

MUNICIPAL ARBORISTS AND URBAN FORESTERS COMMITTEE

URBAN FORESTRY —

BEST MANAGEMENT PRACTICES

FOR

ONTARIO MUNICIPALITIES



B.H.McGAULEY Chair  
Best Management Practices Subcommittee  
2000

INTERNATIONAL SOCIETY OF ARBORICULTURE - ONTARIO

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## INTRODUCTION:

The Municipal Arborists and Urban Foresters Committee of the International Society of Arboriculture - Ontario established a subcommittee in April 1997. The Best Management Practices Subcommittee was asked to develop general practice guidelines for urban forestry in Ontario. This initiative was largely driven by an examination of tree risk assessment which was undertaken in late 1996 which showed that there were a variety of activities which were being undertaken at different levels depending on the municipality. For example, one municipality had a ratio of tree workers to number of trees of 1:19000 while another had a ratio of 1:2000. It could therefore be argued that they were not managing trees equally well. There were also a great variety of methods being used to inspect trees and the cycles of inspection varied from occasional drivebys to a 4 week blitz at a specific time of year. Again the argument; Are we managing trees in an effective and consistent manner?

In an effort to standardize the approach to managing trees in cities, the subcommittee was charged with the task of developing Best Management Practices (BMP) which could be used throughout the province of Ontario. The subcommittee reviewed an extensive list of potential BMP's and then began over a 2 year period, to develop what they felt were the highest priority practices. Each BMP has been prepared as a stand alone document. We hope that in future, other BMP's will be developed and that this document will be expanded.

The committee consisted of the following:

BRUCE McGAULEY	Chair, LONDON
MARK PROCUNIER	TORONTO
PETER HARPER	ETOBICOKE
JANET SNAITH	BRANTFORD
DIEGO FABRIS	MISSISSAUGA
RICK LIPSITT	BURLINGTON
BOB CRUMP	NORTH YORK (resigned Jan. 1999)

This is the first attempt to develop guidelines for Ontario. Ontario is a very large province and the committee, while attempting to consider provincial conditions, focused primarily on southern Ontario. We would welcome input from municipal arborists/foresters from the northern regions. We hope that the adoption of these standards, over time, will improve trees and promote healthy urban forests.

*Municipalities are encouraged to establish policies/practices for their particular conditions using these best management practices as a guide. It is recognized that these guidelines may not be implemented immediately, but they are intended to provide a target towards which to work. These guidelines are necessarily of a general nature and do not take into account the specific risks of individual municipalities. Each municipality is urged to seek specific legal*

*and arboricultural advice in developing their own standards and should not rely solely on the text of this publication.*

#### **DISCLAIMER**

**As stated above, these best management practices are intended to be a useful starting point, but they are neither an exhaustive coverage of every best management practice, nor are they to be used or construed as the sole source of advice. This Committee and ISA Ontario do not accept any responsibility for reliance on these best management practices including any damages incurred directly or indirectly from the use of this information.**

# I.S.A. ONTARIO BEST MANAGEMENT PRACTICE

## TREE INSPECTION CYCLE

November 2000

### BACKGROUND:

The maintenance of trees on City property is a legislated responsibility of each municipality (Municipal Act). In order to properly maintain trees and reduce the chances of property damage and human injury, each tree on the municipality's property must be regularly inspected. The inspection must be documented in a uniform fashion in order to be acceptable to the courts.

This Best Management Practice identifies trees in various size categories and in different locations and recommends inspection cycles. It also identifies who should undertake the inspections and what minimum records must be maintained. Additional information may be kept if desirable.

The scheduling of maintenance work identified during the inspection is dealt with in the Best Management Practice entitled Pruning Cycle and Standards.

### BEST MANAGEMENT PRACTICE:

#### 1.0 TREE CATEGORIES AND INSPECTION CYCLES:

As an ongoing municipal practice, trees are inspected as soon as is practical after any request is received. However, in the event that requests are not made, the following outlines the recommended minimum inspection cycles for trees in stated categories:

##### 1.1 STREET TREES:

- |                                   |                     |
|-----------------------------------|---------------------|
| Old trees (>24"DBH)               | - annual inspection |
| Intermediate trees (10 to 24"DBH) | - 3 year cycle      |
| Young trees (<10"DBH)             | - 5 year cycle      |
| High use areas (eg. downtown)     | - annual inspection |

##### 1.2 PARK TREES:

- |  |                         |
|--|-------------------------|
| Active parks (sports, play equipment)              | - inspect annually      |
| Passive parks (turf maintained, trees well spaced) | - inspect every 3 years |
| Pathways (walking, bicycle)                        | - inspect annually      |
| Natural areas (ravines, river banks)               | - not inspected         |

- 2.0 The **maximum inspection cycle** for trees in any location where there are trees and targets (potential property damage or human injury) is every 5 years. Where an inspection demonstrates a hazard concern, a shorter inspection cycle will be required.

### **3.0 QUALIFICATIONS OF INSPECTORS:**

Staff engaged in tree inspections for risk management purposes can be divided into two classes as follows:

#### **3.1 INSPECTOR:**

The Inspector must be trained in arboriculture, forestry, horticulture or equivalent and have training and experience in tree identification and risk evaluation. The training is obtained through organizations such as International Society of Arboriculture, Ontario Shade Tree Council or others who adopt their professionally accepted standards. Experience is gained through at least 3-years of continuous working in the tree maintenance industry.

#### **3.2 INSPECTOR ASSISTANT:**

The assistant could be a parks person, forestry staff, student or volunteer with interest in plants and trees. These individuals would receive training from the Inspector prior to undertaking inspections and be determined to be competent by the Inspector. The Inspector Assistant would use a standardized reporting format (see Sec.4). The inspector must be involved in any situations where a second opinion is needed.

### **4.0 RECORDS:**

The purpose of establishing this best management practice is to demonstrate that trees are being inspected for health and safety on a regular basis. In order to prove that inspections have been carried out, records must be filed using a standardized format. The records must show the following:

- Date
- Inspector name
- Tree location, size, species, condition
- Action required
- Urgency of action - immediate, short term, long term

Any other information may be recorded including photos, drawings, defect description, utilities, target location and description.

## TREE OWNERSHIP

November 2000

### **BACKGROUND:**

The issue of tree ownership is important to municipalities because there are many situations where trees are close to the boundary between private and City property. Often, these trees are not included in the inventory of City trees because at the time of the inventory, the small trees were clearly on private property. However, as trees grow, they are considered to encroach on to City property. Therefore, the City may be held accountable in the courts, for the maintenance of such trees or the damages caused by them. It is because of these situations that a clear delineation of tree ownership is required.

