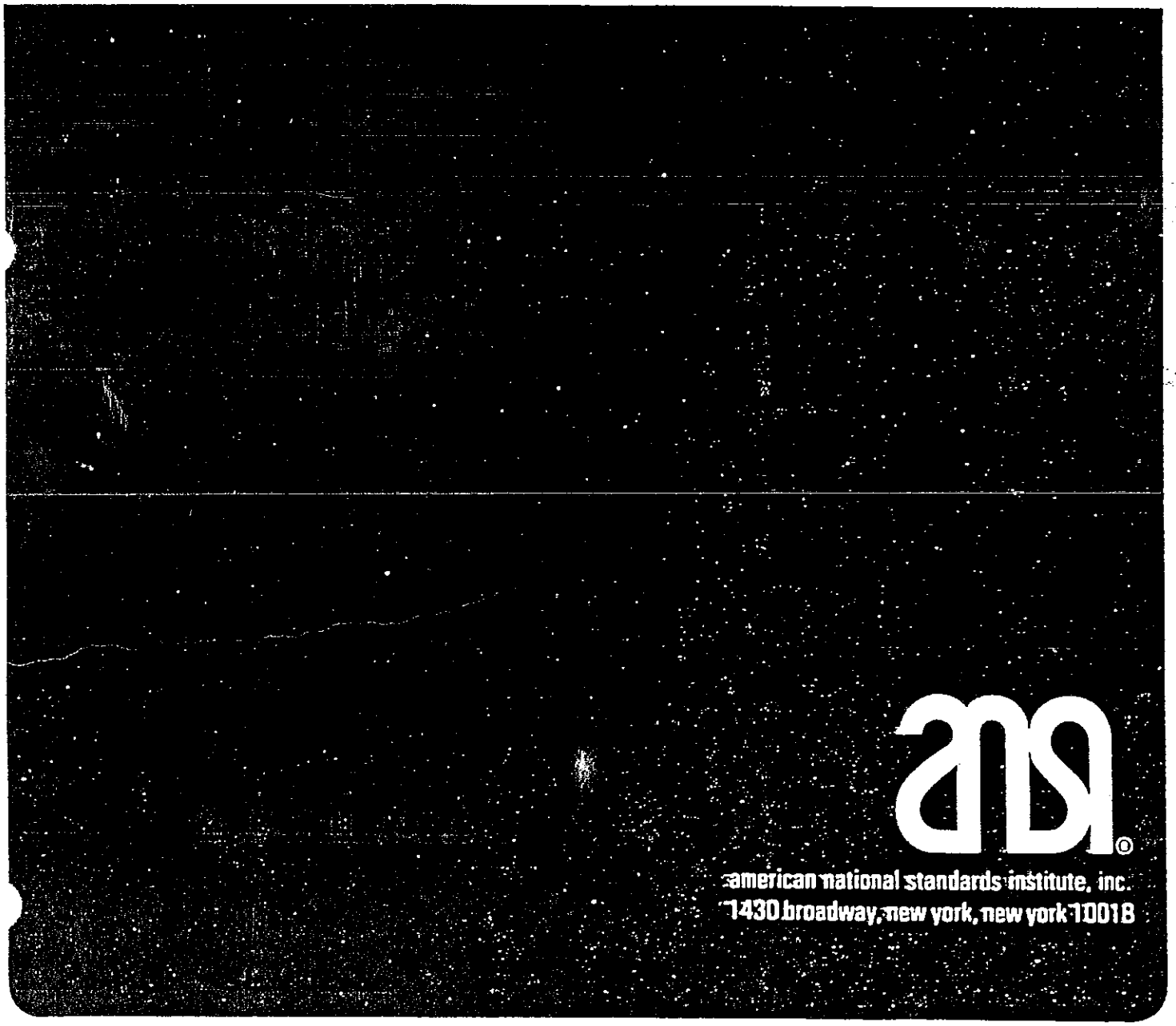


American National Standard

for tree care operations –

pruning, trimming, repairing, maintaining, and removing trees, and cutting brush – safety requirements



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ANSI Z133.1-1988

ANSI®
Z133.1-1988
Revision of
ANSI Z133.1-1982

American National Standard
for Tree Care Operations –

Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush – Safety Requirements

Secretariat

International Society of Arboriculture

Approved November 23, 1987

American National Standards Institute, Inc

American National Standard

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Foreword

(This Foreword is not part of American National Standard Z133.1-1988.)

This standard was developed under the procedures of the American National Standards Institute by Accredited Standards Committee on Safety in Tree Trimming Operations, Z133. The secretariat of the Z133 Committee is held by the International Society of Arboriculture.

Accredited Standards Committee Z133 was organized on April 4, 1968 in response to efforts by Mrs Ethel M. Hugg of Johnstown, N.Y. Mrs Hugg's son had died while trimming trees, and this tragic incident caused her to write to federal and state authorities, and to various safety organizations, in an attempt to have measures initiated that would make tree trimming safer.

The Z133 Committee was organized with the National Arborist Association as secretariat. Committee delegates included representatives of industry, labor, the academic community, government, equipment manufacturers, insurance carriers, and other interested experts. The International Shade Tree Conference became secretariat of the committee in November 1969. In 1975, the International Shade Tree Conference was renamed the International Society of Arboriculture.

Five subcommittees were formed to develop specific portions of the original standard. Each subcommittee prepared and edited material in its area of concern; the material was then combined and submitted to the full committee for review. One of the subcommittees also met with representatives of the Occupational Safety and Health Administration, U.S. Department of Labor.

An initial draft was submitted for committee ballot on March 2, 1971. A revised draft was unanimously adopted by the committee on July 14, 1971 and was approved as an American National Standard on December 20, 1972.

The Z133 Committee continued to monitor tree-trimming safety performance, providing interpretation and clarification of the intent of the requirements. Portions of the safety standard were adopted by the Occupational Safety and Health Administration under the "Telecommunications" Safety and Health Standard 29CFR Part 1910 – *Federal Register* Volume 38, No. 166, August 28, 1973.

Based on the experience of users, minor amendments to the standard were approved on November 17, 1975. The need for additional revision became evident and the committee, after considerable effort, discussion, consideration, and balloting unanimously approved the first revision on June 19, 1978. On May 17, 1979 the first revision was approved and printed for distribution as an American National Standard.

To clarify and acknowledge additional changes to the standard, the committee initiated consideration of other revisions at three meetings held March 25, 1981, October 5, 1981, and March 24, 1982 at the U.S. Department of Labor Building, Washington, DC. After proper discussion and balloting, the committee approved the second revision on March 24, 1982. On August 23, 1982, the second revision was approved as an American National Standard.

In July 1987, the committee voted to adopt several changes in the 1982 standard. These changes were made owing to increased technology and understanding of safe working practices related to tree care. The committee approved the final content and editorial changes on September 16, 1987. The standard was approved by the American National Standards Institute on November 23, 1987.

The Z133 Committee will continue to be available for interpretation or clarification of the intent of the requirements in the standard and for any adjustments or revisions of the standard.