The most current treatment of the topic of tree ownership and trees growing on boundary lines can be found in "Arboriculture and the Law in Canada" by J.A.Dunster and S.M.Murray 1997. Readers are encouraged to consult their own legal staff and this authoritative reference for specific cases and additional detail.

### **NOTE: - THIS BMP DEALS WITH TREE OWNERSHIP**

The tree maintenance guidelines are provided for additional clarification and interest only.

### **BEST MANAGEMENT PRACTICE:**

#### **1.0 MUNICIPAL TREE OWNERSHIP:**

Any tree, the trunk of which at the ground level is fully on a municipal road allowance or which sits fully on a parcel of land owned by the municipality, is owned by the municipality.

#### **2.0 BORDER TREE OWNERSHIP:**

Border trees are defined as those trees whose trunk at ground level grow either on or beside the property line. A border tree growing totally on municipal property is municipally owned as above.

### **3.0 STRADDLING TREE OWNERSHIP:**

A tree which straddles a property line is defined as one which has any part of the above ground trunk, at the ground line, on two or more adjacent properties.

**NOTE:** To date, there does not appear to have been a challenge relating to root flare and tree trunk.

### **TREE MAINTENANCE GUIDELINES:**

- 1.0 Municipally owned trees (the entire trunk at the ground line is on municipal property), must be maintained by the municipality. Where municipally owned trees overhang private property, you should obtain permission to enter onto private property if such is necessary to undertake maintenance operations. Generally the homeowner request for maintenance is considered granting permission to enter private property.
- 2.0 Private trees overhanging municipal property can be trimmed by the municipality. Although not legally required, notification is considered good practice. Do not enter private property or airspace without permission.

#### **NOTE:**

Private property is defined as the ground inside a private property line. This line can be extended vertically, both above and below the ground. Trespass can occur on the ground, above the ground and below the ground where trees are involved. Therefore, care is required in maintaining trees which grow on, over, or under a property line.

- 3.0 Straddling trees cannot be removed without the consent of both owners. Trimming straddling trees can occur as in section 2.0 where they overhang municipal property. Take care not to cross into private airspace or on to private land without permission.

## I.S.A. ONTARIO BEST MANAGEMENT PRACTICE

# TREE INVENTORY

November 2000

### **BACKGROUND:**

Urban Forestry is the management of trees in the urban environment. Urban forest management details a strategic method of developing and maintaining trees in the city. The foundation of an effective management program is a detailed tree inventory. The tree inventory must provide sufficient information to create meaningful reports that aid in the decisions to manage the resource.

The tree inventory should clearly identify tree health, size/age, and ownership or tree location on the road allowance or on parkland.

The establishment of a tree inventory system should begin as soon as there are trees on public property. The tree inventory is used to identify the total number of trees, the percentage in each age/size category, the percentage of each species etc. These parameters are vital to decisions concerning the long term management of the forest (eg. if 80% of the trees are sugar maple, you may decide not to plant anymore in the next 10 years).

### **BEST MANAGEMENT PRACTICE:**

Any municipality with trees on public property should have an inventory of its trees.

The system should be computer based so it can be updated on a regular basis.

Collect the following information by property address:

- tree type by species, cultivar
- tree size(age) by stem diameter at breast height
- tree condition class (dead, poor, fair, good, excellent)
- tree location
- potential planting sites

Ensure that reports producing the following can be generated:

- total number of trees
- number of trees by species, by age class, by condition etc.

Graphic display of all of the information is highly recommended - GIS, OBM or similar

## I.S.A. ONTARIO BEST MANAGEMENT PRACTICE

# TREE WORK ORDER HISTORY

November 2000

### **BACKGROUND:**

A tree work order history system is used to track tree calls for the benefit of customer service, to monitor tree health, and to provide the municipality with accurate records for liability claims. It is usually address based and contains information about tree maintenance work, when it was performed and by whom.

A work history system should be established as soon as tree work is performed on a municipally owned tree. The work order should track the status of the tree call, customer concern, detail the work requested, work recommended, report what was done and provide the corresponding dates. It may also record labour and equipment costs associated with the work activity on each tree.

### **BEST MANAGEMENT PRACTICE:**

A tree work order history system should be established as soon as tree work is performed on a municipally owned tree.

The system should be computerized (and compatible with the tree inventory - see BMP Tree Inventory) and based on municipal address. It should include all trees on city property at each address. Park tree work orders should be based on park name and/or address.

The work order should include standard headings including:

- tree location by address or other (eg. GIS identifier)
- caller name, telephone number
- adjacent homeowner name and phone
- tree species (common name is acceptable)
- tree condition and size
- dates should include customer call date, inspection date, completion date(s)
- comments/work details should include information on site and tree condition, comprehensive tree work direction, crew type, equipment required, crew names, hours attributed to the job, and additional notes.
- all orders should be assigned a priority rating as well as a work order number
- presence of hydro and other utilities as appropriate.

The work order system must have the capability to generate reports including:

- number of outstanding orders
- number of outstanding orders in each category (eg. trim, remove, plant)
- total orders complete to date, yearly, etc.
- activity related to specific storm occurrences.

The standard procedure for a computerized system is as follows:

- call received
- caller information is entered in the computer
- printed work order is prepared
- inspection undertaken by a qualified inspector
- inspection details are noted on the order with work direction
- these details are entered in the computer
- order passed to crew who complete the work and fill out work detail section
- supervisor verifies the work and equipment and labour costs
- work order closed by entering information in the computer.

This now forms an entry in the system and a permanent record of what was done, where, when and by whom.

## I.S.A. ONTARIO BEST MANAGEMENT PRACTICE

# STREET TREE PLANTING

November 2000

### **BACKGROUND:**

The issue of tree selection and planting is of utmost importance in managing the urban forest. Planting the “right tree in the right place” is key to not only a healthy tree but also to reduced future conflicts with the many other utilities and amenities in a streetscape. Well located and selected trees significantly enhance the urban environment and create long term satisfaction for residents, neighbourhoods and communities. By minimizing conflicts, maintenance needs are reduced, public safety is enhanced and long term costs are reduced. The following recommendations have been designed to guide and encourage communities to adopt practical and sustainable tree planting programs. Planting and aftercare are equally important to the long term health of the urban forest.