Suggestions for improvement of this standard will be welcome. They should be sent to the International Society of Arboriculture, 303 W. University, Leal Park, P.O. Box 71, Urbana, IL 61801 or phone (217) 328-2032.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee on Safety in Tree Trimming Operations, Z133. Committee approval of the standard does not necessarily imply that all members voted for its approval. At the time it approved this standard, the Z133 Committee had the following members:

John Hendricksen, Chair
Robert Felix, Vice-Chair
William P. Kruidenier, Secretary

Organization Represented	*Name of Representative*
A.C.R.T., Inc	Kenneth C. Miller
	E. Thomas Smiley (Alt)
American Association of Nurserymen	David Hamilton
American Insurance Association	George Klinger
Asplunch Tree Expert Company	James Allard
The F. A. Bartlett Tree Expert Company	John L. Jordan
The Davey Tree Expert Company	Clyde Rhodes
Edison Electric Institute	Joe Skala
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International Brotherhood of Electrical Workers	James L. Dushaw
International Society of Arboriculture	David C. Shaw
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	John R. Hendricksen (Alt)
National Arborist Association	Robert Felix
	Fred Drewry (Alt)
	Gerald Duke (Alt)
Ontario Hydro	William O'Connor
Outdoor Power Equipment Institute	John Liskey
Pacific Coast Electric Association	Richard G. Alvarez
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Utility Arborist Association, ISA	Michael Watson
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Honorary Members	Mr. and Mrs. Edward Hugg
	Richard Abbott
	Robert Hercer
	Gordon S. King

Individual Members

H. Dennis P. Ryan, III
James Sweeny

Contents

SECTION PAGE

American National Standard for Tree Care Operations –

Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush – Safety Requirements

1. General

1.1 Scope. This standard presents safety requirements for pruning, trimming, repairing, maintaining, and removing trees and for cutting brush, and for the equipment used in such operations.

1.2 Purpose. The purpose of this standard is to provide safety criteria for workers and the public. It is intended as a guide to federal, state, and municipal authorities in the drafting of their regulations and may be adopted by them in whole or in part.

1.3 Application. This standard is intended to apply to any employer engaged in the business, trade, or performance of tree pruning, trimming, repairing, maintaining, removal, or brush cutting who hires one or more persons to perform such work. It is also intended, through voluntary use, as a standard reference for safety requirements for those engaged in pruning, trimming, repairing, maintaining, or removing trees or cutting brush.

The terms "climbing line" and "climbing rope" are used interchangeably in this standard.

2. Definitions

aerial lift. One of the following types of vehicle-mounted aerial devices used to elevate personnel to job sites above ground:

(1) Extensible boom platforms
(2) Aerial ladders
(3) Articulating boom platforms
(4) Vertical towers
(5) A combination of any of the above defined in ANSI A92.2-1979.[1]

These devices are made of metal, wood, fiberglass reinforced plastic (FRP), or other material, are powered or manually operated; and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis.

approved. Acceptable to the federal, state, or local enforcing authority having jurisdiction.

electrical conductor. Any overhead or underground electrical device, including communications wires and cables, power lines, and other such facilities.

electrical hazard. An electrical hazard exists when a worker, a tool, or any conductive object is closer than 10 feet (3 meters) from an energized conductor rated 50 kV, phase-to-phase or less, or closer than 10 feet + 4/10 inch (3 meters + 10 mm) from each kilovolt over 50 kV. When an electrical hazard exists, minimum clearances shall be maintained and only qualified line clearance tree trimmers or qualified line clearance tree trimmer trainees shall perform the work.

false crotch for a climbing line. A 5/8-inch shackle (clevis) with a minimum breaking strength of 5000 pounds (22.2 kN) supported by a line equal to the minimum requirements or a climbing line. The pin in the shackle (clevis) shall be secured in a positive manner (by safety wiring the pin in place or securing the pin in place with a cotter pin).

improved crotch. Any tight or V-shaped crotch that has been altered so as to allow the climbing line to move freely.

line-clearance tree trimming. The pruning, trimming, or removal of trees or brush growing or existing in proximity to electrical conductors (as defined above) for the purpose of preventing such growth from interfering with the facilities involved.

[1] The full titles for all referenced American National Standards are listed in Section 9.

proximity. Within 10 feet (3 meters) of energized conductors rated 50 kV phase-to-phase or less; for conductors rated over 50 kV phase-to-phase, the minimum clearance shall be 10 feet + 4/10 inch (3 meters + 10 mm).

qualified line-clearance tree trimmer. A tree worker who, through related training and on-the-job experience is familiar with the hazards in line clearance and has demonstrated his/her ability in the performance of the special techniques involved. This qualified person may or may not be currently employed by a line clearance contractor.

qualified line-clearance tree trimmer trainee. Any worker undergoing line-clearance tree trimming training, who, in the course of such training, is familiar with the hazards in line clearance and has demonstrated his/her ability in the performance of the special techniques involved. Such trainees shall be under the direct supervision of qualified personnel.

qualified personnel. Any worker who by reason of his/her training and experience has demonstrated the ability to safely perform his/her duties and, where required, is properly licensed in accordance with federal, state, or local laws and regulations.

qualified tree worker. A worker who, through related training and on-the-job experience, is familiar with the hazards of pruning, trimming, repairing, maintaining, or removing trees, and with the equipment used in such operations, and has demonstrated his/her ability in the performance of the special techniques involved.

qualified tree worker trainee. Any worker undergoing on-the-job training who, in the course of such training, is familiar with the hazards of pruning, trimming, repairing, maintaining, or removing trees, and with the equipment used in such operations, and has demonstrated his/her ability in the performance of the special techniques involved. Such trainees shall be under the direct supervision of qualified personnel.

shall. As used in this standard, denotes a mandatory requirement.

should. As used in this standard, denotes an advisory recommendation.

system operator/owner. The person or organization that operates or controls the electrical conductors involved.

taut-line hitch. A knot used for securing all workers aloft to their climbing rope, and consisting of either one or two wraps over two wraps.

NOTE: A glossary of additional terms is given in Appendix B.

3. General Safety Requirements

3.1 General

3.1.1 Employers and employees shall observe all provisions of applicable federal, state, and local laws for persons engaged in the occupations covered by this standard.

3.1.2 Safety equipment and devices shall conform with the requirements of this standard and shall be maintained in safe condition.

3.1.3 Employers shall instruct their employees in the proper use of all equipment provided for them and shall require that safe working practices be followed. A job briefing, work procedure, and assignment shall be worked out carefully before any tree job is begun.

3.1.4 All equipment, including ropes and lines upon which the worker must rely for his/her safety, shall be inspected by the worker each day before use.

3.2 Personal Protective Equipment

3.2.1 Personal protective equipment as outlined in 3.2 shall be required where there is a reasonable probability of injury or illness that can be prevented by such protection. Employees shall use such protection.

3.2.2 Head protection shall be worn by workers engaged in tree operations. It shall conform to the applicable provisions of ANSI Z89.1-1986. Class B helmets only shall be worn when working in proximity to an electrical conductor, in accordance with ANSI Z89.1-1986. The tree worker shall not place reliance on the dielectric capabilities of such helmets.

3.2.3 Respiratory protection shall be worn as required and shall conform to the applicable provisions of ANSI Z88.2-1980.

3.2.4 Eye and face protection shall be worn as required in this standard and shall conform to the applicable provisions of ANSI Z87.1-1979.

3.2.5 Employees shall wear clothing and footwear appropriate to the work location and condition.

3.2.6 Safety belts or tree-trimming saddle belts as specified in ANSI A10.14, or a saddle formed by a double bowline on a bight shall be worn to protect workers above ground level.

3.2.7 Saddle belts or safety belts used for climbing operations shall have forged support rings. Snaps used in climbing ropes or in safety straps, for attachment to the forged support ring, shall be of a self-closing safety type. Forged support rings shall be designed so that the snaps will not become disengaged (roll off) accidentally.