### **BEST MANAGEMENT PRACTICE:**

#### **SITE EVALUATION:**

Planting sites must be carefully and fully evaluated before the decision is made to plant any tree. Always take into consideration the following factors:

- Is there sufficient soil volume and area to support a healthy tree to maturity?
- Is the soil suitable/capable of supporting a healthy tree or can it be modified sufficiently?
- Are there underground utilities in place which restrict or prevent a tree being planted?
- Is there sufficient overhead space to allow a tree canopy to develop unimpeded and without unusual pruning requirements?
- What overhead utilities prevent or restrict tree planting?
- What site lines must be maintained?
- What level of maintenance can be expected from adjacent landowners?
- Is there a potential conflict with other maintenance needs or uses of the street? (Snow loading).

#### **SPACING GUIDELINES:**

Minimum distance between trees - 10 meters.

Minimum boulevard width to accommodate a tree - 1.5 meters

Minimum distance to plant from:

- driveway - 2 meters
- streetlight - 5 meters
- stop sign - 15 meters
- fire hydrant and underground vault - 3 meters
- communication pedestals - 2 meters
- main traffic intersections - 20 meters
- secondary traffic intersections - 10 meters

### **SELECTING QUALITY TREES:**

Only select high quality nursery grown trees which conform to the Canadian Standards for Nursery Stock. This initial investment will help to ensure structurally sound, healthy and well formed trees, reducing long term maintenance needs and problems. Select only trees which have clear stems to at least 1 meter height on ornamental varieties and 1.5 meters on large growing varieties. Plant material must not be dug or collected from native stands or established woodlands.

### **SELECTING THE SPECIES:**

The increased use of native tree species is encouraged, especially in proximity to natural areas where the potential for invasion by non-native species is high. Always select for as much diversity as possible. Consideration should be given to the maintenance needs of any species and the anticipated level of maintenance available. By selecting species best suited to a site, maintenance needs are reduced, healthier trees are achieved and resident satisfaction will be higher. Refer to the Best Management Practice Recommended Street Trees. Always plant the largest tree (at maturity) that the site will accommodate since large trees make the greatest environmental contribution.

### **PLANTING SPECIFICATIONS:**

Consult the Reference Guide for Developing Planting Details, produced by Landscape Ontario, Horticultural Trades Association. This is a valuable tool for developing specifications catering to the needs of communities.

Always secure locates of underground utilities when planting trees on public land.

### **AFTER CARE:**

A 2-year guarantee is recommended on all tree planting projects. All tree planting projects should include full maintenance programs to ensure the success of transplanting and long term health of the trees. This should include identified watering cycles, mulching, weed removal and stake removal.

## REFERENCES:

Watson G.W.; E.B.Himelick: 1997: PRINCIPLES AND PRACTICE OF PLANTING TREES AND SHRUBS: Published by International Society of Arboriculture

Farrar J.L. : 1995: TREES IN CANADA: Published by Fitzhenry and Whiteside Limited.

Dirr M.A.: 1990: MANUAL OF WOODY LANDSCAPE PLANTS, IDENTIFICATION, CHARACTERISTICS, CULTURE, PROPAGATION AND USE: Stipes Publications

Gerhold H.D.: Lacasse N.L.: Willet N. : 1993: STREET TREE FACTSHEETS: Published by Pennsylvania State University.

## I.S.A. ONTARIO BEST MANAGEMENT PRACTICE

# RECOMMENDED STREET TREES

November 2000

### **BACKGROUND:**

Tree species vary in their ability to thrive in different environments. Although every tree has its place and can successfully contribute to an environment, some species are better suited as street trees.

Street trees have increased pressures or stresses than do trees planted in other locations. Stresses including reflected heat, exposure, compacted soils, drought, salt, air pollution and mechanical injuries are commonplace along the road right-of-ways and all have negative effects on tree performance.

One critical consideration in recommending trees is hardiness. There are eight hardiness zones in Ontario indicated by Agriculture and Agri Food Canada. These zones are often defined by average minimum annual temperatures. Trees survive in each zone because of their inherent tolerance to winter cold. Moving trees from one zone to another is not recommended.

Other points to consider include fruit drop, tolerance to salt and drought, inherent strength of the species and pest resistance.

Municipalities are increasingly more conscious of their liability, so features such as root structure and strength of branching are also important considerations. Evergreens and multi-stemmed trees which tend to be low branching, can impede site lines and are not recommended as street trees.

Tree form and size are considerations in determining the tree which best fits a particular site, to optimize aesthetics and reduce utility conflicts and maintenance requirements.

Finally, tree selection will be affected by availability of species. Popular species will be readily available at local nurseries. Locally grown stock is preferable.

### **BEST MANAGEMENT PRACTICE:**

The following charts have been constructed to aid in the selection of species for a given streetscape. They have been separated to include those species recommended for use as street trees and other species that warrant consideration. Species in the second category in the future might move into the

recommended list, they have been placed on this secondary list due to:

- inconsistent performance
- poor characteristics
- lack thorough industry experience
- lack of availability from nurseries

Several key areas have been identified for consideration when selecting species. These areas include:

- **Stress** - the tolerance of the species to conditions such as compacted soils, drought, road salt, insects and disease
- **Hardiness** - indicates the Canadian hardiness zones in which the species can survive
- **Time** - indicates which species are best suited to spring plant only
- **Hydro** - the suitability for installation under or in proximity to overhead energized conductors
- **Native** - identifies the species that are native to Ontario, native to other parts of North America, are not native to North America and species which are invasive
- **Form** - the general form class of the species (see illustration below)
- **Size** - the height range of the tree at maturity
- **General Comments** - indicates attributes such as leaf colour, flower and bark texture, and constraints such as pervasive fruit, maintenance, branch structure and site requirements.



**COLUMNAR**



**ROUNDED**



**SPREADING**



**VASE**



**PYRAMIDAL**



**OVAL**

The charts are best used by combining the key features in each column to arrive at a number of species best suited to the situation encountered by the user. The ratings given are meant only as a guide.

The charts have been constructed with the intention that plantings will be located in street-side lawns and landscaped boulevards, not in sidewalks, planters and paved road islands.

Further information on this subject can be found in:

- Dirr, M.A. 1990 Manual of Woody Landscape Plants
- Farrar, J.L. 1995 Trees in Canada
- Gerhold, H.D. et.al., 1989 Street Tree Fact Sheets
- Himelick, E.B. 1981 Tree & Shrub Transplanting Manual
- Poor, J.M. (Editor), 1984 Plantsd Merit Attention Vol. 1
- Rehder, A. 1940 Manual of Cultivated Trees & Shrubs
- Strenberg, G. & J. Wilson 1995 Landscaping with Native Trees
- Watson, G.W. 1992 Selecting and Planting Trees

Tree Name	Stress	Hardiness	Time	Hydro	Native	Form	Size	General Comments
Acer campestre Hedge Maple	GT/CS/DIS/ DRO/INS/ST	4-7	○	○	NN	R	S	compact form/trunk suckers require extra maintenance/yellow fall colour
Acer ginnala Amur Maple	DRO/ST	1-7	○	○	NN	O	S	compact form/red & yellow fall colour/lots of seeds/tends to sucker/specify single stem
Acer platanoides Norway Maple (cultivars)	GT/CS/DIS/ DRO/ST	2-7	○	●	NN/I	S-R	L	invades native areas/surface roots conflict with turf/girdling roots/aphid problems/dense shade
Columnar, Olmsted, Superform	GT/CS/DIS/ DRO/INS/ST	2-7	○	⊗	NN	C	L	narrow form

STRESS	TIME	HYDRO	NATIVE	FORM	SIZE
GT General Tolerance	○ Install throughout the	○ Use under most hydro	○ Native to Ontario	C Columnar	S Small (under 10 m)
CS Compacted Soil	○ season subject to	⊗ May be used in close	● Native to other	P Pyramidal	M Medium (10-15m)
DIS Disease Resistant	○ availability and suitable	○ proximity to lines	● parts of Canada/ USA	R Rounded	L Large (over 15m)
DRO Drought Resistant	○ ground conditions	● Do not use near lines	NN Not Native to	S Spreading	
INS Insect Resistant	● Spring planting only		North America	O Oval	
ST Salt Tolerance			I Invasive	V Vase	
● Poor tolerance to urban conditions					

Tree Name	Stress	Hardiness	Time	Hydro	Native	Form	Size	General Comments
Crimson King, Deborah, Schwedler	GT/CS/DRO/ INS	2-7	○	●	NN	S-R	L	dark red to green susceptible to reflected heat
Emerald Queen	GT/CS/DRO/ INS	2-7	○	●	NN/I	O-R	L	excellent upright form
Globe	GT/CS/DRO/ INS	2-7	○	○	NN	R	S	dense, formal globe habit/ tends to hide stinging insects
Acer rubrum Red Maple	GT	2-9	●	●	○	O-R	L	green summer foliage & yellow to red fall colour/ tolerates wet soil/some cultivars do not preform well in clay soils
Acer saccharum Sugar Maple	INS/●	3-7	○	●	○	O	L	upright form/fall colour varies/prefers good drainage
Amelanchier canadensis Shadblow or Serviceberry	●	3-8	●	○	○	R	S	difficult to maintain single stem/4 season interest/tolerates moist soil
Celtis occidentalis Hackberry	GT/DRO	2-8	●	●	○	O-R	L	requires pruning for witches broom and general form/good substitute for Elms/good in container situations
Corylus colurna Turkish Hazel	GT	3-6	●	●	NN	P	M	good form/difficult to transplant/winter interest
Fraxinus americana White Ash	GT/DRO/ST	2-8	○	●	○	O	L	large tree/tolerates dry soil/susceptible to die back & numerous insects
Fraxinus pennsylvanica (cultivars) Green Ash/Marshall's Seedless/Patmore/ Summit	GT/DRO/ST	2-8	○	●	○	O-R	L	most have a low branching habit/very adaptable and likes moist soil

STRESS	TIME	HYDRO	NATIVE	FORM	SIZE
GT General Tolerance	○ Install throughout the	○ Use under most hydro	○ Native to Ontario	C Columnar	S Small (under 10 m)
CS Compacted Soil	○ season subject to	⊗ May be used in close	● Native to other	P Pyramidal	M Medium (10-15m)
DIS Disease Resistant	○ availability and suitable	○ proximity to lines	● parts of Canada/ USA	R Rounded	L Large (over 15m)
DRO Drought Resistant	○ ground conditions	● Do not use near lines	NN Not Native to	S Spreading	
INS Insect Resistant	● Spring planting only		○ North America	O Oval	
ST Salt Tolerance			I Invasive	V Vase	
● Poor tolerance to urban conditions					

Tree Name	Stress	Hardiness	Time	Hydro	Native	Form	Size	General Comments
Ginkgo biloba (cultivars) Maidenhair tree	GT/DIS/INS/ ST	2-7	●	●	NN	O	L	good yellow fall colour/thin bark/male variety only
Gleditsia triacanthos var. inennis Thornless Honey locust cultivars Shademaster & Skyline	GT/DRO/ST	2-8	○	●	○	O-S	L	small leaves are difficult for home maintenance/provides a filtered shade/susceptible to defoliation
Gymnocladus dioicus Kentucky Coffeetree	GT/CS/DIS DRO/INS	3-8	●	●	○	S	L	interesting winter texture/open lawn setting/large leaves/male variety only
Malus (most) Flowering & Domestic Apple	GT/CS	2-8	○	⊗	O/NN	O-R	S	good flowers/fruit usually maintenance problems/disease & insect problems/tolerates most soils
Platanus x acerifolia London Plane Tree	GT/CS	3-7	○	●	NN	R-S	L	frost cracks on trunk/attractive peeling bark/witch's broom is a problem
Prunus (cultivars) Ornamental Cherry/Columnar/ Sargent/Kwanzan	GT	3-8	●	○	NN	S	S	excellent flowers with no fruit/single stem to be specified/weeping cankers
Pyrus (cultivars) Ornamental Pear/Aristocrat/ Capital/Chantieleer/ Redspire	GT	4-7	●	●	NN	O-R	M	good flowers/may have good fall colour/lush shiny leaves/Fireblight problems
Quercus robur English Oak	GT	2-8	●	●	NN	R	L	needs acid soil/fruit maintenance/ difficult to transplant

**STRESS**

GT General Tolerance  
CS Compacted Soil  
DIS Disease Resistant  
DRO Drought Resistant  
INS Insect Resistant  
ST Salt Tolerance

● Poor tolerance to urban conditions

**TIME**

○ Install throughout the season subject to availability and suitable ground conditions  
● Spring planting only

**HYDRO**

○ Use under most hydro  
⊗ May be used in close proximity to lines  
● Do not use near lines

**NATIVE**

○ Native to Ontario  
● Native to other parts of Canada/USA  
NN Not Native to North America  
I Invasive

**FORM**

C Columnar  
P Pyramidal  
R Rounded  
S Spreading  
O Oval  
V Vase

**SIZE**

S Small (under 10 m)  
M Medium (10-15m)  
L Large (over 15m)