3.2.8 Climbing ropes shall have a minimum diameter of 1/2 inch (12 mm) and be constructed of a synthetic fiber, with a minimum nominal breaking strength of 5400 pounds (24 kN) when new or equivalent or greater

strength and durability. Maximum working elongation (elasticity) shall not exceed 7 percent at a load of 540 pounds (10 percent minimum breaking strength).

3.2.9 Saddle belts or safety belts shall not be spliced or weakened by punching extra holes in them.

3.2.10 Climbing ropes shall not be used to lower limbs or other parts of trees, or to raise or lower equipment.

3.3 First Aid

3.3.1 An approved first-aid kit adequately stocked and maintained shall be provided by the employer when and where operations are being carried on. Each employee shall be instructed in its use.

3.3.2 All employees shall be instructed in identification of, and preventive measures relating to, common poisonous plants such as poison ivy, poison oak, and poison sumac.

3.4 Traffic Control

3.4.1 Effective means for control of pedestrian and vehicular traffic shall be instituted on every job site where necessary.

3.4.2 Traffic-control devices used in tree operations shall conform to the applicable federal and state regulations or to applicable sections of ANSI D6.1-1978 and ANSI D6.1b-1983.

3.5 Fire Protection

3.5.1 The requirements of the federal, state, and local enforcing authorities shall be complied with in providing the necessary fire protection for tree operations.

3.5.1.1 Gasoline-powered equipment shall be refueled only after it has been stopped. Any spilled fuel shall be removed from the equipment before restarting.

3.5.1.2 Gasoline-powered equipment shall not be operated within 10 feet (3 meters) of any refueling operation or any area in which refueling has recently taken place.

3.5.1.3 Flammable liquids shall be stored, handled, and dispensed only from metal containers or approved safety cans.

3.5.2 Smoking shall be prohibited when handling or working around any flammable liquid.

3.6 Noise. When employees are required to work in areas in which the noise levels exceed acceptable standards as established by federal regulations,[2] the employer shall take appropriate measures to suppress the noise to safe levels. When it is not practicable to decrease the noise or isolate the workers from it, the workers shall wear effective hearing-protective equipment as provided by the employer.

[2] For information about the federal regulation, see Section A4 of the Appendix.

3.7 Rescue. Rescue procedures for employees working above ground shall be established by the employer, and the employees trained accordingly.

4 Electrical Hazards

4.1 General. All overhead and underground electrical conductors and all communication wires and cables shall be considered to be energized with potentially fatal voltages and shall never be touched either directly or indirectly.

4.1.1 Every treeworker shall be instructed that:

(1) A direct contact is made when any part of the body touches or contacts an energized conductor or other energized electrical fixture or apparatus.

(2) An indirect contact is made when any part of the body touches any object in contact with an energized electrical conductor or other energized fixture or apparatus.

(3) An indirect contact can be made through conductive tools, tree branches, trucks, equipment, or other conductive objects, or as a result of communication wires and cables, fences, or guy wires being accidentally energized.

(4) Electric shock will occur when a tree worker, by either direct or indirect contact with an energized conductor, energized tree limb, tool, equipment, or other object, provides a path for the flow of electricity to a grounded object or to the ground itself. Simultaneous contact with two energized conductors will also cause electric shock that may result in serious or fatal injury.

4.1.2 The system operator/owner shall be advised before any work is performed in proximity to energized conductors. This rule shall not apply to persons working on behalf of, or employed by, the system operator/owner.

4.2 Working in Proximity to Electrical Hazards

4.2.1 An inspection shall be made by a qualified tree worker to determine whether an electrical hazard exists before climbing, otherwise entering, or performing any work in the tree.

4.2.2 Only a qualified line-clearance tree trimmer or qualified line-clearance tree-trimmer trainee shall be assigned to the work if it is found that an electrical hazard exists. A trainee shall be under the direct supervision of qualified personnel.

4.2.3 There shall be a second qualified line-clearance tree trimmer or line-clearance tree-trimmer trainee within normal voice communication during line-clearing operations aloft when the line-clearance tree trimmer or line-clearance tree-trimmer trainee must approach more closely than 10 feet (3 meters) to any conductor

or electrical apparatus energized in excess of 750 volts or when:

(1) Branches or limbs being removed cannot first be cut (with a pole pruner/pole saw) sufficiently clear of the conductors and apparatus so as to avoid contact

(2) Roping is required to remove branches or limbs from such conductors or apparatus

This does not apply to utility workers engaged in tree trimming incidental to their normal occupation.

4.2.4 Line-clearance tree trimmers and line-clearance tree-trimmer trainees shall maintain the clearances from energized conductors given in Table 1.

4.2.5 All other tree workers shall maintain a minimum clearance of 10 feet (3 meters) from energized conductors rated 50 kV phase-to-phase or less; for conductors rated over 50 kV phase-to-phase the minimum clearance shall be 10 feet + 4/10 inch (3 meters + 10 mm) for each kilovolt over 50 kV.

4.2.6 Branches hanging on a conductor may be removed using appropriately insulated equipment.

4.2.7 Footwear, including those having electrical resistance soles and lineman's overshoes, shall not be considered as providing any measure of safety from electrical hazards.

4.2.8 Ladders, platforms, and aerial devices, including insulated aerial devices, shall not be brought in contact with an electrical conductor.

4.2.9 When an aerial lift device contacts an electrical conductor, the truck supporting the aerial lift device shall be considered as energized, and contact with the truck shall be avoided except where emergency rescue procedures are being carried out. Emergency rescue should only be attempted by properly trained persons familiar with electrical hazards.

4.3 Storm Work and Emergency Conditions

4.3.1 Storm work and emergency conditions create special hazards; only authorized representatives of the system operator/owner shall perform tree work under such conditions.

4.3.2 When, during tree operations, an emergency condition develops that involves electrical conductors, work shall be suspended and the system operator/owner shall be notified immediately.

5. Mobile Equipment

5.1 General

5.1.1 All vehicles and equipment, regardless of type, shall be equipped and operated in compliance with applicable federal, state, and local laws and regulations, and with manufacturer's operating instructions.

Table 1
Minimum Working Distances from Energized Conductors for Line-Clearance Tree Trimmers and Line-Clearance Tree Trimmer Trainees

Voltage Range (phase to phase) (kV)	Minimum Working Distance
2.1 to 15.0	2 ft 0 in (0.6 m)
15.1 to 35.0	2 ft 4 in (0.7 m)
35.1 to 46.0	2 ft 6 in (0.75 m)
46.1 to 72.5	3 ft 0 in (0.9 m)
72.6 to 121.0	3 ft 4 in (1.0 m)
138.0 to 145.0	3 ft 6 in (1.05 m)
161.0 to 169.0	3 ft 8 in (1.1 m)
230.0 to 242.0	5 ft 0 in (1.5 m)
345.0 to 362.0	7 ft 0 in (2.1 m)
500.0 to 552.0	11 ft 0 in (3.35 m)
700.0 to 765.0	15 ft 0 in (4.55 m)

5.1.2 All equipment shall be turned off and at rest when repairs or adjustments are made, except where manufacturer's procedures require otherwise. All defects or malfunctions affecting the safe operation of any equipment shall be corrected before placing such equipment into use.

5.1.3 Trucks with obscured rear vision, particularly those with trailed vehicles, should be backed up only when absolutely necessary and then only with outside guidance.

5.1.4 All equipment shall be operated by qualified personnel.

5.1.5 All material and equipment carried on vehicles shall be stored so as to prevent them from falling off the truck during transit.

5.1.6 Workers shall not be permitted to ride outside of, or on top of, the vehicle or its load unless they are riding in a designated place or places required by the nature of the operation, such as roadside spraying.