Tree Name	Stress	Hardiness	Time	Hydro	Native	Form	Size	General Comments
Quercus robur 'Fastigiata' Columnar English Oak	GT	2-6	●	●	NN	C	L	needs acid soil/holds leaves through the winter/difficult to transplant/very upright in form
Quercus rubra Red Oak	GT	2-6	○	●	○	R	L	needs acid soil/fruit maintenance/difficult to transplant/no tap root
Syringa reticulata 'Ivory Silk' Ivory Silk Lilac Japanese Tree Lilac	GT	1-6	○	○	NN	R	S	good white summer flower/excellent small specimen
Tilia cordata (cultivars) Littleleaf Linden/ Glenleven/Greenspire /Greenglobe	GT	1-6	○	●	NN	P-O	L	showy & fragrant flowers/Greenglobe maybe used under hydro lines/aphid & borer problems/suckers from base/messy species

STRESS	TIME	HYDRO	NATIVE	FORM	SIZE
GT General Tolerance	○ Install throughout the season subject to availability and suitable ground conditions	○ Use under most hydro	○ Native to Ontario	C Columnar	S Small (under 10 m)
CS Compacted Soil		⊗ May be used in close proximity to lines	● Native to other parts of Canada/USA	P Pyramidal	M Medium (10-15m)
DIS Disease Resistant	● Spring planting only	● Do not use near lines	NN Not Native to North America	R Rounded	L Large (over 15m)
DRO Drought Resistant			I Invasive	S Spreading	
INS Insect Resistant				○ Oval	
ST Salt Tolerance				V Vase	
● Poor tolerance to urban conditions					

## NOTEWORTHY STREET TREES

Tree Name	Stress	Hardiness	Time	Hydro	Native	Form	Size	General Comments
Acer nigrum Black Maple	DRO/DIS/ INS	3-7	●	●	○	○	L	lots of seed for winter interest/rare/needs moist soil
Acer pseudoplatanus Sycamore Maple	GT/ST	3-6	●	●	I	S-R	L	very pollution tolerant/rare
Acer saccharinum Silver Maple	GT/DRO/CS/ ST	2-8	●	●	○	S-V	L	aggressive root system/ increased liability with age
Acer tataricum Tatarian Maple	DRO/ST	2-6	○	○	NN	○	S	good red & yellow fall colour/tends to sucker/lots of seeds
Aesculus glabra Ohio Buckeye	GT/INS/DIS	2-6	○	●	○	○	L	prefers moist soils
Aesculus hippocastanum 'Baumannii' Bauman Horsechestnut	●	3-6	●	●	NN	O-S	L	good spring flower with no seeds/rare/disease susceptible
Alnus glutinosa European Alder	GT	2-6	●	⊗	NN	R	M	showy flower & fruit/tolerant of wet & dry soil/common to pure stands
Betula (most) Birch	●	1-6	●	●	○	O-R	M	yellow fall colour/best in moist areas/lost of seeds/insect problems
Carpinus betulus 'Fastigiata'/ Fastigate European Hornbeam	●	3-6	●	●	NN	○	M	difficult to transplant/keep away from road salt & spray/oval shaped form
Celtis laevigata Sugar Hackberry	GT/DRO	4-8	●	●	●	S	L	compact form/good in moist soils

### STRESS

GT General Tolerance  
 CS Compacted Soil  
 DIS Disease Resistant  
 DRO Drought Resistant  
 INS Insect Resistant  
 ST Salt Tolerance  
 ● Poor tolerance to urban conditions

### TIME

○ Install throughout the  
 season subject to  
 availability and suitable  
 ground conditions  
 ● Spring planting only

### HYDRO

○ Use under most hydro  
 ⊗ May be used in close  
 proximity to lines  
 ● Do not use near lines

### NATIVE

○ Native to Ontario  
 ● Native to other  
 parts of Canada/  
 USA  
 NN Not Native to  
 North America  
 I Invasive

### FORM

C Columnar  
 P Pyramidal  
 R Rounded  
 S Spreading  
 ○ Oval  
 V Vase

### SIZE

S Small (under 10 m)  
 M Medium (10-15m)  
 L Large (over 15m).

Tree Name	Stress	Hardiness	Time	Hydro	Native	Form	Size	General Comments
Cercidiphyllum japonicum Katsura Tree	DIS/INS/●	3-7	●	⊗	NN	O	L	difficult to transplant/orange fall colour/thin bark
Cercis canadensis Eastern Redbud	●	3-7	○	○	○	S	S	good flower/shade tolerant/weak crotches
Cladrastis kentukea (lutea) Yellowwood	DIS/INS/●	3-7	○	●	●	O-R	M	fall yellow colour/weak branch structure/thin bark
Cornus florida Flowering Dogwood	●	4-8	○	○	○	R	S	good flower/specimen tree/red fall colour/source trees locally
Crataegus (cultivars) Hawthorns	GT	2-6	●	○	●/NN	R	S	<u>thornless &amp; disease resistant varieties only</u> . Do not plant near stands of apples or pears
Fagus grandifolia American Beech	●	2-8	●	●	○	O-R	L	sensitive to activity within root zone/leaves persist through winter/thin bark
Fagus sylvatica European Beech	●	3-6	●	●	NN	R-S	L	different leaf colours with varieties/sensitive to activity within root zone/leaves persist through winter/thin bark
Koelreuteria paniculata Golden Rain Tree	GT/DIS/DRO/INS	4-8	●	⊗	NN	S	S	good yellow flower & fruit/susceptible to winter damage/weak crotches
Laburnum (cultivars) Golden Chain Tree	GT	4-6	●	○	NN	O-S	S	yellow chain like flower/weak crotches/short lived
Liriodendron tulipifera Tulip Tree	●	3-8	●	●	○	O	L	good flowers & yellow fall colour/moist well drained soil/very large tree

STRESS	TIME	HYDRO	NATIVE	FORM	SIZE
GT General Tolerance	○ Install throughout the season subject to availability and suitable ground conditions	○ Use under most hydro	○ Native to Ontario	C Columnar	S Small (under 10 m)
CS Compacted Soil	● Spring planting only	⊗ May be used in close proximity to lines	● Native to other parts of Canada/USA	P Pyramidal	M Medium (10-15m)
DIS Disease Resistant		● Do not use near lines	NN Not Native to North America	R Rounded	L Large (over 15m)
DRO Drought Resistant			I Invasive	S Spreading	
INS Insect Resistant				O Oval	
ST Salt Tolerance				V Vase	
● Poor tolerance to urban conditions					