5.1.7 No hoisting or manlifting equipment shall be used to lift more than its rated capacity as stated by the manufacturer's plate or specification.

5.1.8 Pads shall be set under outrigger feet when they are put on a soft surface. Traction for outrigger feet shall be ensured when ice or snow is present.

5.1.9 The manufacturer's instructions shall be followed in detecting hydraulic leaks. Workers shall not attempt to locate hydraulic leaks by feeling for them with their hands.

5.1.10 All step surfaces on equipment shall be skid-resistant.

5.1.11 The manufacturer's recommended maintenance and parts-replacement procedures should be followed.

5.1.12 All ignition keys shall be removed when the equipment is left unattended to prevent unauthorized starting.

5.2 Aerial Lifts

5.2.1 All aerial-lift equipment used for operations within the scope of this standard shall be in accordance with ANSI A92.2-1979.

5.2.2 Prior to the daily use of an aerial-lift device, a visual inspection and operational check shall be made in accordance with the manufacturer's and owner's instructions.

5.2.3 Buckets, platforms, or booms of aerial-lift equipment shall be provided with some means of anchorage to which a safety belt or lanyard can be secured.

5.2.4 The combined load, including workers, material, and tools, shall not exceed the rated lift capacity as stated by the manufacturer. Such rated lift capacity (load rating) shall be conspicuously and permanently posted on the lift in accordance with ANSI A92.2-1979.

5.2.5 An aerial lift or ladder shall not be used as a crane or hoist to lift or lower materials unless specifically designed to perform such operations.

5.2.6 Wheel chocks shall be installed before using an aerial lift.

5.2.7 Pneumatic tools, when being serviced or adjusted or when not in use, shall be disconnected, except where manufacturer's procedures require otherwise.

5.2.8 When hydraulic tools are being serviced or adjusted, they shall be disconnected, except where manufacturer's procedures require otherwise.

5.2.9 When operating an aerial-lift device, the operator shall look in the direction of travel of the bucket and be aware of the booms in relation to all other objects and hazards.

5.2.10 When booms are operated over roads, safe clearances from passing vehicles shall be maintained or traffic control shall be provided.

5.2.11 A one-man bucket shall not have more than one person riding in it during work operations.

5.2.12 Except where quick-acting connectors are used, pressure shall be released before connections are broken to avoid the hazards of flying particles or the whipping of hydraulic or pneumatic hoses. Hydraulic or pneumatic hoses shall never be kinked in order to cut off pressure prior to disconnecting.

5.2.13 No part of the body shall be used to either locate or attempt to stop a hydraulic leak: A hydraulic puncture wound will probably cause a generalized infection and result in amputation; wounds permitting hydraulic fluid to get into the circulatory system have caused death.

5.2.14 All hoses affecting the dielectric characteristics of equipment shall be made of nonconductive material. Hydraulic fluids for insulated equipment shall be of the insulating type.

5.2.15 Booms or buckets shall not be run into conductors, cables, poles, trees, and similar objects.

5.2.16 Electric cables (as for an electric saw), lights, or other conductive material shall not be run from the truck to the bucket on insulated equipment.

5.2.17 An aerial-lift truck shall not be moved when the boom is elevated in a working position with men in the bucket, except for equipment that is specifically designed for this type of operation. The booms of a fully articulated aerial device shall not be considered elevated in a working position when the bucket is "landed" directly in front of or behind the truck with the booms held as low as feasible and low enough so that the operator's head is below the highest point of the vehicle.

5.2.18 Booms shall not be operated unless outriggers, where required, are down.

5.2.19 Workers shall not drill holes that may reduce dielectric integrity in aerial-lift buckets.

5.2.20 During aerial-lift operations, tree workers not engaged in line clearance shall maintain a minimum clearance of 10 feet (3 meters) from energized conductors rated 50 kV phase-to-phase or less; for lines rated over 50 kV phase-to-phase the minimum clearance shall be 10 feet + 4/10 inch (3 meters + 10 mm) for each kilovolt over 50 kV phase-to-phase. Qualified line-clearance tree trimmers or qualified line-clearance tree-trimmer trainees using an insulated aerial bucket may operate in accordance with the clearances given in Table 1.

5.2.21 Workers shall be instructed that even fully-insulated buckets do not protect them from other electric paths to the ground such as those through trees, through a guy wire, or the path from one phase wire to the second phase wire, any one of which can be fatal.

5.3 Brush Chippers

5.3.1 Access panels for maintenance and adjustment shall be closed and secured prior to operation of brush chippers.

5.3.2 Each rotary drum tree or brush chipper or disk-type tree or brush chipper not equipped with a mechanical infeed system shall be equipped with an infeed hopper not less than 85 inches (2.15 meters), measured from the blades or knives to ground level over the centerline of the hopper, and shall have sufficient height on its side members so as to prevent personnel from contacting the blades or knives of the machine during normal operations.

5.3.3 Each rotary drum tree or brush chipper or disk-type tree or brush chipper not equipped with a mechanical infeed system shall have a flexible anti-kickback device installed in the infeed hopper for the purpose of protecting the operator and other persons in the machine area from the hazards of flying chips and debris.

5.3.4 Each disk-type tree or brush chipper equipped with a mechanical infeed system shall have a quick stop and reversing device on the infeed. The activating mechanism for the quick stop and reversing device shall be located across the top, along each side of, and as close to the feed end of the infeed hopper as practicable and within easy reach of the operator.

5.3.5 Trailer chippers detached from trucks shall be chocked or otherwise secured.

5.3.6 The operator and workers in the immediate area shall wear eye protectors in accordance with 3.2.4.

5.3.7 When in tow position, the chipper safety chains shall be crossed under the tongue of the chipper and affixed securely to the towing vehicle.

5.4 Sprayers and Related Equipment

5.4.1 Working and walking surfaces of all sprayers and related equipment shall be covered with skid-resistant material.

5.4.2 Equipment on which workers stand and spray while the vehicle is in motion shall be equipped with guardrailing around the working area. The guardrailings shall be constructed in accordance with ANSI A12.1-1973.

5.4.3 Workers wearing clothing on which flammable liquid has been spilled shall avoid open flame and other sources of ignition, and change the contaminated clothing as soon as possible.

5.5 Stump Cutters

5.5.1 Stump cutters shall be equipped with enclosures or guards that effectively protect the operator.

5.5.2 The operator and workers in the immediate area shall wear eye protectors in accordance with 3.2.4.

5.6 Trucks

5.6.1 A steel bulkhead or equivalent protection shall be provided to protect the occupants of vehicles from load shifts.

5.6.2 Logs or brush shall be securely loaded onto trucks in such a manner as not to obscure taillights or brake lights and vision, or to overhang the side.

5.6.3 In order to avoid the hazard of spontaneous combustion or the production of undesirable products, wood chips should not be left in trucks for extended periods.

5.7 Log Loaders, Tree Cranes, and Related Hoists

5.7.1 Tree cranes operated by qualified line-clearance personnel working with the knowledge and approval of the system operator/owner shall be operated to maintain a minimum clearance of 10 feet (3 meters) from energized conductors rated 50 kV or less. The minimum clearance shall be 10 feet + 4/10 inch (3 meters + 10 mm) for each kilovolt over 50 kV; however, a nonconductive load line of a crane may be operated within the clearances set forth in Table 1.

5.7.2 A boom-angle indicator shall be provided on all cranes.

5.7.3 All cranes and rigging shall be in compliance with ANSI/ASME B30.5-1982, B30.5a-1984, B30.5b-1985, and B30.5C-1987.