Tree Name	Stress	Hardiness	Time	Hydro	Native	Form	Size	General Comments
Magnolia x soulangiana Saucer Magnolia	GT	3-8	●	○	NN	S	S	good flowers low branching & spreading/scale problems
Ostrya virginiana Ironwood	●	2-8	●	⊗	○	R	S	sudden mortality problem/trunk suckers heavy wood/borer problems
Phellodendron amurense Amur Cork Tree	DIS/DRO/INS	3-6	○	⊗	NN/I	S	M	good winter texture in bark/lots of black berries
Prunus virginiana 'Shubert' Shubert Cherry	GT	2-5	●	●	○	O	M	green spring foliage & red in summer/black knot problems/upright form/bark tends to split
Quercus macrocarpa Bur Oak	GT/DRO	2-7	●	●	○	O	L	needs acid soil/fruit maintenance/difficult to transplant
Sophora japonica Japanese Pagoda Tree	GT/DRO	4-6	●	●	NN	R	S	excellent white flower/green stem when young/prolific fruit
Sorbus aucuparia European Mountain Ash	GT/CS	2-5	○	●	NN	O-R	S	small flower & orange fruit/disease & insect problems/weak bark/good in clay soils
Tilia x euchlora Crimean Linden	GT/INS	2-6	○	●	NN	R	L	showy & fragrant flowers/fruit messy/suckers from base
Ulmus carpinifolia 'Homestead' Homestead Elm	GT/CS/INS	1-8	○	●	I	V	L	aggressive species & self-pruning/can cause root problems/resistant to Dutch Elm Disease

#### STRESS

GT General Tolerance  
CS Compacted Soil  
DIS Disease Resistant  
DRO Drought Resistant  
INS Insect Resistant  
ST Salt Tolerance  
● Poor tolerance to urban conditions

#### TIME

○ Install throughout the season subject to availability and suitable ground conditions  
● Spring planting only

#### HYDRO

○ Use under most hydro  
⊗ May be used in close proximity to lines  
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#### FORM

C Columnar  
P Pyramidal  
R Rounded  
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#### SIZE

S Small (under 10 m)  
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L Large (over 15m)

## I.S.A. ONTARIO BEST MANAGEMENT PRACTICE

# STREET TREE PROTECTION

November 2000

### **BACKGROUND:**

Healthy trees are a valuable asset to any community. Mature trees have grown slowly over time and cannot be easily replaced. For these and other reasons, guidelines are required for tree protection during construction.

There are several construction activities which can affect street trees. These include development on adjacent private property, curb and sidewalk installations, paving, excavation for underground utilities, road widening and installation of above ground hydro and communication wires.

Construction damage can occur on many parts of the tree including root damage/cutting, trunk breakage, bark removal, branch scrapes and breakage, to total tree destruction. Trees which are not killed outright, often suffer extensive root decay, structural trunk damage or severe branch loss. Such trees are transformed from attractive healthy infrastructure to public hazards which reduce property value and increase municipal liability.

Preventing construction damage is essential to the health and safety of the urban forest.

Preventing construction damage requires knowing what trees need to survive and what will cause harm. Often, the lack of understanding of the biological function of a tree leads to unnecessary and irreversible damage.

Due to the variety of construction activities, complicated tree biology, and numerous types of tree damage, it is not possible to cover everything in one best management practice. There have been numerous books, pamphlets and videos produced on this topic and the reader is encouraged to consult these for full information. The following best management practice is intended to provide basic information and point out for the reader the aspects which must be explored to better protect trees from construction damage.

## **BEST MANAGEMENT PRACTICE:**

There are several steps required to facilitate tree protection as follows:

- ★ **SPECIFICATIONS:** Working with others, establish a number of specifications for working around trees, including the areas of root zone protection, trunk and branch protection, installation techniques for a variety of installations, fencing requirements, soil compaction prevention, timing of construction and so on. The specifications should include enforceable penalties for non-compliance.
  
- ★ **PLANNING**                      Involve a multidisciplinary team at the earliest stage of project development as possible.  
The team should include professionals such as the engineer, planner, arborist/forester/landscaper/landscape architect, contractor. Assess all trees, alter plans where possible, select trees to be protected, alter construction methods, and do whatever is possible to reduce the construction impact on trees.
  
- ★ **MONITOR**                        Have the arborist on site on a regular (daily) basis to monitor the construction activity. Where damage is likely to occur, halt the construction until the situation is corrected. Ensure that all protection devices are in place and that no damage occurs. Where compliance does not occur, enforce penalties within the parameters of the specifications.
  
- ★ **POST CONSTRUCTION**                      In many situations, there may be a requirement to undertake remedial work to improve tree health. These activities could include additional watering, improving soil aeration, adding fertilizer or replacing trees. Ensure that as many of these items as possible are identified prior to construction and then follow-up to ensure that the requirements are met. This may require several site visits and assessments over 2 to 5 years after the work is completed.
  
- ★ **FINAL INSPECTION**                        Ensure that the arborist is retained to undertake the final inspections. Be sure to list all of the assessment criteria prior to construction so that all parties are aware of what is going to be assessed and evaluated.

## **KEY POINTS FOR CONSIDERATION:**

### **ROOTS**

- ★ extend 2 to 5 times the drip line
- ★ the critical root zone is within the drip line
- ★ erect construction barrier fence at drip line or beyond if possible
- ★ roots are vital for tree survival and stability
- ★ the fine hair roots are totally responsible for water and nutrient uptake
- ★ 90% of the roots exist in the top 30 cm of soil
- ★ maximum loss of 25% is tolerable
- ★ must not be exposed to air for more than a few minutes or will die - keep wet with burlap or cover with soil and water regularly
- ★ can be killed by soil compaction - protect by adding a 25 cm layer of wood chips and later removing
- ★ can be protected using directional drilling at about 1 meter - do not open trench
- ★ do not alter the grade by removing or adding soil - this alters soil air space and kills fine roots
- ★ should be cut clean (if necessary) to promote regrowth and prevent tearing
- ★ will die if chemicals including oil, hydraulic fluid, gas are dumped
- ★ no construction, equipment or material should be inside a fence erected prior to construction, at the dripline of each tree

### **STEMS or TRUNKS**

- ★ support the tree in the upright position
- ★ conduct water and nutrients in the tissue just under the bark
- ★ bark tearing will allow decay to enter - do not break or tear bark
- ★ grow taller and bigger around with an annual ring each year
- ★ can be protected against damage by banding boards in a vertical direction during construction
- ★ removing the bark all around the trunk will kill a tree - do not girdle the trunk

### **BRANCHES**

- ★ support the leaves which make food for the tree
- ★ can be pruned at the branch collar - use the three cut system and 3:1 ratio rule
- ★ do not remove more than 25% of the live leaf surface area
- ★ do not tear bark off of the branches - this promotes decay
- ★ leave the tree with a "balanced" crown
- ★ select appropriately sized construction equipment to reduce negative impacts on trees
- ★ redirect exhaust stacks to prevent leaf burn and chemical damage

## I.S.A. ONTARIO BEST MANAGEMENT PRACTICE

# PRUNING CYCLE AND STANDARD

November 2000

### **BACKGROUND:**

Municipal arborists and urban foresters work with a challenging set of circumstances relating to the pruning of municipally owned trees.

Trees are situated in a variety of locations from very congested and busy roadways to open areas in parklands to along nature trails deep in wooded ravines.

These trees are of all ages and a wide variety of species, growth rates and growth habit.

This pruning cycle and standard is to be instituted in concert with the BMP- Tree Inspection Cycle.

Generally, trees are pruned for the following reasons:

- safety concerns
- maintenance of legislated clearances
- property owner requests
- tree health and vitality
- disease control

Individual tree pruning requirements may include:

- structural training
- clearance for pedestrian and vehicular traffic
- visibility clearance for stop signs, traffic signals and bus stops
- clearance from buildings
- removal of deadwood
- removal or shortening of long hazardous limbs
- crown thinning for tree health or to improve sunlight penetration
- crown balancing to correct for storm damage
- crown reduction when overall size is considered problematic
- clearance from hydro and other utilities

Property owner requests often dominate the number of pruning jobs performed and also greatly influence the scheduling of work.

This may create a situation where young trees are not pruned early enough (creating problems later). The lack of a systematic pruning schedule leads to some trees being pruned too often while others are

not being pruned.

This tends to be inefficient, unfair and potentially creates municipal liability due to "neglected trees".

## **BEST MANAGEMENT PRACTICE:**

To properly maintain the municipally owned portion of the urban forest, a planned program of pruning should be undertaken.

All trees on the road allowance and in parklands must be included.

### **A) PRUNING CYCLE: (see BMP - Tree Inspection Cycle)**

The pruning cycle is intimately connected with and dictated by the tree inspection cycle. Trees should be pruned as soon as possible after inspection and preferably not to exceed 12 months after inspection.

### **B) PRUNING STANDARD:**

All municipal trees should receive the following Standard Pruning on the cycle mentioned above.

One must recognize the location, vigor, growth habit and maturity of trees when making decisions about pruning. Young trees will require a modified approach until they are mature but they should receive the following levels of pruning over time. Pruning is to follow the Tree Pruning Principles as illustrated in the following.

#### **STANDARD PRUNING:**

- a) Remove all dead, dying, diseased, decayed, interfering, noticeably weak or crowded branches. "Crown thinning" once associated with Standard Pruning is not recommended for large street trees.
- b) Crown raising is the removal of lower branches and suckers to maintain minimum clearances as follows:
  - 4 meters over curb and street
  - 2 meters over sidewalk and lawns
  - All other necessary clearances from driveways, roves, signs, lights and other fixed objects or structures
- c) Clear stop signs:
  - Minimum 30 meters clear view from a car approaching the sign in the right lane.
- d) Clear traffic signals:
  - Minimum 30 meters clear view from a car approaching the signal in the right lane.
- e) Provide necessary or prescribed clearances from above ground un insulated utility conductors as follows:
  - 1 meter from house service

1.5 meter from secondary service  
2 meters from primary service

f) Report any defects not identified on service order to the supervisor.

N.B. In any case where a service order clearly requests Standard Pruning, all of the above will be completed in accordance with recognized arboriculture standards.

#### NON-STANDARD PRUNING:

a) Reduce Weight

- often related to individual limbs
- elimination of major limb wood in the crown and retention of smaller diameter branches. Used to reduce a potential hazard.

b) Thin (also known as crown thinning)

- removal of selected limbs throughout the crown in a balanced fashion. This thinning operation should not be limited to removal of large limbs off the main stem(s) but should extend to include thinning of small branches at the outer canopy. This technique is most commonly used to re-establish natural form after previous topping and pollarding and may also be applied to old fruit trees and large shade trees with abnormally dense crowns.

c) Reduce crown (also known as crown reduction)

- overall reduction of the trees crown size. Used when there is a conflict involving the tree size.
- drop crotch technique is used.

d) Balance crown

- used when one or more limbs protrude past the normal crown shape or where due to storm damage or other reasons, the crown is heavy on one side and requires re-balancing.
- drop crotch technique is used.

e) Deadwood only

- Used occasionally when it is desirable to retain all live growth or when only individual limbs have dieback and create a hazard.

f) Raise (also known as crown elevation)

- remove or shorten lower limbs to eliminate hazards, provide desired clearance for pedestrian or vehicle traffic or to permit entry of direct sunlight.

g) Clearances

- performed on large trees where limbs hang low or rub any part of a dwelling, structure or its immediate attachments.

- clearance is approximately 3 to 4 meters depending on species, tree age and pruning cycle.

N.B. Non -standard pruning will NOT generally be used to meet the following objectives:

- to improve scenic views

- to obtain light to swimming pools, patios etc.

- to obtain uninterrupted path for signals to satellite dish

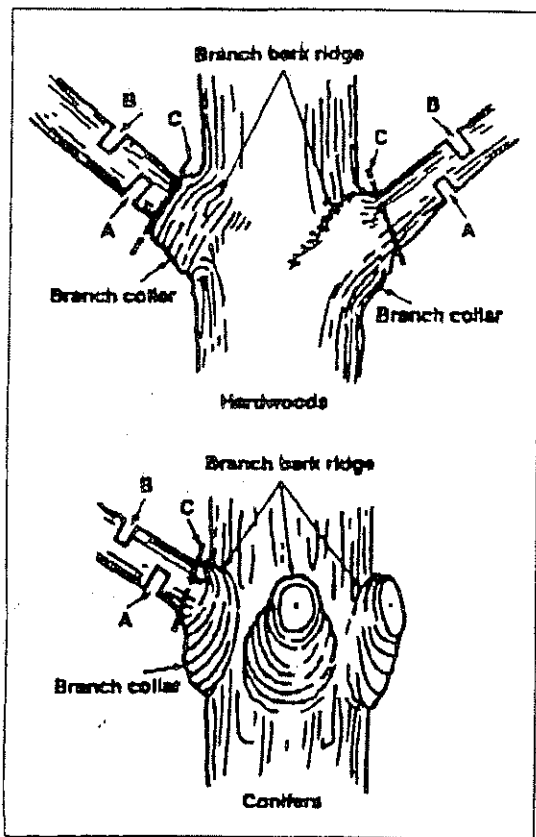
- to "produce sunlight" (no amount of pruning will provide enough sunlight to the lawn beneath without adversely affecting the health of the tree being pruned).