5.7.4 An operator of hoisting equipment shall remain at the controls while a load is suspended.

5.7.5 Riding the load line is prohibited. However, a qualified tree worker may be hoisted into position utilizing the hook, provided that he/she is tied in with an approved type of climbing rope and safety saddle that is independently secured to the boom – *and not to the hook.*

5.7.6 A daily visual inspection of wire ropes, gears, chain drives, and other parts shall be made by the operator, in accordance with the manufacturer's recommendations.

5.7.7 A durable and legible sign shall be placed conspicuously and shall contain the following wording or its equivalent: "Warning – Keep Clear of This Equipment When in Operation."

5.8 Off-the-Highway Equipment and Tracked Vehicles

5.8.1 Vehicles shall not be operated at speeds which will endanger the driver, workers, or traffic. Equipment shall be under control at all times and shall be kept in gear when descending grades.

5.8.2 Towing equipment for brushogs and similar implements should be equipped with a deadman control. If a deadman control is not available, the operator shall disengage the power source to the rotary or cutter head before alighting.

5.9 Digging and Ditching Operations. The location of any underground utilities shall be determined before digging or ditching operations are begun.

6. Portable Power Hand Tools

6.1 Portable Electric Power Tools

6.1.1 Electrical tools (except those that are self-powered) shall never be used in trees near an energized electrical conductor where there is a possibility of the

supply cord or tool contacting the conductor, whether in an aerial lift or not.

6.1.2 All portable electric hand tools shall:

(1) Be equipped with three-wire cord having the ground wire permanently connected to the tool frame and means for grounding the other end; or

(2) Be of the double insulated type and permanently labeled as "Double Insulated"; or

(3) Be connected to the power supply by means of an isolating transformer, or other isolated power supply

6.1.3 Extension cords shall be maintained in safe condition. Exposed metal sockets shall not be used.

6.1.4 Tool operators shall:

(1) Use electric hand tools in accordance with the manufacturer's instructions

(2) Prevent cords from becoming entangled, damaged, or cut by blades and bits

(3) Avoid laying an extension cord in water

(4) Support an electrical tool and its power supply cord by a line, independent of the worker when the tool is used aloft

6.2 Gasoline-Driven Power Saws

6.2.1 The manufacturer's operating and safety instructions shall be followed unless modified by this standard.

6.2.2 Power saws weighing more than 15 pounds (6.8 kg) (service weight) that are used in trees shall be supported by a separate line, except when used from an aerial-lift device.

Where there are no lateral branches on which to crotch a separate support line for power saws weighing over 15 pounds (6.8 kg), a false crotch shall be used. A false crotch is one that can hold power-saw lines without slipping or coming untied.

6.2.3 The operator shall have secure footing when starting the saw. Power saws weighing less than 15 pounds (6.8 kg) (service weight) may be drop started. Drop starting of saws over 15 pounds (6.8 kg) is permitted outside of the bucket of an aerial lift only after ensuring that the area below the lift is clear of personnel.

6.2.4 The engine shall be started and operated only when all co-workers are clear of the saw.

6.2.5 The engine shall ordinarily be stopped when power saws are being carried. The saw need not be stopped between cuts during consecutive felling, bucking, limbing, or cutting operations on reasonably level ground. The chain shall not be moving and the operator's hand shall be off the throttle lever while operators move between work locations. One-man saws shall be carried by the worker on his/her side with the guide bar of the saw pointed to the rear; two workers shall carry a two-man saw.

6.2.6 The engine shall be stopped for all cleaning, refueling, adjustments, and repairs to the saw or motor where practical, except where manufacturer's procedures require otherwise.

6.2.7 The saw muffler should be maintained in good condition.

6.2.8 The saw should be clean of saw dust and flammable material.

6.3 Backpack Power Units (for Use in Pruning, Clearing, etc)

6.3.1 The manufacturer's operating and safety instructions shall be followed unless modified by this standard.

6.3.2 No one except the operator shall be within 10 feet (3 meters) of the cutting head of a brush saw.

6.3.3 The power unit shall be equipped with a quick shutoff switch readily accessible to the operator.

6.3.4 The operator shall observe the position of all personnel while the unit is running.

6.3.5 The engine shall be stopped for all cleaning, refueling, adjustments, and repairs to the saw or motor where practical, except where manufacturer's procedures require otherwise.

7. Hand Tools

7.1 General

7.1.1 The correct tool shall be selected for the job.

7.1.2 Tools that have been made unsafe by damage or defect shall not be used.

7.1.3 When climbing a tree, workers shall not carry tools in their hands other than tools that are used to assist them in climbing, such as pole pruners or pole saws.

7.1.4 Workers shall maintain a safe working distance from other workers when using hand tools.

7.1.5 Tools shall be properly stored or placed in plain sight out of the immediate work area when not in use.

7.1.6 Workers shall not throw or drop tools from trees unless warning has been given and the ground area is clear, and the act of dropping will not endanger personnel.

7.2 Chopping Tools – Axes, Brush Hooks, Machetes, and Others

7.2.1 Chopping tools that have loose or cracked heads or splintered handles shall not be used.

7.2.2 Chopping tools shall never be used while working aloft.

7.2.3 Chopping tools shall be swung away from the feet, legs, and body, using the minimum power practical for control.

7.2.4 Chopping tools shall not be driven as wedges or used to drive metal wedges.

7.3 Pruners and Saws

7.3.1 Pole pruners, pole saws, and other similar tools shall be equipped with wood or nonmetallic poles. The actuating cord shall be of nonconducting material.

7.3.2 When inserting a blade in a bow-saw frame, workers shall keep their hands and fingers in the clear when the tension lever snaps into or against the saw frame. When removing a bow-saw blade from the frame, the operator shall stay clear of the blade.

7.4 Injector Tools for Applying Herbicides

7.4.1 The bit of injector tools shall be covered with a shield when not in use.

7.4.2 Injectors shall be laid flat on the ground when not in use.

7.4.3 The injector shall not be carried on the shoulders but shall be carried by the loop handle on the downhill side, with the bit properly shielded and facing to the rear.

7.4.4 The manufacturer's recommendations shall be used in handling chemical mixtures.

7.4.5 Workers shall have firm footing and shall clear all interfering limbs away before using the tool.

7.5 Grub Hoes, Mattocks, and Picks

7.5.1 The blade eye shall be tight-fitting and wedged so that it cannot slide down the handle.

7.5.2 When swinging grub hoes, mattocks, and picks, the worker shall have a secure grip and firm footing.

7.6 Cant Hooks, Cant Dogs, Tongs, and Carrying Bars

7.6.1 Hooks should be firmly set before applying pressure.

7.6.2 Tools with cracked, splintered, or weakened handles should not be used.

7.6.3 Workers shall be warned and shall be in the clear before logs are moved.

7.6.4 The points of hooks shall be at least 2 inches (51 mm) long and shall be kept sharp.

7.6.5 Workers shall stand to the rear and uphill when rolling logs.

7.7 Wedges, Chisels, and Gouges

7.7.1 Wedges, chisels, and gouges shall be inspected for cracks and flaws before use.

7.7.2 Wedges and chisels shall be properly pointed and tempered. Tools with mushroomed heads shall not be used.

7.7.3 Only wood, plastic, or soft-metal wedges shall be used with power saws.

7.7.4 Wood-handled chisels should be protected with a ferrule on the striking end.

7.8 Hammers, Mauls, and Sledges. Wood, rubber, or high-impact plastic mauls, sledges, or hammers should be used when striking wood-handled chisels or gouges.