#### HAZARD / EMERGENCY PRUNING:

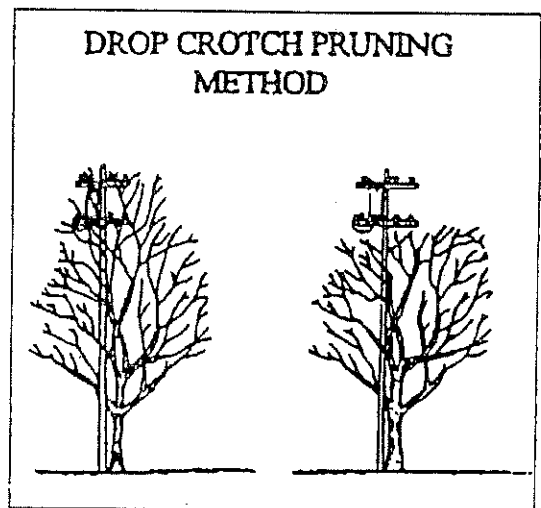
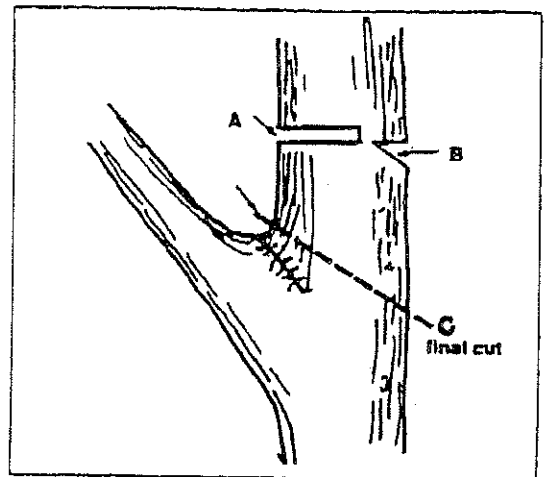
Hazard pruning is not generally recommended as a stand alone approach since it is a minimal approach and does not satisfy good arboriculture practice. However, it does eliminate immediate hazards.

In a hazard prune, one or more of the seven categories in Non-standard pruning are combined to achieve the minimum immediate required results.

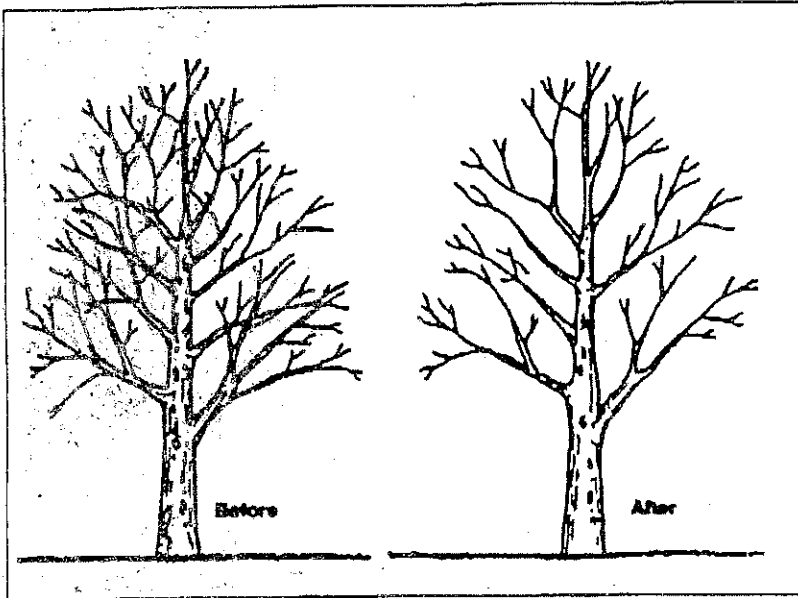
For example, remove hanger, remove deadwood, provide clearances.



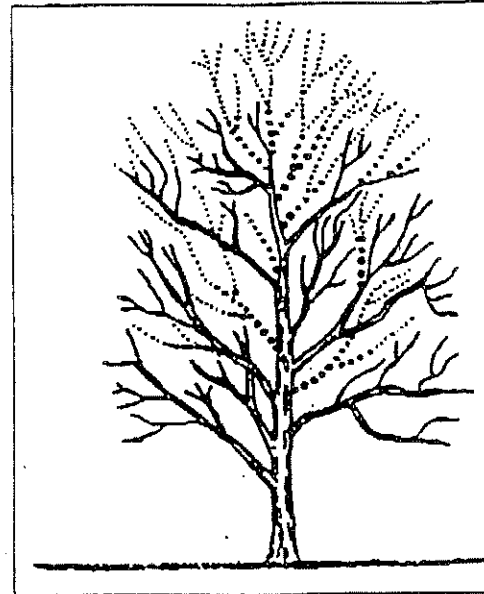
**TREE PRUNING PRINCIPLES \***  
 (a) is first cut, (b) is second cut  
 (removes branch), (c) is final cut



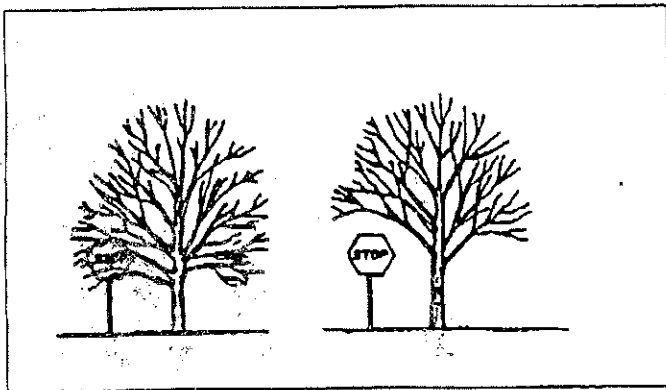
**DROP CROTCH PRUNING**  
 (example)



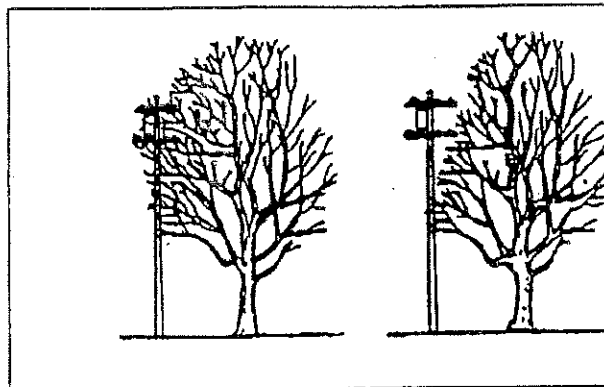
CROWN THINNING



HEIGHT REDUCTION



CROWN RAISING/ELEVATING



SIDE PRUNING