7.9 Ropes

7.9.1 Climbing ropes shall meet the minimum requirements specified in 3.2.8.

7.9.2 Rope made unsafe by damage or defect, or for any other reason, shall not be used.

7.9.3 Rope shall be stored away from all cutting edges and sharp tools. Corrosive chemicals, gas, and oil shall be kept away from rope.

7.9.4 When stored, rope shall be coiled and piled, or suspended, so that air can circulate through the coils.

7.9.5 Rope ends shall be secured to prevent unraveling.

7.9.6 Climbing and safety rope shall not be spliced to effect repair.

7.9.7 Safety snaps shall be rotated from one end of the rope to the other, as needed, and the worn end cut off.

7.10 Tackle Blocks and Pulleys. Tackle blocks and pulleys shall be inspected immediately before use and shall be condemned if defective, in accordance with procedures given in ANSI/ASME B30.9-1984, B30.9a-1985, and B30.9b-1987.

7.11 Ladders

7.11.1 Ladders made of metal or other conductive material shall not be used where an electrical hazard exists. Only approved wood ladders (constructed in accordance with ANSI A14.1-1982) or nonconductive ladders made of synthetic material equal to or exceeding the strength of approved wood ladders shall be used.

7.11.2 Metal ladders used where no electrical hazard exists shall conform to ANSI A14.2-1982.

7.11.3 All ladders shall be inspected daily before use. Unsafe ladders shall not be used.

7.11.4 The attaching of cleats, metal points, and safety feet; lashing; or other effective means of securing the ladder shall be used if there is danger of its slipping.

7.11.5 Ladders shall be supported while in storage so they will not sag. Except when on mobile equipment, ladders shall be stored under suitable cover, protected from the weather, and kept in a dry location away from excessive heat.

7.11.6 Ladders shall not be used as bridges or inclined planes to load or handle logs or other material.

7.12 Climbing Spurs. Climbing spurs shall be of the tree-climbing type and shall have gaffs of the type and length suitable for the tree being climbed.

8. Safe Work Procedures

8.1 Climbing. A tree worker shall be tied in with an approved type of climbing rope and safety saddle when working above the ground. This does not necessarily apply to a worker ascending into a tree. Work may be performed while standing on a self-supporting ladder, including the top rung, but only when the worker is tied in as required.

8.1.1 During climbing operations, tree limbs should be inspected before weight is applied to them. The climber should not trust the capability of a dead branch to support his/her weight. Dead branches should be broken off on the way up, if possible. Hands and feet should be placed on separate limbs, if possible.

8.1.2 It is recommended that a worker never shin a tree for a distance greater than 15 feet (4.55 meters) or shin for any distance beyond his/her demonstrated physical capabilities.

When the climbing distance is greater than 25 feet (7.6 meters), or is beyond the worker's physical capabilities, the worker should not climb or footlock the rope, but should use a safety saddle or a sling instead.

8.1.3 The climbing rope should be passed around the trunk of the tree as high above the ground as possible using branches with a wide crotch to prevent any binding of the safety rope.

Exception: Palms and other trees with similar growth characteristics that will not allow a climbing rope to move freely.

The crotch selected for tying in should be directly above the work area, or as close to such a position as possible, but located in such a way that a slip or fall would swing the worker away from any electrical conductor. The rope should also be passed around the main leader or an upright branch, using the limb as a stop. Feet, hands, and ropes should be kept out of tight V-shaped crotches.

8.1.4 A 5/8-inch metal shackle (clevis) shall be secured to the end of a support line that meets minimum standards for a climbing line. The support line shall be tied to the pin of the shackle (clevis) with the climbing line placed through the shackle (clevis). The support line shall be placed through the top of the palm tree pulling the shackle (clevis) and climbing line into position. The support line shall be tied off at the base of the tree or any other acceptable anchor.

8.1.5 While climbing, the location of all electrical conductors should be noted and the worker should climb on the side of the tree that is away from electrical conductors, if possible.

8.1.6 A figure-eight knot should be tied in the end of the rope, particularly when climbing high trees. This will prevent pulling the rope accidentally through the taut line-hitch and possible serious injury from a fall.

8.1.7 The climbing line shall be crotched as soon as practicable after the worker is aloft and then a taut line-hitch shall be tied and checked.

8.1.8 The worker shall be completely secured with the climbing line before starting his/her operation.

8.1.9 The worker shall remain tied in until the work is completed and he/she has returned to the ground. If it is necessary to recrotch the rope in the tree, the worker shall re-tie in or use the safety strap before releasing the previous tie.

8.2 Pruning and Trimming

8.2.1 Pole pruners and pole saws shall be hung securely in a vertical position to prevent dislodgement. Pole pruners or pole saws shall not be hung on utility wires or cables and shall not be left in the tree overnight. Pole saws shall be hung so that the sharp edge is away from the worker, if possible.

8.2.2 A scabbard or sheath should be hooked to the belt or safety saddle to carry the handsaw when it is not in use.

8.2.3 Warnings, when necessary, shall be given by the worker in the tree before a limb is dropped. "Timber" or "heads up" are common terms used for this purpose.

8.2.4 A separate line should be attached to limbs that cannot be dropped safely or are too heavy to be controlled by hand. The line should be held by workers on the ground end of the rope. Use of the same crotch for both the safety rope and the work rope should be avoided.

8.2.5 The safety line or climbing rope shall never be used for any purpose but climbing.

8.2.6 Cut branches should not be left in trees overnight.

8.2.7 A climbing rope shall never be left in a tree overnight. A service line should be put up for operations lasting overnight or longer and should be used to to bring the climbing rope back into position at the start of the next day's work operation.

8.2.8 The tree climber shall inspect his/her rope for cuts or abrasions before starting work. If any cuts or serious abrasions are found, the rope should be discarded or used for some other purpose or the defective section should be cut off.

8.2.9 During all tree-working operations above a height of 12 feet (3.65 meters) that are not subject to the requirements of 4.2.3, there shall be a second worker in the vicinity.

8.3 Cabling

8.3.1 In cabling operations, branches that are to be cabled should be brought together to the proper distance by means of a block and tackle, a hand winch, a rope, or a rope with a come-along.

8.3.2 Not more than two persons should be in a tree working at opposite ends during cabling installation.

8.3.3 When the block and tackle are released, workers in trees should be positioned off to one side in order to avoid injury in case the lag hooks pull out under the strain.

8.3.4 Groundmen should not stand under the tree when cable is being installed.

8.3.5 Tools used for cabling, bark tracing, cavity work, etc, shall be carried in a bag or belt designed to hold tools and not put in the pockets or stuck in the top of a boot.

8.3.6 A handline shall be used for raising or lowering tools.

8.4 Topping/Lowering Limbs

8.4.1 Workers performing topping operations should make sure the trees are able to stand the strain of a topping procedure. If not, some other means of lowering the branches should be provided, such as a tree crane.

8.4.2 If large limbs are lowered in sections, the worker in the tree should be above the limb being lowered.

8.4.3 Guidelines, handlines, or tag lines shall be used when conditions warrant their use.

8.5 Felling

8.5.1 Before beginning any felling operation, the worker shall carefully consider:

(1) The tree and the surrounding area for anything that may cause trouble when the tree falls

(2) The shape of the tree

(3) The lean of the tree

(4) Wind force and direction

(5) Decayed or other weak spots

(6) The location of other persons

8.5.2 The work area shall be cleared to permit safe working conditions, and an escape route shall be planned before any cutting is started.

8.5.3 Each tree worker shall be instructed as to exactly what he/she is to do. All workers not directly involved in an operation shall be kept clear of the work area.

8.5.4 A notch or backcut shall be used in felling trees over 5 inches (127 mm) diameter, measured at breast height. No tree shall be felled by "ripping" or "slicing" cuts.

8.5.4.1 The depth or penetration of the notch shall be about one-third the diameter of the tree.

8.5.4.2 The opening or height of the notch shall be about 2-1/2 inches (63.5 mm) for each foot (0.3 meter) of the tree's diameter.

8.5.4.3 The backcut shall be made higher than the point or apex of the notch to prevent kickback.

8.5.5 Just before the tree is ready to fall, an audible warning shall be given to those in the area. All personnel in the vicinity shall be safely out of range when the tree falls.

8.5.6 If there is danger that the trees being felled may fall in the wrong direction or damage property, wedges, block and tackle, rope, or wire cable (except where an electrical hazard exists) shall be used. All limbs shall be removed from trees to a height and width sufficient to allow the tree to fall clear of any wires and other objects in the vicinity.

8.5.7 Special precautions in roping rotten or split trees are important because they may fall in an unexpected direction even though the cut is made on the proper side.

8.5.8 Persons shall be kept back from the butt of a tree that is starting to fall.

8.6 Brush Removal and Chipping

8.6.1 Brush and logs should not be allowed to create a hazard at the work site.

8.6.2 All workers feeding brush into chippers shall wear eye protectors.

8.6.3 Brush chippers shall be fed from the side of the centerline, and the operator shall immediately turn away from the feed table when the brush is taken into the rotor. Chippers shall be fed from the curbside whenever practical.

8.6.4 The chipper chute shall not be raised or removed while the rotor is turning. The chipper shall not be used unless an exhaust chute of sufficient length or design to prevent contact with the blade is in place.

8.6.5 Foreign material such as stones, nails, sweepings, etc, shall not be fed into the chipper.

8.6.6 Loose clothing, gauntlet-type gloves, rings, and watches shall not be worn by workers feeding the chipper.

8.6.7 The feed chute or feed table of a chipper shall have sufficient height on its side members to prevent operator contact with the blades or knives during normal operation.

8.7 Limbing and Bucking

8.7.1 Whenever it is possible to do so, the tree worker shall work on the side opposite the side on which the limb is being cut.

8.7.2 The tree worker should stand on the uphill side of the work whenever possible.

8.7.3 Branches bent under tension shall be considered hazardous.

8.7.4 The tree worker shall block the log to prevent rolling, when necessary.

8.7.5 When bucking up trunks of trees, wedges shall be used as necessary to prevent binding of the guide bar or chain.

9. Referenced American National Standards

This standard is intended to be used with the following American National Standards. When these referenced standards are superseded by a revision approved by the American National Standards Institute, Inc, the revision shall apply:

ANSI A10.14, Requirements for Safety Belts, Harnesses, Lanyards, Lifelines, and Drop Lines for Construction and Industrial Use[3]

ANSI A12.1-1973, Safety Requirements for Floor and Wall Openings, Railings, and Toeboards

ANSI A14.1-1982, Ladders – Portable Wood – Safety Requirements

ANSI A14.2-1982, Ladders – Portable Metal – Safety Requirements

ANSI A92.2-1979, Vehicle-Mounted Elevating and Rotating Aerial Devices

ANSI D6.1-1978 and ANSI D6.1b-1983, Manual on Uniform Traffic Control Devices for Streets and Highways

ANSI Z87.1-1979, Practice for Occupational and Educational Eye and Face Protection

ANSI Z88.2-1980, Practices for Repiratory Protection

ANSI Z89.1-1986, Personnel Protection – Protective Headware for Industrial Workers – Requirements

ANSI/ASME B30.5-1982, B30.5a-1984, B30.5b-1985, and B30.5c-1987, Safety Standard for Mobile and Locomotive Cranes

ANSI/ASME B30.9-1984, B30.9a-1985, and B30.9b-1987, Safety Standard for Slings

[3] This standard is presently under development. Contact the secretariat for its current status.

Appendixes

(These Appendixes are not part of American National Standard Z133.1-1988, but are included for information only.)

Appendix A

General Safety Procedures that Apply to All Tree Work

A1. Lifting

Before lifting any weight, the tree worker should:

(1) Be sure clear ground is available if the weight is to be carried from one place to another.

(2) Decide exactly how the object should be grasped to avoid sharp edges, slivers, splinters, or other things that might cause injury.

(3) Make a preliminary lift to be sure the load can be safely handled.

(4) Place feet solidly.

(5) Crouch as close to the load as possible with legs bent at an angle of about 90 degrees.

(6) Keep back as straight as possible. It may be far from vertical but should not be arched.

(7) Lift with the legs, not the back.

A2. Load Handling

Loads should be handled by the use of skids and winch equipment; cutting logs into shorter lengths should be considered.

A3. Direct Supervision

Direct supervision is when a qualified line-clearance tree trimmer or a qualified supervisor is present on the job site.

A4. Federal Regulations for Noise Levels

The acceptable noise levels as established by the Occupational Safety and Health Administration (OSHA) may be obtained by writing:

U.S. Department of Labor
OSHA – Noise Conservation Standards
200 Constitution Ave., NW,
Washington, DC 20210

A5. Safety Training Materials for Tree Workers

(1) Publications[4]

(a) Tail Gate Safety Program in Arboriculture

(b) Electrical Hazards Awareness – Home Study Program

(2) Slide/cassette programs[4]

(a) Tree Care Safety

(b) Chain Saw Use and Safety

(c) Aerial Rescue

(d) Electrical Hazards and Trees

(e) Tree Care Practices around Electrical Conductors

(f) Tree Climbing Techniques

(3) Video Programs[4]

[4] Available from the National Arborist Association, Inc, P.O. Box 1094, Amherst, NH 03831-1094. Phone: (603) 673-3311.

Appendix B

Glossary of Terms for ANSI Z133.1-1988

NOTE: The numbers that appear in parentheses after these terms are cross-references to the section or subsection in the text in which the term is used.

brushog (5.8.2). A heavy-duty rotary mower, normally pulled by a farm-type tractor, used for cutting and mulching brush.

bucket (5.2.3). A basket-type enclosure approximately 4 feet (1.22 meters) high, which is attached to the end of the upper boom on an aerial lift providing a work platform for the operator who is working aloft.

bucking (6.2.5). The act of sawing a felled tree, limbs, or both, into smaller sections.

crotch (6.2.2). To pass a rope through the crotch of a limb, or false crotch, in such a way that the load will be supported by the main leader.

deadman control (5.8.2). A safety switch, electrical or mechanical, that deactivates the equipment's function when released by the operator.

dielectric (3.2.2). Designed to be nonconductive of electrical current.

drop started (6.2.3). The act of starting a chain saw by pushing the saw away from the body while simultaneously pulling on the starter handle.

false crotch (6.2.2). A pulley, block, sling, lashing, or metal ring, affixed to a tree's leader or limb, through which a load line is passed, to lower or raise limbs or equipment.

footlock (8.1.3). To climb up a suspended rope by pulling with the hands and arms and pushing upward with the feet. The loose end of the rope is wrapped under the middle and over the top of one foot, and is locked in place with pressure from the other foot.

groundlines, handlines, taglines (8.4.2). Ropes used for lifting, lowering, or guiding limbs or equipment, or both, into or out of the tree.

groundmen (8.1.3). Workers on the ground who are assigned to assist and carry out other related tree work activities.

kilovolts (4.1 and 4.2.5). The term for 1000 volts, abbreviated as kV. Higher voltages are generally expressed in this unit, i.e., 12.5 kV (12,500 volts) and 19.9 kV (19,900 volts).

lanyard. A short line or strap designed to stop a fall. One end is secured to a worker's approved body belt, harness, or saddle and to the other anchorage point in a manner that prevents the worker from contacting a lower level, should a fall occur.

mushroomed. A condition that develops from constant hammering on the heads of chisels and wedges that causes the metal to spread outward, fold under, and splinter off.

phase (4.2.5). Any current-carrying conductor that has an electric potential other than ground.

phase-to-ground (4.2.5). The electric potential (voltage) between a conductor and ground (assumed at 0 volts).

phase-to-phase (4.2.5). The electric potential (voltage) between two conductors, each having its own electric potential reference ground.

primary conductor (4.2.3). Any conductor including aluminum, copper, or aluminum conductor steel reinforced (ACSR), bare, covered, or insulated, generally considered as above 750 volts.

quick-acting connectors (5.2.12). Hose connectors in a hydraulic or pneumatic system designed to allow connection or disconnection without leakage when the system is pressurized.

shin (8.1.3). To climb by alternately shifting the grip of the arms and legs upward on the leader or on the limbs of the tree, or on both.

tied in. The term that describes a tree climber whose climbing line has been properly crotched and attached to the saddle and whose taut-line hitch is tied.

volts (4.1 and 4.2.5). A unit of electric potential difference between two points. Lower voltage systems are generally expressed in terms of volts, i.e., 120 volts, 240 volts, and so on.

wheel chocks (5.2.6). Wedge-shaped blocks of wood or other material, placed in front of or in back of a vehicle's tires or tracks to prevent unintentional movement. If necessary, the chocks can be placed both in front and in back of the tires or tracks.

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APPENDIX
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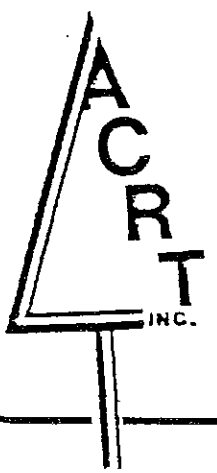

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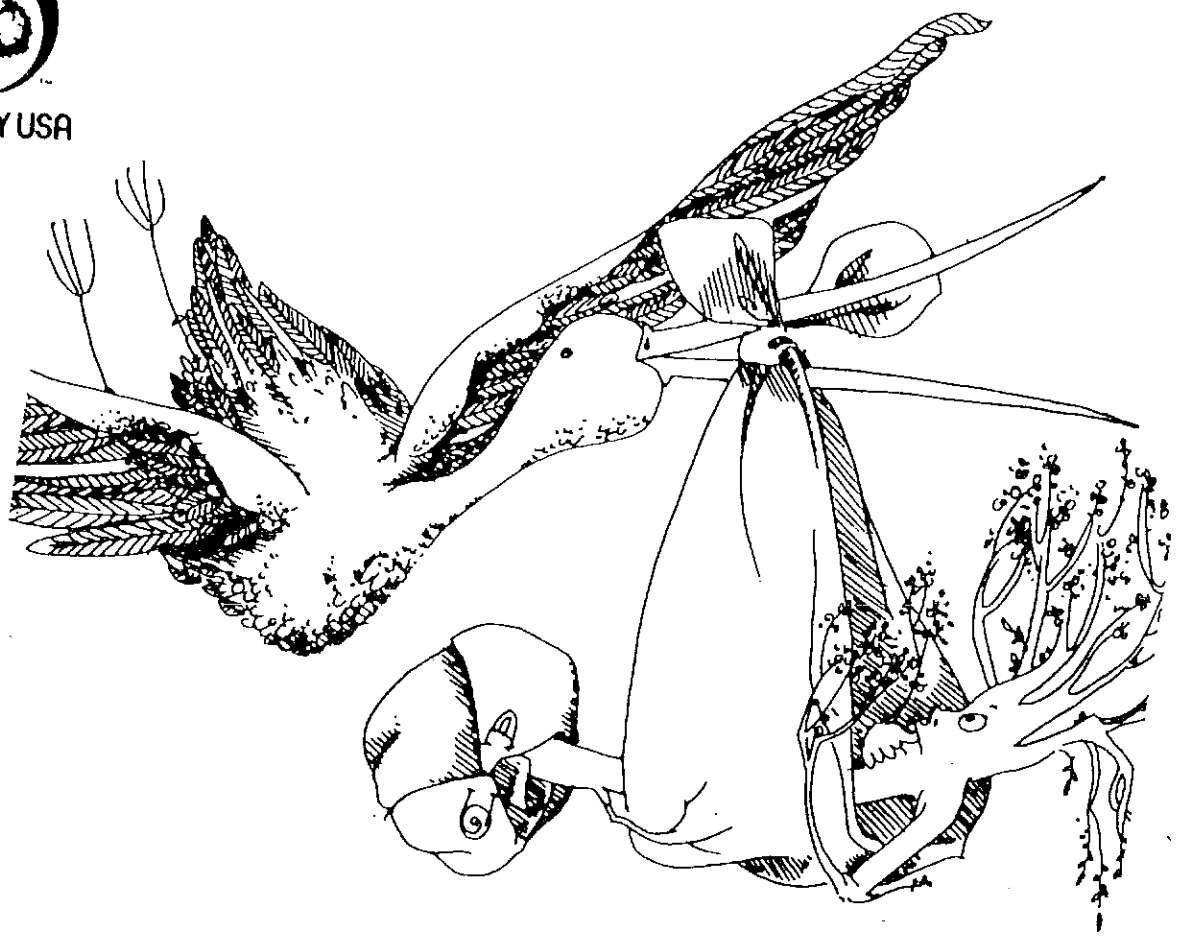

YOUR STREET IS GETTING GREENER!

Soon your street will be planted with many healthy trees, and we'd like to take this opportunity to tell you more about the project.

The Urban Forest Management Section is systematically planting all over the city. And, thanks to the cooperation of your _____ _____, it's your time to receive trees.

In the near future, you may want to keep your eye out for landscaping contractors and their crews in your neighborhood. These professionals will be planting the trees following surveys and specifications written by foresters and community representatives.

This project is funded by a special forestry assessment particularly designated for street tree planting and maintenance. In the future, the trees will be properly pruned for street and sidewalk clearance and to avoid future problems.

TAKE PRIDE AND CARE OF YOUR NEW ADDITION!

The new trees will be 1½ inches in diameter and approximately six to ten feet tall. The species was chosen after a careful evaluation of the site. We want to be positive that the tree will remain healthy and attractive and cause no problems now or in the future. All trees will be planted between the curb and the sidewalk on the City-owned right-of-way.

The trees on your street are _____ _____, and they need your help. They'll contribute beauty to your street if you'll contribute some simple care during their early years.

1. WATERING. Trees should be watered deeply, and slowly every two weeks. Five to six gallons a week may be needed in dry weather.
2. MULCHING. Wood chips, bark chips, leaf compost, or other attractive non-packing material can be used. A mulch will keep the soil moist, cool, loose, and help reduce weed growth.
3. LAWNMOWER DAMAGE. Please avoid hitting the tree with a lawnmower. This will damage the bark, provide an entry point for decay and insects, and will lead to a premature loss of the tree.

We hope you are as excited about this project as we are. Your street will soon join many others in our efforts to keep The Queen City a green city. If you have any questions, please call the Urban Forest Management Division at: