(797) *Ptelea trifoliate*, Hop Tree

A native Carolinian species that is seldom seen in cultivation. It can grow to a height of just 3 m and is often as broad. Covered with umbels of white flowers in May it is quite attractive in bloom and should warrant greater use in the landscape. Clusters of discs (seeds) hang from the tree for sometime after flowering and often persist into the winter months also adding a distinct element to the winter landscape. With pruning in its juvenile form it can be a suitable addition to the small garden. It grows along the Lake Erie shoreline and is tolerant of very dry, exposed conditions.
(FORM AND LEAVES SHOWN BELOW)

315 *Pyrus calleryana* 'Chanticleer', Chanticleer Pear

A tree that has gained tremendous popularity in recent years, all the Pyrus calleryana cultivars are excellent choices for today's smaller, contemporary landscapes. Somewhat pyramidal in form, it is covered with shiny green leaves for the entire year, which at the onset of autumn begin to develop their intense colourful coat of yellow, orange and red. In flower the tree is also spectacular, being embraced in a delicate coat of white; unfortunately the flowering period is brief. Suited to a variety of conditions the tree has seen popular use as a street tree, it will reach a mature height of 10 m.
(FORM AND LEAVES SHOWN BELOW)

321 *Quercus alba*, White Oak

A native to the London area the White Oak is considered a very valuable lumber tree with the wood often used for barns and fences. Reaching heights in excess of 25 m is a large tree that needs room to grow and will produce a tall rounded specimen. Of limited use in the landscape since there are many more attractive species of Quercus available to us. (FORM AND LEAVES SHOWN BELOW)

322 *Quercus coccinea*, Scarlet Oak

A broadly pyramidal tree 15 m in height, Q. coccinea has one of the most intense red autumn colours of all the Oak species that can be grown in Southern Ontario. Suitable for large-scale landscapes, the typical oak like leaves are glossy green and remain blemish free for most of the season.
(FORM AND LEAVES SHOWN BELOW)

323 *Quercus imbricaria*, Shingle Oak

An unusual Oak in that the leaves are entire and lanceolate. Glossy green and persisting into the winter months they add both a brown winter colour to the landscape and sound as the winds rustle them. A broad spreading tree with horizontal branching habit it is broadly pyramidal and can reach a height of 20 m. Full sun and well-drained soils produce a specimen that is dense and suitable for screening since it is often low branched. (FORM AND LEAVES SHOWN BELOW)

324 *Quercus macrocarpa*, Burr Oak

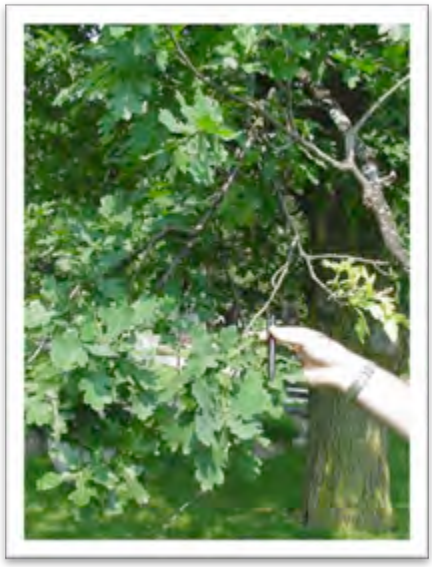
A common native species that is of value as a lumber tree. It has little landscape value since its coarse structure and rough leaves have little to contribute to the designed landscape. Reaching a height of over 25 m, it is somewhat majestic in its native environments and is one of the few Oaks to tolerate heavy, periodically wet soils. (FORM AND LEAVES SHOWN BELOW)

(831) *Quercus prinus*, Chestnut Oak

An unusual, relatively rare species that I have only seen a few selected specimens of and then only in cultivation. A very majestic tree, with untypical oak leaves, more closely resembling the American chestnut than an Oak. It can reach an enormous height of 30 m and above, thus is suited to the park or commercial landscape. (FORM AND LEAVES SHOWN BELOW)

326 *Quercus robur*, English Oak

Famous to Sherwood Forest and Robin Hood the English Oak does not achieve the stature that it does in England. A broad canopied tree with almost horizontal branching habit it can reach a height of 20 m in Ontario. Suitable for lean, dry type soils it is best suited to park and commercial use. It will occasionally experience aphid and sooty mold problems as well as inter-venial chlorosis stemming from associated soil pH problems. (FORM AND LEAVES SHOWN BELOW)



326 *Quercus robur 'Fastigiata'*, Columnar English Oak

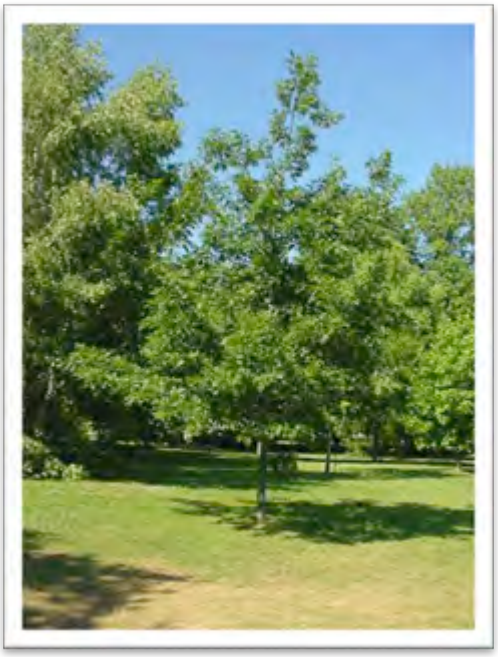
A popular tree in the landscape because of its upright form. There seems to be quite a variation between forms of the species and I believe this stems from the fact that some are propagated from seed while other more desirable forms are cloned or grafted. It can reach a height of about 10 m. In Ontario and is tolerant of a wide variety of site conditions from partial shade to full sun and dry lean soils to good garden soils. Used often as a vertical accent against buildings the exceptional specimens are densely branched and retain their 'paper brown coloured' leaves into the winter months. It will occasionally experience aphid and sooty mold problems as well as inter-venial chlorosis stemming from associated soil pH problems. (FORM AND LEAVES SHOWN BELOW)

328 *Quercus rubra*, Red Oak

A native plant of exceptional character, turning a bright red in autumn and often retaining its leaves into the winter months. It is an upland species found in climax forests along screen and sandy ridges. It can reach a height of 20 m and is often used in park and commercial landscape developments. Leaves remain clean throughout the season and it seems tolerant of minor urban conditions. Its broadly pyramidal form in late autumn colour can be a striking accent in the large landscape.
(FORM AND LEAVES SHOWN BELOW)

(829) *Quercus shumardii*, Shumard Oak

An unusually rare Oak in Southern Ontario, the Shumard oak is similar in character to the White Oak. (FORM AND LEAVES SHOWN BELOW)



(839) *Rhamnus cathartica*, Common Buckthorn

A common introduced pest found in flood plains and forest edge areas. Its black fruit is quite striking against the dark shinny leaves, however it tends to seed its self quite readily. It should not be used in the landscape. (FORM AND LEAVES SHOWN BELOW)

339 *Rhodotypos scandens*, Black Jetbead

An uncommon shrub from China, Jetbead is a subtle charmer know for its delicate white flowers and black seeds. It may reach a height of 3 m and tolerates partial shade to full sun. Its foliage is a light green colour, which can appear very refreshing in the summer border.
(FORM AND LEAVES SHOWN BELOW)

343 *Rhus typhina*, Staghorn Sumac

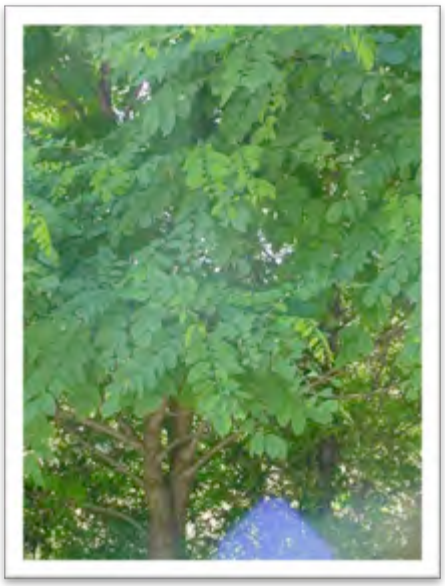
A native tree/shrub that can attain a height of 5 m. R. typhina is common throughout Southern Ontario often found on dry upland areas. It is often grown in cultivation for its ability to spread by underground rhizomes hence its suitability for bank stabilization. Coupled with its tolerance to pollution and especially salt it is often used alongside highways. In the home landscape attractive plants can be maintained by the removal of sprouts and growing the plant as a single stem rather than a colony. Young twigs are tomentose, much resembling the velvet on deer antlers. It produces a red pyramidal fruit cluster that is preceded by a 10-20 cm panicle of creamy white flowers. Autumn colour is often deep red, one of the most intense fall colours I have seen. (FORM AND LEAVES SHOWN BELOW)

344 *Ribes odoratum*, Clove Currant

A popular plant for hedging, this can also prove to be an interesting shrub if grown in the border. It can reach a height of 1m and produces clusters of lemon yellow flowers in June.
(FORM AND LEAVES SHOWN BELOW)

346 *Robinia pseudoacacia*, Black Locust

This tree gained popularity in Europe because of its large panicles of white blooms, which are quite pendulous. It has not received great standing in its native country, Canada, but should be considered. It is found in upland areas and tolerates dry sites. It is prone to borer and miner and its has weak brittle wood. However, it is quite stunning in bloom and should be given more consideration in the Canadian Landscape where it can be placed toward the back of properties. (FORM AND LEAVES SHOWN BELOW)



352 *Salix alba 'Tristis'*, Weeping Willow

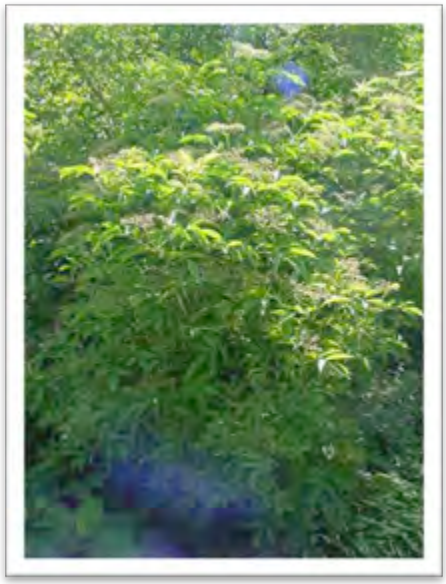
A favourite of designed streamside plantings the Golden Weeping Willow is a very majestic, broad canopied tree that can reach a height of 20 m. It is a very fast growing species that has a voracious appetite for water; roots have been known to clog water and septic lines. Since it is a fast growing species it is also weak wooded and as such causes constant litter problems and is very problematic during winter storms.

355 *Salix matsudana 'Tortuosa'*, Corkscrew Willow

A very unusual tree where all the young branches grow with a spiral twist to them and often the trunk is covered with large burrs. Typical willow characteristics, long thin leaves, yellow twigs and fast growth make this a candidate suitable for park side and commercial plantings. It is a messy, weak-wood tree prone to extensive liter and storm damage and is short lived. It can reach a height of 15 m.
(FORM AND LEAVES SHOWN BELOW)

356 *Sambucus canadensis,* Common Elder

A common landscape shrub that is often used as filler in the borders. If left unpruned it may reach a height of some 3 m. Its large cymes of white flowers in early summer are followed by clusters of dark black berries, suitable for pies, jams and wines etc. Several cultivars enhance its appeal to the horticulturist and designer alike, 'Lutea' a yellow foliaged cultivar and 'Nigresecns' a black leafed cultivar are very useful, especially if coppiced annually to reduce their height.
(FORM AND LEAVES SHOWN BELOW)



365 *Sophora japonica*, Scholar-Tree

An unusual tree in flower, large, white, pendulous panicles cover the entire tree in late spring. Considered a majestic tree, it can reach a height of over 20 m and to its credit, it needs room to grow and flourish. It prefers well-drained soils and in our climate a somewhat protected location. Uncommon in the Ontario landscapes it will seldom reach the mature heights I have stated and consequently could be used in almost any residential landscape or park setting. (FORM AND LEAVES SHOWN BELOW)

367 *Sorbaria sorbifolia*, Ural False Spirea

A popular plant for mass planting because of it's vigorous underground rhizomes. It will colonise large areas fairy quickly and remains controllable in areas of dry shade. It should be pruned to the ground every several years to retain the uniformity of the plantings. Its white plumes are attractive in July and are suitable for dried arrangements. I have had to remove this plant from gardens with fertile soils with the aid of a backhoe. It may reach a height of 2 m. (FORM AND LEAVES SHOWN BELOW)

369 *Sorbus americana*, American Mountain Ash

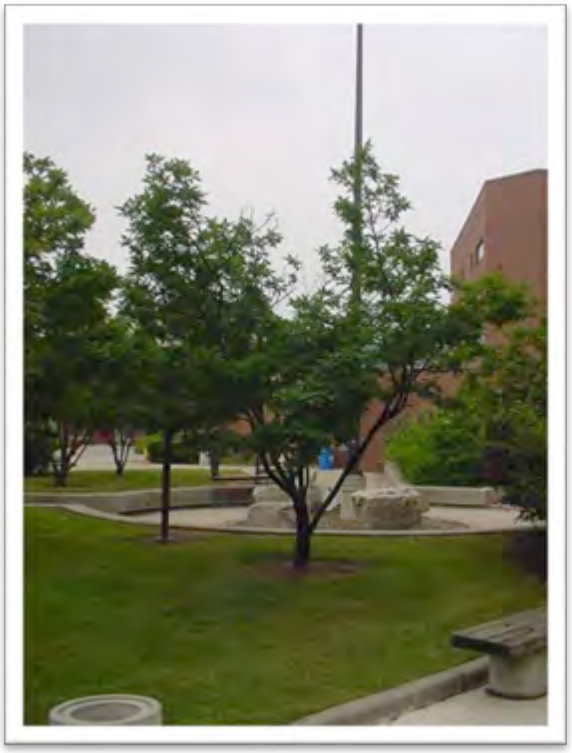
A native Sorbus that is often multi-stemmed and can attain a height of 5 m. It is often found growing on poor soils in open areas where it is stunted or on moist bog and swamp areas and is considered of marginal landscape value. It produces large cymes of creamy white flowers in June/July, which results in orange to red berries. Foliage has an intense yellow colour in autumn.
(FORM AND LEAVES SHOWN BELOW)

370 *Sorbus aucuparia*, European Mountain Ash

A very popular tree for the residential landscape. This tree flowers with large white panicles of blooms in late spring; these are followed by clusters of orange fruit that persist for the remainder of the season. It has smooth bark and can reach a heights of 6 m. It may be susceptible to Sawfly and Borer infestations. It prefers full sun in well-drained soils. (FORM, LEAVES/FLOWER SHOWN BELOW)

Sorbus sorbifolia, Swedish Mountainash

An unusual species of Mountain Ash seldom seen in cultivation since it is often superceded by its cousin S. acuparia. S. sorbifolia is a rounded formed tree that reaches a mature height of 7 m and distinguishes itself from S. acuparia in that its leaves are entire and not compound. They are deeply dissected giving the tree a more solid appearance than its cousins. It has similar flowers to other species and similar sitting requirements. (FORM, LEAVES/BERRIES SHOWN BELOW)



372 *Spiraea X bumalda 'Goldflame'*, Goldflame Spiraea

Once again one of those very popular plants that you find in the worst designed landscapes. There is no such thing as a bad plant just bad use and this plant has experienced plenty of it. It can be attractive in mixed plantings because of its orange tipped gold foliage. Mature plants grown in full sun can reach .5 m in height. (FORM, LEAVES/FLOWERS SHOWN BELOW)

372 *Spiraea X bumalda 'Anthony Waterer'*, Anthony Waterer Spiraea

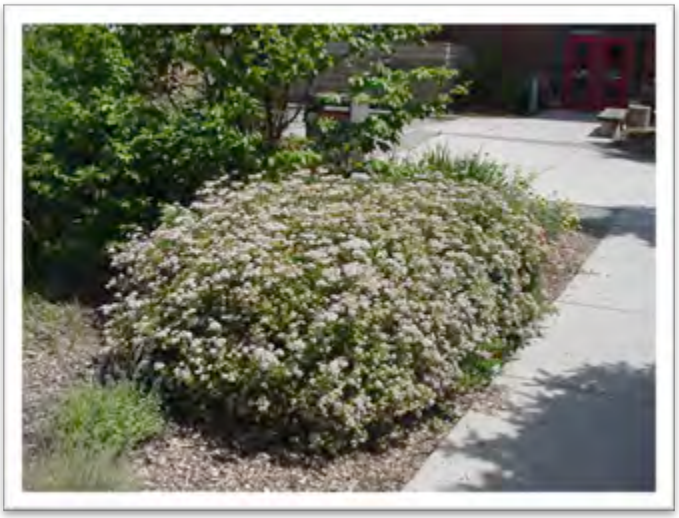
A popular shrub that is often used in mass planting because of its large pink flower inflorescences that appears in late June and continue for about a month. A large shrub that may reach 1m across and 75 cm in height it is suited to full sun and well drained soil. (FORM, LEAVES/FLOWERS SHOWN BELOW)

376 *Spiraea X vanhouttei*, Bridalwreath Spiraea

An old standby that has seen declining use most likely due to its size. S. vanhouttei will reach a height of 2 m and 1.5 m across. It is beautiful in flower in late May when it is covered in creamy white cymes that coat the entire plant. After flowering it has little presence in the landscape and appears as a drab green mass. (FORM AND LEAVES SHOWN BELOW)

373 *Spiraea japonica 'Little Princess'*, Little Princess Spirea

Not as popular as Goldflame but an ideal plant as a specimen or accent plant. It can, because of its size be used in pseudo rockgardens. Unlike Goldflame it is grown for its delicate green foliage topped with pink blooms in late spring. It may reach a height of 20 cm. (FORM AND LEAVES SHOWN BELOW)



(959) *Spiraea X japonica 'Goldmound'*, Goldmound Spiraea

More popular than 'Golflame' again it has experienced poor use in the landscape. A suitable plant for mass planting in full sun where it's yellow foliage will shine for most of the season. 5 m in height. (FORM, LEAVES/FLOWER SHOWN BELOW)

374 *Spiraea nipponica 'Snowmound'*, Snowmound Spirea

A personal favourite that is beginning to fall from favour because it seems to have developed a habit of twig dieback in recent years. It produces long arching branches that are masked in delicate white blooms in late spring. It may be used as informal hedge. As an element to tie parts of the landscape together or as an accent plant in the spring. 1.5 m in height. (FORM AND FLOWER SHOWN BELOW)

377 *Stephanandra incisa 'Crispa'*, Cutleaf Stephanandra

An edging plant, Stephanandra seldom exceeds 40 cm. The small, lime-green, deeply dissected leaves cover the entire plant and are held on cinnamon brown, pendulous branches. It produces delicate white flowers and en masse can be quite attractive although somewhat ephemeral in nature. Full sun and good soils are required however I have seen it grown with some success in partial dry shade.
(FORM AND LEAVES SHOWN BELOW)

384 *Symphoricarpos X chenaultii*, Coralberry

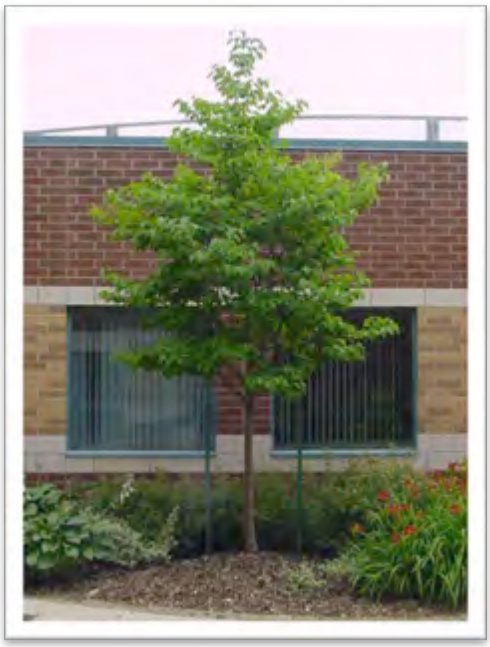
Used as a mass planting, snowberry produces large clusters of attractive white berries in mid-summer, these usually persist for some time on the 1 m tall plants. The plants need regular grooming to keep them compact and can be used as a groundcover in partial dry shade.

(983) *Syringa patula 'Miss Kim'*, Miss Kim Lilac

A soorly underrated and underused lilac reaching a height of 75-100 cm. Miss Kim maintains a dense polite habit that endears it to be planted close to the door where the full fragrance may be appreciated while in bloom. Panicles are typical lilac panicles, however they are a little smaller than the French hybrids. The shiny obovate leaves personify its refined behavior throughout the rest of the season. This plant will tolerate poor soil and hot dry conditions once established.
(FORM AND FLOWER SHOWN BELOW)

390 *Syringa reticulata*, Japanese Tree Lilac

A very popular tree when in flower in late June or Early July, the 6 m tall trees are covered in very airy, light cream panicles, its flowers for several weeks with the entire tree covered in bloom. In seems pollution tolerant and is often used in urban environments, however it will never develop a large canopy because of its relatively small stature. It has a broadly obovate canopy and is used too great effect in alee's lining paths and sidewalks. It has a somewhat unpleasant scent when in flower.
(FORM AND LEAVES SHOWN BELOW)



391 *Syringa vulgaris*, Common Lilac

A shrub that everyone should be familiar with, the common lilac is a fragrant plant in the spring garden. Recent hybridisation has seen improvement in colours and flower structure with an endless variety seen in the French hybrids. A plant that will survive for generations in the garden and can be developed into a very architectural plant with careful pruning. Can reach heights of 4 m.
(FORM AND LEAVES SHOWN BELOW)

402 *Tilia americana*, Basswood

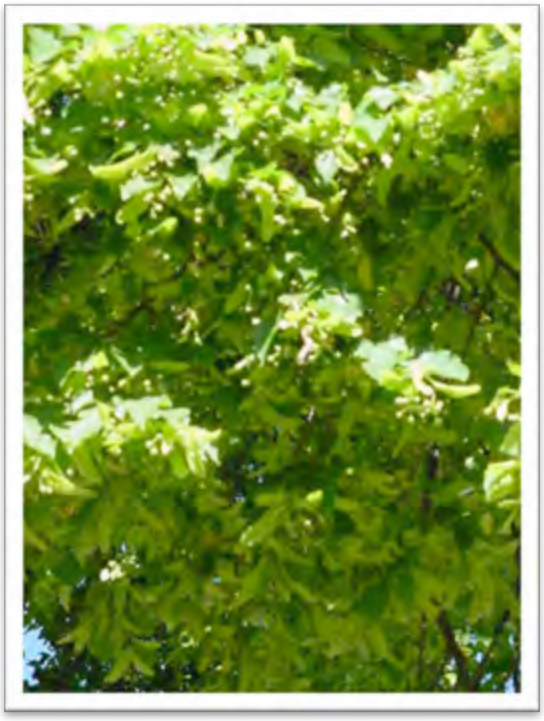
A common tree found along rural hedgerows. It is relatively fast growing and produces softwood that is often used in high school shop projects. Of little use in the designed landscape in can reach a height of 20 m. And is usually found as a multi-stemmed tree. (FORM AND LEAVES SHOWN BELOW)

403 *Tilia cordata*, Little Leaf Linden

A popular street tree for its tolerance to urban situations and its compact form. It can reach heights of 8 m. It does flower and although the flowers are quite small they are produced en masse and can be quite fragrant and attractive. It is a favourite of bees when in full bloom.
(FORM, LEAVES/FLOWER SHOWN BELOW)

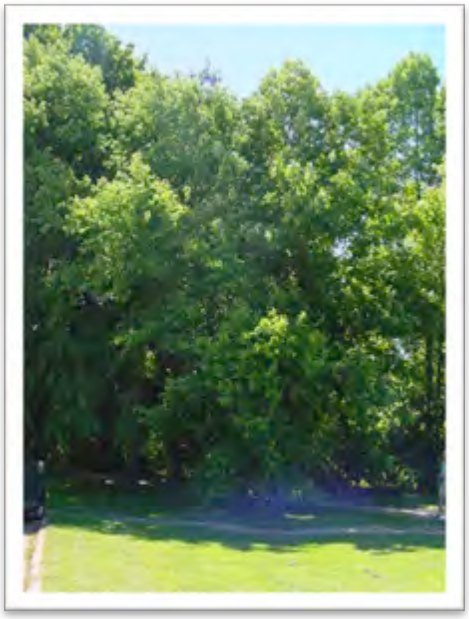
404 *Tilia X europaea*, European Linden

A large version of the Tilia reaching 30 m in height. Often used in the early part of the 19th century as a park tree is has a defined pyramidal form. Not pollution tolerant this species is not commonly used in residential landscaping. (FORM AND LEAVES SHOWN BELOW)



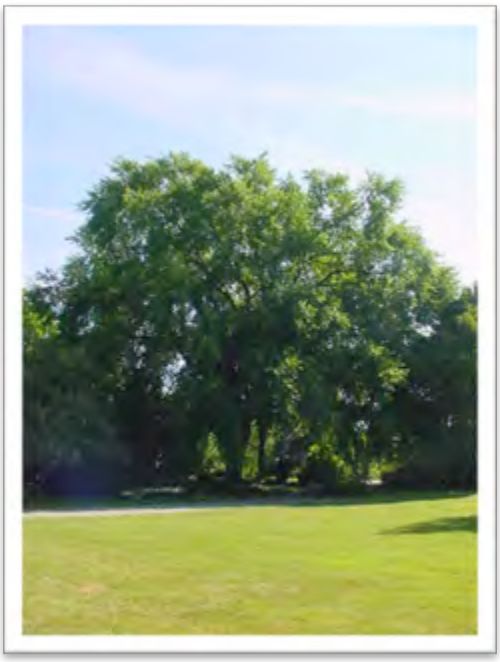
406 *Tilia tomentosa*, Silver Linden

Of European origin T. tomentosa can reach a height of 20 m or more and is best suited to park and commercial use where its full somewhat pyramidal form is appreciated. T. tomentosa has a distinct silvery underside to its leaves, hence its name. It is not a very tolerant urban species and can suffer from aphid infestations and leaf gall problems, which almost all Tilia are prone to in our Ontario climate. (FORM AND LEAVES SHOWN BELOW)



409 *Ulmus americana*, American Elm

Once a common tree in the landscape it has succumbed to Dutch Elm Disease spread by the Elm Bark Beetle. Trees now observed are often infected with the disease and as a result are often short-lived. There are a few resistant trees in the province and with their weeping high-branched canopy and are quite majestic. 18 m. (FORM AND LEAVES SHOWN BELOW)

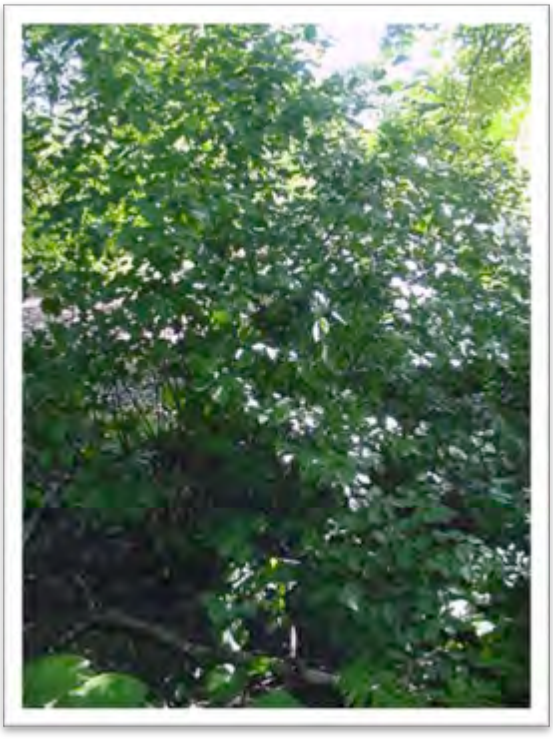


420 *Viburnum carlessii*, Korean Spice Viburnum

A favourite viburnum that is well behaved. It maintains a dense, compact, globular form and produces deeply fragrant blooms hinting of spice in late spring. A suitable plant to place near an entrance or patio edge. Reaches a height of 1.5 m. (FORM AND FLOWERS SHOWN BELOW)

420 *Viburnum dentatum*, Arrowwood Viburnum

A shrub often used for screening, under planting and mass planting being very utilitarian in nature. This native shrub can reach a height of 2 m and is suitable for shade and full sun. It will flower in late summer, (July-August), however given the wide variety of floriferous Viburnums available this plant is a second rate choice for bloom. (FORM AND LEAVES SHOWN BELOW)



424 *Viburnum lantana 'Mohican'*, Mohican Viburnum

Mohican can reach a height of 5 m and is a selection that is grown for its compact form, dark green glossy leaves and fruit that turn an orange red in July. Its creamy white flowers make a nominal show in May. It's strong from and foliage/fruit suggest inclusion in the landscape. I have used it in mixed shrub borders as a backdrop and appreciate its solid form as a contribution to 'bones' of the garden. (LEAVES/FLOWER SHOWN BELOW)

425 *Viburnum opulus*, European Highbush Cranberry

An old standby not found in common use. This single flowered plant produces cymes of white blooms in late spring. These are followed by bright red berries that persist into the winter; an excellent contrast against winter snows. It thrives in partial shade to full sun and will reach a height of 3 m. As of late it may become infected with the Viburnum Beetle.

425 *Viburnum opulus 'Compactum'*, Compact European Cranberrybush

Not at all floriferous this cultivar is often grown for its attractive maple like leaves, its rounded, dense form and its autumn's colour of yellow to shades of red. It will flower but the flowers are sporadic and are not worthy of note. Its habit permits its use as a hedging material either in a clipped form or unclipped where it will take on a mounding character. It can reach a height of 1.5 m in ideal locations of full sun and good garden soil with adequate moisture. (FORM AND LEAVES SHOWN BELOW)

427 *Viburnum plicatum var. tomentosum,* Doublefile Viburnum

A striking specimen in full flower in late May/June it can reach a height of about 3 m. It does not tolerate summer drought and can be used as an accent or mass-planting specimen in the landscape. Its red/purple autumn colour is quite attractive.

427 *Viburnum plicatum var. tomentosum* 'Shasta', Shasta Doulbefile Viburnum

A spectacular shrub at maturity where the branches begin to take on a layered effect and in flower the blooms are held in arrangement on the branches. It is a broad spreading shrub and is often as tall as is wide, commonly reaching a height of 3-5 m. Full sun to partial shade and room to showcase its spectacular form are necessary. A class plant that deserves more frequent inclusion in the garden. (FORM AND LEAVES SHOWN BELOW)

435 *Viburnum trilobum*, American Cranberry

A common back of he border shrub that can reach a height of 3 m. It' s small lobed maple like leaves are supplanted by large cymes of white blooms in late spring. Berries are late and orange-red and will persist into the winter months as most birds find them undesirable. (FORM SHOWN BELOW)

435 *Viburnum trilobum 'Bailey Compact'*, Bailey Compact Vibrunum

A compact form that reaches a height of 2 m. Large cymes of white in mid may are followed by clusters of berries that evolve from soft orange to bright red. Not a favourite of wildlife, the berries often remain into the winter months where they contrast against a backdrop of fresh snow. Partial shade to full sun in moist rich soil. (LEAVES SHOWN BELOW)

435 *Viburnum trilobum 'Compactum'*, Dwarf Cranberry

This low mounding, irregular shaped form produces clusters of white flowers in may followed by red berries. It requires moist rich soils to reach a height of 1.5 m

(1094) *Weigela florida 'Bristol Ruby'*, Bristol Ruby Weigela

A popular robust, summer flowering shrub with dark green leaves. Bristol Ruby has ruby like flowers that may attract hummingbirds. It's robust form and dark green leaves make this a shrub for the border. It can reach a height of 2.5 m and form a rounded globe. (FORM AND FLOWER SHOWN BELOW)

438 *Weigela florida, 'Minuet'*, Dwarf Purple Leaf Weigela

A dwarf form of Weigela that grows to about 50 cm, grown primarily for its purple foliage it is not very floriferous and is best used as a mass planting in urban and commercial situations. Requires full sun and good soils. (FORM AND LEAVES SHOWN BELOW)

(1094) *Weigela florida 'Variegata'*, Variegated Weigela

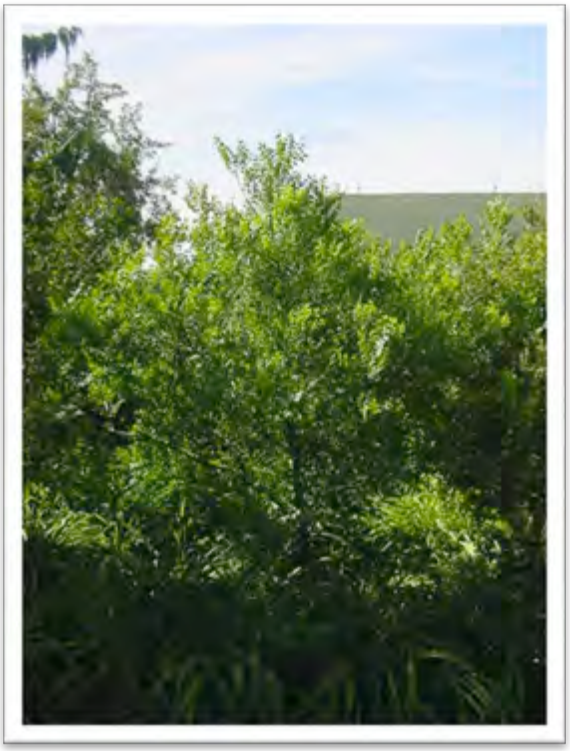
A variegated form that has longer seasonal interest than Bristol Ruby because of its variegated leaves. It produces light pink blooms but is not quite as floriferous as Bristol Ruby.

439 *Wisteria sinensis*, Chinese Wisteria

One of the most romantic of vines, the large pendulous racemes of white flowers can be up to 20 cm in length. It needs a sturdy support as often the trunk of this vine can reach a diameter of 40 cm. It has compound leaves and an extremely vigorous growth rate that will require the vine being pruned several time a season. (FORM, LEAVES AND FLOWERS SHOWN BELOW)

440 *Xanthoceras sorbifolium*, Yellowhorn

A rare and unusual shrub from China. It produces large clusters of white flowers in late spring, often followed by unusually large fruit the size of a golf ball. It has an ungainly form reaching 2.5 m in height and should be grown more as a horticultural oddity than a valuable landscape specimen plant.
(FORM AND LEAVES SHOWN BELOW)



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Factsheet

Fertilizing Trees and Shrubs in the Landscape

(Reprinted June, 1988)

G.P. Lumis, Department of Horticultural Science, University of Guelph

Reasons for Fertilizing In our man-made landscapes and altered environment, mineral nutrients are often not present in adequate supply for optimum growth of trees and shrubs. Most woody plants in residential, municipal and industrial areas benefit from the addition of fertilizer. Often our urban environment alters the ability of trees and shrubs to obtain the proper amount of nutrients. The vegetation and topsoil are often removed, the subsoil becomes compacted by heavy equipment, and when construction is completed, a layer of topsoil is replaced. Such a site usually requires special planting techniques as well as fertilizer to ensure proper growth of trees.

Advantages of Fertilizing A tree that is growing vigorously is less susceptible to severe injury by certain disease and insect pests that is a less vigorous one. Canker-causing fungi are often more common on trees which are growing poorly. Liberal applications of fertilizer high in nitrogen may help maples with mild cases of Verticillium wilt.

Another advantage of proper fertilization is to aid the establishment and growth of a recently planted tree or shrub. Root growth will increase water and nutrient uptake which will in turn provide more raw materials for photosynthesis. In soils which are low in mineral nutrients, fertilizer is a valuable asset to the proper development of woody plants.

Fertilizers also help to overcome nutrient deficiencies. Plants which are lacking in nitrogen, iron and certain other elements have deficiency symptoms which are evident as a chlorotic appearance of the leaves. The application of fertilizer can often correct the problem. There are causes of yellowing of leaves other than nutrient deficiencies, and fertilizers will not cure these.

Fertilizer is no miracle drug or cure-all; it merely enables a tree to grow more vigorously, and in this way helps to offset the adverse effect of stress. Fertilizer will not save a tree which has been severely damaged by natural or man-made causes.

Disadvantages of Fertilizing Heavy nitrogen fertilization may delay or retard flowering. Plants which put on excessive vegetative growth will not flower until the rate of leafy growth is much reduced. Also, high rates of readily available nitrogen fertilizer during July or August may stimulate growth which will not harden-off properly prior to winter, and result in winterkill. When we fertilize a tree or shrub we are adding nutrients such as nitrogen, phosphorus and potassium regardless of whether we apply 7-7-7, bonemeal, compost or manure.

Understanding the Label A bag of fertilizer contains some important information. The main face of the package of fertilizer must show the following:

(a) guaranteed analysis
(b) registration number for pesticides
(c) directions for use
(d) weight of the fertilizer
(e) name of the fertilizer, including pesticides
(f) cautions to observe
(g) name and address of packager, manufacturer or registrant
(h) a statement directing the purchaser to the location of the remaining required labeling.

The most important item in the latter list is the guaranteed analysis. For example, a 10-6-4 represents the percentages of total nitrogen (N), available phosphoric acid (P_2O_5) and water-soluble potash (K_2O) respectively. The three numbers do not add up to 100% because completely pure sources of nutrient elements can not be used; also an inert material is added to make the fertilizer easier to spread.

TYPICAL FERTILIZER GUARANTEED ANALYSIS

Guaranteed Minimum Analysis	
Total Nitrogen, N	10.0%
Water-Insoluble Nitrogen, WIN	5.0
Available Phosphoric Acid, P_2O_5	6.0
Soluble Potash, K_2O	4.0
Total Sulfur, S	5.5
Total Magnesium, Mg	1.0

Slow-release Nitrogen Any claim for the presence of slowly available nitrogen can be made only if at least one-quarter of the total nitrogen is in the water-insoluble form. The difference between total nitrogen and water-

insoluble nitrogen is a measure of how much of the nitrogen is readily available. In order for nitrogen to be of value to plants, it must become available. One slow-release nitrogen fertilizer is urea formaldehyde for which a measure of the availability of the insoluble form is the Activity Index. In general, an Activity Index of at least 40 to 50 is desired. Other slow-release nitrogen fertilizers may measure the availability in terms of water solubility over 7 days at a temperature of 25°C.

Fertilizing New Plantings Differences of opinion exist among horticulturists as to the benefits of applying a complete fertilizer in the planting of trees and shrubs. If done carefully at less than normally recommended rates it should do no harm. However, on soils with adequate fertility, fertilizer may not result in better establishment.

At planting time mix 60 g of 20% superphosphate (or 90 g of bonemeal) per 36 litres (1 bushel) of the topsoil used to fill the hole. This will supply phosphorus to aid root growth.

Watering In order for fertilizers to be absorbed by plant roots, the nutrients must be in solution, which obviously requires soil moisture. Fertilizers applied during dry weather and not watered-in are of no value until it rains. Fertilizers are concentrated salts and can damage plants if applied at high rates on soils low in moisture. Be sure to water thoroughly after applying fertilizer, and be careful that water is applied slowly so that the fertilizer is not washed away.

FERTILIZING TREES

Type of Fertilizer Any complete fertilizer which is high in nitrogen and potassium but low in phosphorus is fine for trees. Although phosphorus is a very important nutrient, particularly for root growth of newly planted trees, it does not leach away as do nitrogen and potassium. Since phosphorus builds up in a soil which is fertilized frequently, lower rates are suggested. Do not use fertilizer containing a herbicide.

Time of Application Early spring is a good time to fertilize trees. Apply the fertilizer approximately 2 weeks before you expect the shoot buds to grow. Root growth of many trees begins before the shoot buds open. Early application will also help to avoid overstimulating grass under the tree. Fertilizers with a high percentage of water-insoluble (slow-release) nitrogen will be very slowly available in cold soils in the spring.

Fall is also a good time to fertilize trees. In southern Ontario September 15 to October 15 is normally an appropriate time. Many trees grow roots in the fall after the shoots have stopped growing. Provided fall fertilization is applied after the shoots have stopped growing, when days are shorter and nights are cool, it will not stimulate shoot growth in the fall. Since fall fertilization is usually a supplement to spring fertilization, apply no more than half the total seasonal application in the fall.

Do not apply large amounts of readily available nitrogen during July or August because this may stimulate shoot growth which would not harden-off properly, causing winter injury.

Once a tree has become established, it may not require specific fertilization. If a tree is growing well, with no signs of decline or nutrient deficiencies, fertilizer is not required. Fertilizing lawn areas in which trees are growing will supply some nutrition for established trees.

Rate of Application The quantity of fertilizer to use is based on the size of the tree and the climate, as shown in Table 1.

TABLE 1. RECOMMENDED RATES OF FERTILIZER FOR TREES*

Trunk Diameter	Rate per cm diameter
less than 15 cm	0.2 - 0.4 kg
more than 15 cm	0.4 - 1.0 kg

Measure trunk diameter between 1 and 1.5 m above the ground.

Rates are based on a complete fertilizer containing 10% nitrogen. Double the rate for 5% nitrogen fertilizer and use half with a 20% nitrogen material.

Use the minimum figures for evergreen and deciduous trees in areas where the growing season is limited (Plant Hardiness Zones 1-4). In warmer parts of Ontario the higher rates may be used.

Water thoroughly after applying a dry fertilizer.

Do not apply large amounts of readily available nitrogen during July or August.

Example: A tree with a trunk diameter of 40 cm growing in southern Ontario should receive no more than 40 kg of a 10% nitrogen fertilizer.

As noted in Table 1, the quantity of fertilizer to use is based on a material containing 10% nitrogen. When a 5% nitrogen fertilizer is used, the rate should be doubled. If a fertilizer containing 15% nitrogen is used, the rate should be reduced proportionately. To apply 1 kg **actual** nitrogen on a particular area you would need to use 10 kg of 10-6-4 fertilizer, since the fertilizer in the bag is only 10% nitrogen. The minimum figures in the table should be used for evergreen and deciduous trees in areas where the growing season is limited (Plant-Hardiness Zones 1-4). In warmer parts of Ontario and similar climates, the higher recommendation may be used.

When trees are growing in restricted areas such as adjacent to a driveway, the recommended rate of fertilizer should be reduced. If one-third of the root system is covered by paving, reduce the quantity of the fertilizer applied by approximately one-third.

Methods of Application: Selecting the best way to apply fertilizer to trees will depend on what is growing under them, the soil conditions, the amount of time and labor available, and specific nutrient requirements.

1. *Surface application with dry fertilizer* This is an easy and effective way to fertilize trees, since little if any equipment is necessary and the labor cost is low. Spread the necessary quantity of fertilizer uniformly over the tree root zone, and then water the area well in order to move the nutrients into the soil. The zone of actively absorbing roots begins well beyond the dripline of the tree and extends approximately two-thirds the distance between the dripline and the

trunk (Figure 1). When applying fertilizer to trees that are growing in the lawn, remember that the quantity of fertilizer recommended for the tree may injure the grass under the tree, particularly if the tree fertilizer is in addition to fertilizer specifically for the grass.

Figure 1. The actively absorbing root area begins several metres beyond the dripline and extends approximately two-thirds the distance between the dripline and the trunk.

2. *Hole application with dry fertilizer* Research has shown that under many circumstances this method does not produce better growth of trees than does surface fertilizing. The hole method aerates the soil and allows the deep placement of organic or granular material in addition to the fertilizer. The improved aeration may do more to stimulate new root growth than the fertilizer. This method of applying fertilizer to trees is time-consuming and requires considerable labor, so the benefits must be weighed against the time and effort for proper application. Holes should be made at 0.6 to 1-m intervals throughout the actively absorbing root area (see Figure1). After the holes have been made, uniformly distribute the recommended amount of fertilizer among the holes. Some tree-care specialists mix an equal quantity of dry sand or organic material with the fertilizer before filling the hole. Do not fill the hole to the top when working in a lawn. Allow at least 5 cm for topping-up with soil or a soil mix (Figure 2). When the job is completed, water the area thoroughly and repeat at intervals of 10 to 14 days if necessary. If using sticks or "spikes" of fertilizer which are hammered into the soil under the tree, follow directions on the label.

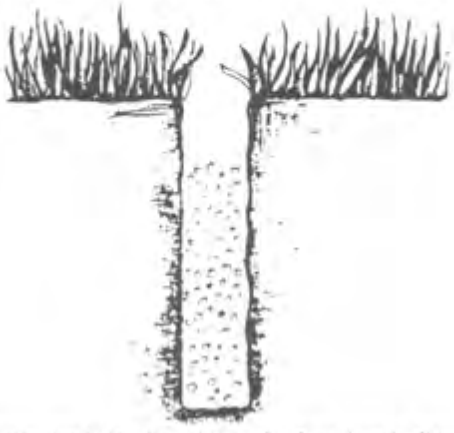

Figure 2. Holes should be 40 cm deep and at least 4 cm in diameter. Allow 5 cm for topping-up with soil.

3. *Hole application with liquid fertilizer* Applying liquid fertilizer is a way to deep-water and fertilize at the same time. When grass or other ground cover is growing under the tree it is not overstimulated as may happen with surface feeding.

With liquid feeding, a fertilizer solution is forced into the soil by means of a root feeder which consists of a perforated hollow rod attached to a source of water pressure. Professional maintenance firms use high-pressure spray equipment with fertilizer dissolved in a large tank. Homeowners can attach a hose to a root feeder and insert fertilizer pellets or cartridges into a chamber at the top of the unit (Figure 3).

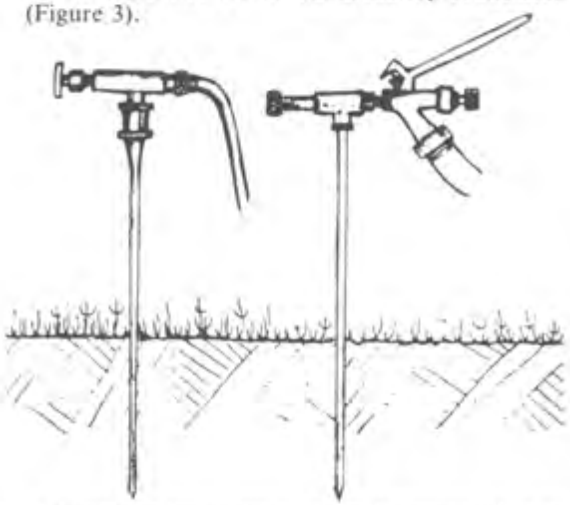

Figure 3. Liquid root-feeding devices used by homeowners (left) are attached to the garden hose and have fertilizer cartridge chambers. Professional devices (right) deliver the fertilizer solution from a spray tank under high pressure.

After attaching the hose, insert the number of fertilizer cartridges recommended by the manufacturer and push the feeder rod into the soil to a depth of 50 cm and at approximately 1-m intervals. A burst of water may cause water to flow up around the rod and onto the surface of the ground. Also, if you hit a stone and have to make a new hole, move away from the first one because pressure may force the solution up and out of the original hole. Follow manufacturer's instructions. Under most conditions this method is not superior to surface or hole fertilizing.

4. *Foliar application with liquid fertilizer* Micronutrient deficiencies, such as manganese chlorosis, can quickly be corrected with foliar sprays, although several sprays during a season may be required. Applying macronutrients such as nitrogen, phosphorus and potassium as foliar sprays is generally not practical. Several products are on the market for correcting nutrient deficiencies. They should be used as described on the manufacturer's label.

5. *Trunk implantation* Several products are available which may correct nutrient problems such as iron and manganese chlorosis. Holes are drilled in the trunk and capsules inserted. Some horticulturists have cautioned against using this method because of potential injury to the trunk. When used properly by a trained person they seem to be effective.

FERTILIZING SHRUBS

If a shrub is growing well and has no signs of decline or nutrient deficiencies, an application of fertilizer is not needed. Because of their size and less extensive root system, shrubs are often easier to fertilize. An easy way to fertilize shrub beds is to broadcast dry fertilizer over the surface of the soil and then water the area thoroughly. Large specimen shrubs may receive individual applications. Shrubs in lawn areas receive benefit from fertilizer applied to the grass and may not require further fertilization. A root feeder may be used in lawn areas or where it is difficult to spread dry fertilizer.

Slow-release, granular and coated fertilizers may be used for shrubs. The material should be cultivated into the soil surface and used as directed by the manufacturer. Rates of actual nitrogen should approximate those shown in Table 2.

TABLE 2. RECOMMENDED RATES OF FERTILIZER FOR SHRUBS*

Type of shrub	Rate	
	Grouped in beds	Large specimens
Deciduous	0.5-1 kg per 10 m²	0.25-0.50 kg per plant
Broadleaf evergreen	0.5-1 kg per 10 m²	0.25 kg per plant
Narrowleaf evergreen	0.5-1 kg per 10 m²	0.25-0.50 kg per plant

Rates are based on a complete fertilizer containing 10% nitrogen. Double the rate listed for a 5% nitrogen fertilizer and use half with a 20% nitrogen material.

Use the low figures in areas where the growing season is limited (Plant-Hardiness Zones 1-4). In warmer parts of Ontario, the high rates may be used.

Water thoroughly after applying a dry fertilizer. Do not apply large amounts of readily available nitrogen during July or August.

Spring is the time to fertilize shrubs, beginning just before the shoot buds open. Do not apply high rates of readily available nitrogen during July or August because this may stimulate growth which would not harden-off properly, causing winter injury. Remember that some shrubs which are growing too vigorously do not flower very well. In such a situation reduce or discontinue the use of nitrogen fertilizer.

Shrubs such as roses which grow and flower vigorously, and are pruned back each year, require slightly different fertilizer applications. Apply 0.5 to 1 kg of fertilizer (based on a 10% nitrogen formulation) per 10 m², one application in early spring and another after the first flowering period.

Special consideration is often necessary for broadleaf evergreen shrubs which require acid soil. Rhododendron, azalea, pieris and bearberry are some examples. A fertilizer specific for acid-soil plants is a wise choice since it usually contains minor elements in addition to nitrogen, phosphorus and potassium. High levels of phosphorus are beneficial for good flower bud formation on azaleas and rhododendrons, while too much nitrogen through the season will substantially reduce the number of flower buds. The soil pH should be near 6.0. If the soil acidity is not that low, use sulfur at the rate of 0.5 to 1 kg per 10 m² or iron (ferrous) sulfate at the rate recommended on the package. Materials must be applied annually to keep pH low. It is not practical to make alkaline soils (pH above 7.0) acid with either sulfur or iron sulfate.

FERTILIZING HEDGES

Many types and sizes of plants are used for hedges. The amount of fertilizer to apply should be based on the size of the plants. Hedges containing small plants should receive proportionately less fertilizer than large plants. Apply the fertilizer in the early spring beginning as soon as the soil is thoroughly thawed.

TABLE 3. RECOMMENDED RATES OF FERTILIZER FOR HEDGES*

Plant height	Rate per 30 linear metres
small: under 1 m	0.5 kg
medium: 1-2.5 m	1.0 kg
large: over 2.5 m	1.5 kg

Rates are based on a complete fertilizer containing 10% nitrogen. If the fertilizer is only 5% nitrogen, double the rate or reduce the rate by half if using a 20% material.

Water thoroughly after applying a dry fertilizer. Do not apply large amounts of readily available nitrogen during July or August.

ACKNOWLEDGMENT

The author thanks Mr. D. Cotton for preparing two sections of the text.

**Recommendations are taken from several available sources and are not based on research by the author.*

Metric Equivalents	
1 g (gram) = .035 oz	1 oz = 28 g
1 kg (kilogram) = 2.2 lb	1 lb = 0.45 kg
1 cm (centimetre) = 0.4 inch	1 inch = 2.54 cm
1 m (metre) = 3.3 ft	1 ft = 0.3 m
1 L (litre) = .03 bus (dry)	1 bus = 36 L
1 m² = 11 sq ft	1 sq ft = 0.09 m²

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Factsheet

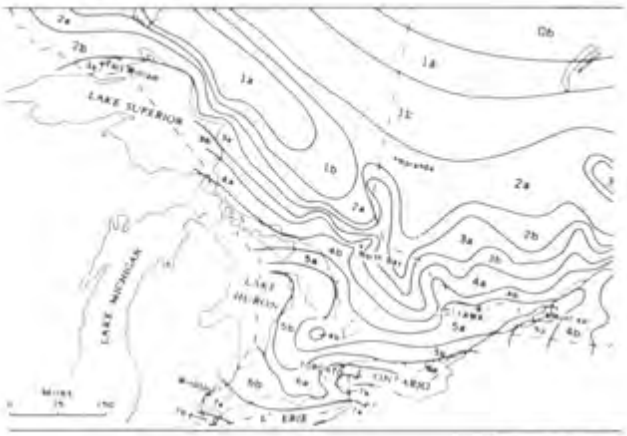
BROAD-LEAVED EVERGREENS FOR THE HOME GARDEN

(Reprinted from December 1985, 85-122)

B. Hamersma and **C. Chong**
Horticultural Research Institute of Ontario Vineland Station

Broad-leaved evergreens, as the name implies, retain their foliage throughout the year in locations with suitable soil and exposure. These plants are distinct from 'narrow-leaved' evergreens such as pines, spruces, firs and others with needle-like leaves. Foliage retention contributes year-round texture and colour effects to home landscapes, making broad-leaved evergreens desirable garden plants. Broad-leaved evergreens are planted most often as ground covers or foundation plantings. They provide a welcome alternative to the dependable but somewhat over-used junipers, yews, arbor-vitae, and deciduous shrubs, all traditionally standard landscape plants. Broad-leaved evergreens require little maintenance when provided with a proper site and planted correctly.

As described in Table 1, a wide range of plants fall into the category of broad-leaved evergreens. To ensure long life and maximum enjoyment it is important that these plants be provided with the appropriate cultural and environmental requirements summarized in this factsheet. Unless indicated otherwise in Table 1, the recommendations provided herein apply to all types of broad-leaved evergreen plants.



Agriculture Canada

Figure 1. Plant Hardiness Zones* in Ontario

Zone	Approximate Minimum Temperature (°C)
3	-40 to -35
4	-35 to -29
5	-29 to -23
6	-23 to -18
7	-18 to -12

* The *a* zones are colder than the *b* zones

CARE OF BROAD-LEAVED EVERGREENS

Site Selection

Broad-leaved evergreens normally require more protection in winter from exposures to sun and wind than do deciduous trees and shrubs, which shed their leaves in autumn. Although the proper hardiness zone must be considered when selecting a plant for a particular area (Figure 1), lack of protection is responsible for more survival problems than actual temperature extremes. During the winter the leaves of broad-leaved evergreens are constantly losing moisture to the air. This moisture cannot be replaced by roots which are frozen, resulting in browned or scorched foliage, and injured buds and stems. This situation is further aggravated by wind and sunlight. Thus, a site protected or an evergreen windbreak, or an east-facing slope is best for planting broad-leaved evergreens.

Winter Protection

In late fall, apply winter mulch around the roots to a depth of 10-15 cm to retard freezing of the soil as long as possible. This provides the plants with a longer period during which moisture is available to the leaves.

Other methods of winter protection that are especially beneficial for the more tender types include: (a) placing evergreen boughs over and among the plants (this breaks the force of the wind and traps snow, which provides excellent insulation), (b) building chicken-wire cages around plants and filling them loosely with leaves, and (c) wrapping entire plants with a loose-weave material such as burlap sacking.

Light and Soil Conditions

Most broad-leaved evergreens prefer partial shade and a soil which is moist but well-drained and predominantly acid (pH of 5.0-6.0). This range of acidity normally can be maintained by adding peat to the soil in the planting hole so that at least half the volume is peat. Locations with filtered sunlight usually are ideal for planting broad-leaved evergreens, and often can be found under deciduous trees with high overhead canopies. Any means of preventing the sun from reaching the plants directly during the hottest part of the day is beneficial to broad-leaved evergreens.

Summer Care

Caring for broad-leaved evergreens during the growing season, for the most part, consists of making sure that they are provided with adequate moisture to maintain the foliage in good condition. This is particularly critical for rhododendrons and azaleas during bloom time, the peak period of growth and development for these species. Attention to moisture becomes more important if mature trees are nearby since trees draw a surprising amount of water from the soil. Roots of broad-leaved evergreens are shallow, and can dry out quickly if not watered frequently in hot weather, or protected by proper mulching. An appropriate mulch, such as coarse, weathered sawdust, wood chips, oak leaves, and pine needles, decomposes relatively slowly, suppresses weed growth, and also contributes to the acidic condition of the soil.

An application of a small amount (one or two handfuls per plant) of an all purpose fertilizer in early spring around the root area of each plant is recommended.

Cultivating too close to the plants will often disturb and destroy the shallow roots. Weeds arising near the plants should be hand-pulled.

Broad-leaved evergreens need little if any pruning except to remove dead or protruding branches. Plants should be allowed to grow in their natural form. The best time for corrective pruning is in early spring before initiation of new growth. Do not prune too late in the season. This stimulates new growth which is susceptible to winter injury.

Table 1. A List of the Most Popular Broad-Leaved Evergreens

Name	Hardiness Zone	Height	Purpose	Comment
Arctostaphyllos uva-ursi Bearberry	1	20 cm	ground cover	- adaptable to hot dry location and (or) poor soil; forms a dense mat.
Buxus microphylla koreana cultivars Littleleaf Boxwood	5	1.5 m	foundation	- branches tend to break under snow load; winter burn often a problem in exposed areas; best grown on soil not too wet.
Cotoneaster dammeri 'Coral Beauty' Cotoneaster	4	75 cm	ground cover	- grows rapidly; very colourful red fruit; best in full sunlight, well drained soil.
Daphne cneorum Rose Daphne	2b	30 cm	ground cover border plant	- requires good drainage; best with an adequate snow cover; adaptable to full sun and lighter soils; - rosy-pink blooms cover the entire plant.
Erica carnea Spring Heath	6	30 cm	rock gardens, ground covers	- blooms January to May in shades of pink, red, or white.
Epigea repens Trailing Arbutus	2	8-10 cm	ground cover	- tolerates poor, gravely soil; can be grown in shade or sun. - low creeper with large leathery leaves and pale pink, very fragrant flowers.
Euonymus fortunei cultivars	5	1.5 m	ground cover, vine, foundation plant, hedge	- very versatile shrub; can be grown in shade or sun; adaptable to a wide range of soils, available in variegated forms as well as green, although more sunlight is needed to maintain variegation; some have quite showy fruits.
Gaultheria procumbens Wintergreen, Checkerberry	3	10 cm	ground cover, rock garden	- shiny leaves and white nodding flowers; leaves and red berries have a decided wintergreen flavour.

Hedera helix 'Baltica'	6		ground cover, vine	- self-clinging as a vine; excellent ground cover for shaded areas within its hardiness limits.
Ilex aquifolium English Holly*	7	3-6 m	specimen, foundation	- leaves glossy, berries red or yellow.
I. opaca 'Hedgeholly' American Holly	6	Grows to 10m	specimen, foundation	- dull green leaves, abundant bright red berries.
I. crenata Japanese Holly	6	1 m	foundation, hedge	- leaves similar to Boxwood; berries black; low growing; dense compact shrub with many dwarf varieties.
I. x meserveae 'Blue Prince'	6	2 m		- male form of the now-popular 'Blue Hollies'.
I. x meserveae 'Blue Princess'	6	2 m		- female form; foliage a lustrous blue-green; red berries occur even on very young plants.
Kalmia latifolia	5b	2-3 m	woodland garden, foundation plant	- companion plant for rhododendrons; displays white to pink clusters in late May or early June.
Ledum groenlandicum Labrador Tea	1	Grows to 1 m	woodland plant	- prefers very moist, boggy conditions; displays clusters of white flowers in May.
Leucothoe fontanesiana Drooping Leucothoe	6	1-15 m	foundation plant	- leaves turn from lustrous dark green in summer to bronze in fall; older leaves may be shed in colder weather; a graceful, arching shrub with white flowers in June.
Mahonia aquifolium Oregon Grape	5	Grows to 2 m	foundation planting	- best known for its glossy, holly-like leaves, clusters of yellow flowers in May; fruits bluish-black; may die-back or develop browned foliage in severe winters or winters without snow cover.
Mitchella repens Partridgeberry	4b	5-8 cm	woodland garden, ground cover	- a dainty creeping ground cover with delicate flowers and red berries; excellent for woodland gardens.
Pachysandra terminalis Japanese Spurge	3	15 cm	ground cover	- one of the best ground covers for shade or partial shade; easy to propagate; used extensively, in woodland plantings under and around rhododendrons, azaleas, and trees.
Pachistima canbyi	2	15-20 cm	ground cover	- neat compact plant, relatively slow growing; appealing dark green leaves.

Pieris japonica Japanese andromeda	5b	2-5 m	foundation plant, natural garden border plant	- lustrous foliage, one of the most striking broad-leaved evergreens; flowers are creamy white in drooping clusters; will produce more flowers in full sun.
Pyracantha coccinea	6	Grows to 2 m	foundation, specimen, accent plant	- well suited to training on trellises or walls; attractive white flowers and red berries; tolerates alkaline soils; variety 'Kasan' is hardiest; 'Lalandii' is more refined.
Prunus laurocerasus Cherry laurel	7	2-3 m	foundation	- shiny green leaves; foliage may brown in exposed sites; not reliably hardy except in Southern Ontario and British Columbia.
Rhododendron	various		specimen, foundation, woodland gardens	- the most spectacular of the broad leaved evergreens; blooms in trusses of lavender, pink, red or white, plants exhibit a great variety of forms; heights range from 60cm to over 2 metres; hardy varieties withstand temperatures as low as -30°C; see OMAF Pub. No. 45, **Rhododendrons and Azaleas** for more details.
Viburnum rhytidophyllum	6b	3m	specimen, shrub	- an evergreen shrub in milder areas; distinctive wrinkled leaves up to 20 cm long with red to black fruits.
Vinca minor Periwinkle	3	30 cm	ground cover	- a dependable evergreen ground cover; very shade tolerant; blue flowers in spring.

**Since sexes are on separate plants the hollies require both a female and male specimen in close proximity in order to pollinate the flowers and produce berries.*

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Factsheet

COMMON DISORDERS OF BROAD-LEAVED TREES

(Revision of Factsheet "Common Disorders of Broad-Leaved Trees", July 1977)

Tom Young, Horticulture Specialist, Consumer Information Centre

INTRODUCTION

Deciduous trees are an integral part of many landscapes. Trees function as windbreaks, barriers for property lines, and also provide privacy, shade and aesthetic value to the home or cottage. Occasionally, however, trees are planted in less than ideal sites or conditions around established trees are modified in a detrimental way. If adverse conditions persist, the health of such trees may be at risk.

When trees are not growing vigorously, stresses such as adverse environmental conditions, and insect and disease activities can weaken trees and cause them to decline. It is important to recognize and identify the cause of stress in trees, so that with early implementation of remedial measures, tree vigour can be improved.

DIAGNOSING THE PROBLEM

The first task in identifying disorders of broad-leaved trees is to determine whether the stress is biotic or abiotic in nature. Biotic stresses are caused by insects, mites, disease (ie. bacteria, fungi, and viruses), animals or other living organisms. Abiotic stresses are caused by non-living factors such as the soil a tree has been planted in, weather conditions or the overall growing conditions.

Biotic Stresses When looking for damage caused by insects, examine the affected tree carefully for signs of insect infestation. Affected areas of the tree may contain insects or signs of their activity. For example, many wood–boring insects create sawdust during their tunneling activity. .The sawdust may remain within the tunnels or collect at the base of the trunk. Some insects such as the Gypsy moth leave empty cocoons behind after emerging as adults. Other indications of insects include egg cases, webbing, faeces, curled leaves or honey-dew (a sticky secretion) that is produced by sucking insects such as aphids, leafhoppers, and scale insects.

When checking for disease, examine twigs for sunken areas (cankers) or raised, blister-like structures (fungal fruiting bodies). It is advisable to cut off an affected twig, and check the inner wood (vascular tissue) for brownish discoloration. Healthy wood color ranges from greenish-white to creamy-yellow. Foliar disease symptoms include discolored spots and blotches, discolored veins and pin–head size black or brown fruiting bodies along the veins or on the surface to the leaves. (Note: some insects will produce galls that resemble fungal structures.)

Animals can damage trees by feeding directly on the tree or by foraging for insects in the bark or wood. Squirrels can prune new growth from elm, maple and oak during spring foraging. A tell-tale sign of this activity is large bunches of healthy leaves littering the ground. Many animals including mice, porcupines and some birds will remove bark to feed on the tender underlying cambium layer. This damage is often noticed on thin-barked trees at ground level or on the main trunk. When a section of bark is removed in a ring around the tree this damage is referred to as **girdling injury.** Girdling is also the term used when a vine, root, rope or cable encircles another root, stem or trunk and slowly constricts it over time. Animal girdling injury can be recognized by uneven tearing of the bark in the damaged area, teeth marks and a general sparseness or dieback of the crown above the injured area.

Abiotic Stresses These types of stresses are usually more difficult to recognize and correct than biotic stresses. When assessing what is affecting the growth of a tree, it is important to not only examine the damaged portion of the tree, but also the rest of the tree as well. Check the surrounding vicinity and examine other plant species to see if they are showing similar symptoms. Try to establish if the stress affecting the tree has been occurring for some time or if it appeared suddenly. Be sure to assess the soil, local weather conditions, and any recent activities that have occurred around the tree (e.g. construction, pesticide application, grading etc.).

Four general factors can be examined when assessing what is affecting tree growth. These are soil, hardiness, environmental stresses and human activities.

SOILS

The quality of soil in which a tree grows is one of the most important factors affecting tree health. Soil conditions including the amount of organic matter, pH (reaction), nutritional status, porosity and aeration will all have a direct effect on tree health.

Drainage The survival and growth of tree roots is very dependent on soil drainage. Soil drainage affects oxygen availability to the roots and is necessary for normal root growth and nutrient uptake. The drainage of a soil can be affected by many factors including texture (clay, silt or sand), mineral composition, amount of organic matter and the local water table.

Roots growing in a poorly drained soil will be deficient in oxygen and have limited nutrient uptake. If soil saturation is continuous, root-hairs will die and the tree will become an easy target for root-rot organisms. The tree will then begin to desiccate (even though water is available), and will start loosing leaves and small branches.

Trees that are growing in gravel or sandy soils that do not retain water well may also show symptoms of drought during dry spells or periods of excessively hot weather. Lack of moisture will also be a problem where soils are severely compacted, as the water will tend to run off the surface instead of percolating down through the soil. If the water table drops because of excavations, additional wells or high water usage, drought symptoms (dry, brown margined leaves) are possible.

ph (Reaction) Soil pH is a measure of acidity or alkalinity of a soil. A soil pH reading above 7.0 is alkaline or basic and below 7.0 is acid. Most plants grow well in soils with pH values of 6.0 to 7.5. Most of soils in Southern Ontario are neutral (7.0) to alkaline. If the soil is too alkaline, this may have an influence on the uptake of some nutrients (eg. iron and manganese). To increase the alkalinity of a soil, dolomitic limestone can be applied. To lower alkalinity, sulphur can be applied.

Iron (Fe) and Manganese (Mn) deficiencies Deficiencies of iron and manganese may occur in trees that are growing in alkaline soils. Trees that commonly exhibit these deficiencies include red maples, oaks, tulip trees, rhododendrons and azaleas. Affected trees will have foliage that is pale green or yellow with dark green veins.

HARDINESS

The ability of a tree to withstand cold temperature is called hardiness. Hardiness varies with tree species, and because of this all plants are assigned a numerical hardiness rating.

In Ontario there are 7 hardiness zones. These zones are based on a number of factors including minimum temperature during the winter, the number of frost-free days, summer rainfall and wind conditions. Areas in the north are given a lower hardiness rating or number. This rating generally increases as one continues south.

It is important to know the zone your property is in, as well as the hardiness rating of the tree. A tree that has a higher hardiness rating than the area it is planted in may not survive. If such a tree does survive, it is more likely to be affected by environmental stresses, and it may sustain injury in the form of branch dieback, severe trunk cracks, desiccation of foliage (as seen in broad-leaved evergreens such as holly and Oregon grape) and root freezing. Such injuries will leave a tree susceptible to attack from insects and disease.

Hardiness ratings are meant as guidelines only. Plants growing beyond their hardiness rating do so if their microclimate has been somewhat modified.

The hardiness of a particular tree will also vary with the season, maturity of tissue, and with cultural practice. Cold hardiness increases as the fall progresses and decreases over the spring to a very low level in the summer. Many plants can be severely damaged by extreme temperature fluctuations (e.g. early fall frosts or late spring frosts).

Many nursery and garden centre catalogues will list a hardiness rating along with a description of the tree. Hardiness zones of many popular trees can also be found in Ontario Ministry of Agriculture and Food (OMAF) Factsheets *Low Maintenance Landscape Plants*, Agdex 274 and *Selecting Trees for Landscape Plantings*, Agdex 275/17

ENVIRONMENTAL STRESSES

Environmental stresses refer to stresses that have been caused by weather conditions or other natural factors. Some of these are as follows:

Winter Injury Winter injury is perhaps one of the hardest common disorders to diagnose due to the different forms of injury that can occur (listed below). Although repeated freezing and thawing will cause damage to plant tissues, it is the formation of ice crystals within the cells of buds, sapwood and cambium that causes the real damage. When ice crystals form in a plant cell, the cell membrane is ruptured and the contents are lost. If many cells are ruptured, tissue death will result.

Winter injury may be caused by the following factors:

- extreme temperature fluctuations.
- extreme low temperatures.
- winter burn or desiccation.

Possible symptoms caused by winter injury:

- buds fail to open in the spring
- buds open, but the leaves are smaller than normal, brown and may wilt by the early summer.
- sunscald - splitting of bark revealing inner wood. This will appear on the south and southwestern exposure and is caused by the rapid freezing and thawing of the underlying tissue.
- twig dieback.
- browning of foliage (winter burn) especially in broad-leaved evergreens. This occurs when roots which are in frozen soil, are unable to replenish the moisture that has been lost from plant tissues, due to desiccation by the wind. This damage is noticed in early spring when temperatures begin to warm up.

Note: Winter injury may not be noticed until the early summer when it can be confused with other abiotic or biotic stresses.

Lightning Injury Tall trees growing in exposed locations such as open fields, hill tops and along fence rows are more likely to be struck by lightning than those trees growing in groups or low-lying areas. However, no tree is exempt from lightning damage. The severity of lightning damage varies depending on the directness of the strike and the strength of the charge. Typical symptoms of lightning damage include large strips of bark and inner wood being blown out, or large portions of a tree suddenly turning brown after a recent electrical storm. As lightning has an enormous amount of electrical energy, this energy must be grounded through the tree into the soil. This energy will sometimes kill an area of cambium that will result in adventitious root growth (air roots) or a large clump of soil or roots will be disturbed where the electrical energy left the tree.

To minimize stress caused by lightning strikes, remedial measures are recommended. Remove long strips of bark with a clean sharp knife so that callus tissue can repair the

damage. Root growth can be encouraged by fertilizing with a blend that is high in phosphorous, but low in nitrogen.

Wind Damage The damage usually associated with strong winds is broken and torn branches (similar damage can also be caused by lightning). Shallowly rooted trees are also susceptible to strong winds and complete uprooting of these trees can occur. Weak-wooded , fast growing trees such as willows and poplars, are especially vulnerable to high winds, since they have large crowns with dense foliage that can easily "catch" the wind. Branch and trunk breakage is more likely to occur on trees infected with wood decay. High winds can also desiccate, damage or tear off leaves. Affected leaves appear tattered with large missing portions, and occasionally the margins will be scorched. These symptoms are more severe in drought stressed trees.

Hail Hard driven hail can cause serious injury to a tree especially in young succulent tissues. Hail damage is recognized by severely shredded leaves and a large number of "pock" marks on twigs and branches that later heal, leaving many small callused scars. Severe callusing can result in a branch becoming partially girdled and eventually dieback will occur. These wounds may in turn provide entrances for insects and disease causing organisms.

Ice and Wet Snow Large amounts of ice and wet snow that accumulated after a winter storm can be heavy enough to cause branches to snap. Small trees that still have a few leaves attached can easily be be broken from the weight of snow and ice. The homeowner can help prevent this injury by properly staking small trees, and removing snow and ice from larger specimen trees (within reason) with a broom.

Competition from Other Plant Species As a tree grows, a network of roots extend in the upper 1 metre of the soil, and well beyond the spread of the crown. The small root hairs covering each root absorb water and nutrients from the upper 30 cm of soil. It is in this zone that the roots of turf and other plant species are also competing for food and water. If a tree does not get enough nutrients it will begin to show deficiency in the leaves. Affected leaves may appear pale green in the case of nitrogen deficiency or purple-red in the case of phosphorous or potassium deficiency. A soil test is often the most efficient way to discover if the soil around the tree is deficient in nutrients. When nutrient and pH levels are normal, misapplied pesticides or other stresses may be causing the discoloration

Drought Trees may suffer from both short-term and long-term drought stress. The leaves of trees that are experiencing short-term drought stress will tend to wilt during the hottest part of the day, and later the leaves will develop margins that are brown and brittle. This damage will be more severe if strong breezes are present. Long-term drought stress will show short-term symptoms as well as the development of premature fall color and defoliation in midsummer.

Trees growing in clay soil may suffer longer periods of drought because sun baked clay soil particles tend to swell-up at the surface when wetted, blocking further moisture from reaching the roots. Aeration of the area under the dripline may help prevent this problem.

As trees are perennial plants they are subject to winter drought as well. The soil around the tree should be well watered in the fall so that the roots will have a good "reservoir" of water to resume growth the following spring.

HUMAN ACTIVITIES

Every year many trees are killed or damaged indirectly by human activities. In this section stresses are listed along with common activities that contribute to them.

Construction Stress

Trenching and excavation activities within the root zone of trees will damage roots, causing a reduction in the uptake of moisture and nutrients. This will eventually cause leaf scorch and dieback in the crown. Trees that have had many roots severed or injured by excavation equipment may also set large amounts of seed from time to time. Although some trees will naturally set heavy crops in alternate years, heavy fruit formation may also be a stress-related condition due to physical damage to the root or trunk. Trees that may set large amounts of fruit when under stress include maples, ash, birch and elm.

The movement of heavy machinery or the installation of driveways, side walks or patios over the root zone can cause soil compaction. Compaction of the upper few inches of soil especially in a clay will result in oxygen and water depletion in the root zone. Tress that are growing in compacted soil will show drought stress.

Improper Maintenance

Application of large amounts of fertilizer in late summer results in the failure of branches and bark to harden-off sufficiently before winter. Trees that have not had sufficient time to harden-off are generally more susceptible to winter injury.

Over-fertilization during the growing season will cause excessive suckering, and may reduce flowering and fruiting ability of some trees.

Improper pruning techniques that leave large stubs and torn bark will leave a wound vulnerable to pathogens of environmental stresses.

Transplanting stresses

There are a number of stresses that can affect a tree before, during and after transplanting. Some of these are as follows:

- Exposure of bare roots to high temperatures, direct sunlight of drying winds between digging and planting.
- Failure to spread roots out during transplanting. (this can cause a condition known as girdling roots).
- Planting root-ball too deep.
- Using unsuitable soil for backfill or failing to firm down the soil after transplanting, resulting in inadequate contact between roots and soil.
- Failure to remove man-made fibre ropes that support the root-ball after transplanting, may result in root girdling that could kill the tree in later years.
- Insufficient supplemental watering after transplanting.

For more information on proper transplanting methods refer to OMAF Factsheet ***Planting Trees in the Landscape***, Adgex 275.

Girdling Stresses

Girdling or strangulation of a tree trunk can be caused when wire fencing, nylon or steel cable (e.g. a clothes line) has been tied around the tree for anchorage. It the wire is left around the tree for a number of years, the bark slowly incorporates the cable, gradually restricting the flow of water and nutrients in the cambium. Similar damage may also occur when guy-wires (that have been used as support after transplanting) become too tight. These wires should be checked every year until they are removed.

Partial girdling of the trunk (especially in young or thin-barked trees) can result when weed-eaters and lawn-mowers are used in close proximity to a tree.

Site Alterations

Increasing the soil level by more than 8 cm around an established tree will reduce the oxygen and moisture supply to the roots. Eventually decline will occur. If soil has to be added because of landscaping needs, the tree can be saved by placing a radiating grid of drainage tile and gravel around the tree. When the fill is less than 45 cm deep, drainage tile will be adequate. However, when the fill is over 45 cm, a layer of gravel 20 to 30 cm deep should be laid along with the drainage tile.

Salt Damage

Trees growing along a street or side walk may be stressed by deicing salt spray and by salt build-up in the soil. Damage increases with closer proximity to the road and damage will be more severe on the foliage facing the road. When salt levels rise in the soil, trees will be subjected to a greater degree of moisture stress or physiological drought. In general, high salt levels can cause root burning and decreased root function, resulting in symptoms of drought and nutrient stress in the crown. Deciduous trees that have salt damage will have unopened buds, twig dieback and tufted growth on the exposed side. If salt damage is suspected a soil sample should be taken and tested for salt levels by an accredited laboratory.

Fertilizers and rotting organic matter are other sources of soluble salts.

Pesticide Damage

The severity of pesticide damage will vary with the chemical involved, its concentration and the duration of exposure. Herbicides applied to a lawn or garden may affect a nearby tree. Symptoms may include discolored leaves, twigs dieback, reduced growth, distortion of leaves and twigs.

Soil sterilants (long term herbicides) applied to patios or driveways may be absorbed into trees roots and affect crown growth. These herbicides can persist for more than one growing season.

Application of pesticides to trees when temperatures are above 27 ^{0}C may cause leafscorch or other types of injury.

The insecticide carbaryl when applied within 3 weeks of flowering will cause fruit thinning.

Dimethoate (a systemic insecticide) when applied to the same area of bark year after year will leave a dark ring and girdling injury may occur. This problem may often be seen on birch trees that have been sprayed for Birch leafminer.

Other Stresses

Gas leaking from underground pipes causes root damage. Natural gas does not normally cause direct injury to trees, but may cause damage by displacing soil oxygen needed for root growth. Chlorinated water from swimming pools or hot tubs may also damage nearby tree roots.

GETTING PROFESSIONAL HELP FOR YOUR TREES

If you require further assistance in diagnosing the problem on your tree, you may want to consult a professional arborist or speak with the staff at your local nursery or garden centre.

Samples can also be mailed or brought in person to;

The Pest Diagnostic and Advisory Clinic
Department of Environmental Biology
University of Guelph
Guelph, Ontario. N1G 2W1
Phone: (519) 824-4120 Ex 2700

There is a fee for this service. For more information please contact the clinic or local Ontario Ministry of Agriculture and Food (OMAF) office.

ADDITIONAL INFORMATION

For more information on trees, the following Factsheets and publications are available at no charge from your nearest county OMAF office or by writing to:

The Consumer Information Centre
Ontario Ministry of Agriculture and Food
801 Bay Street
Toronto, Ontario
M7A 2B2

Publications

Pub. 64 *Insect and Disease control in Home and Garden*
Pub. 483 *Pruning Ornamentals*

Factsheets

Order No.	Agdex No.	
89-115	275	**Planting Trees in the Landscape**
86-038	275/17	**Selecting Trees for Landscape Plantings**
83-040	270/542	**Fertilizer Trees and Shrubs in the Landscape**
89-124	500	**Soil and Fertilizing Information for Home Lawns and Gardens**

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WOODY PLANT WALK NINE
FANSHAWE COLLEGE

94	Chamaecyparis pisifera	'Filifera'	Sawara Falsecypress
151	Euonymus fortunei	var. coloratus	Bigleaf Winter Creeper
(359)	Euonymus fortunei	'Canadale Gold'	Canadale Gold Euonymus
151	Euonymus fortunei	'Emerald Gaiety'	Emerald Gaiety Euonymus
151	Euonymus fortunei	'Emerald'n Gold'	Emerald'n Gold Euonymus
(362)	Euonymus fortunei	'Sunrise'	Sunrise Euonymus
196	Ilex X meserveae	'Blue Boy'	Blue Boy Holly
196	Ilex X meserveae	'Blue Girl'	Blue Girl Holly
196	Ilex X meserveae	'Blue Prince'	Blue Prince Holly
196	Ilex X meserveae	'Blue Princess'	Blue Princess Holly
(514)	Juniperus horizontalis	'Blue Rug'	Blue Rug Juniper
209	Juniperus horizontalis	'Plumosa'	Andorra Juniper
212	Juniperus scopufolium	'Skyrocket'	Skyrocket Juniper
247	Mahonia aquifolium		Oregon Grape Holly
270	Picea abies		Norway Spruce
270	Picea abies	'Nidiformis'	Birds Nest Spruce
271	Picea glauca		White Spruce
(716)	Picea glauca	'Densata'	Black Hills White Spruce
273	Picea pungens		Colorado Spruce
273	Picea pungens	'Glauca'	Colorado Blue Spruce
(1002)	Taxus cuspidata	'Aurescens'	Golden Japanese Yew
(1009)	Thuja occidentalis	'Sunkist'	Sunkist Cedar

WOODY PLANT WALK TEN
FANSHAWE COLLEGE

64	Buxus microphylla	'Green Velvet'	Green Velvet Boxwood
64	Buxus microphylla	'Green Mountain'	Green Mountain Boxwood
(218)	Chamaecyparis obtusa	'Nana'	Dwarf Hinoki Cypress
	Cotoneaster praecox	'Boer'	Boer Cotoneaster
280	Pinus mugo		Mugo Pine
280	Pinus mugo	var. mugo	Dwarf Mugo Pine
280	Pinus mugo	var. pumilo	Pumilo Mugo Pine
280	Pinus nigra		Austrian / Black Pine
283	Pinus strobus		White Pine
285	Pinus sylvestris		Scotch Pine
313	Pseudotsuga menzeisii		Douglas Fir
(796)	Pseudotsuga menzeisii	var. glauca	Blue Douglas Fir
	Taxus cuspidate	'Monloo'	Monloo Japanese Yew
(1002)	Taxus cuspidata	'Thayerae'	Spreading Japanese Yew
398	Taxus X media	'Densiformis'	Dense Anglojapanese Yew
399	Thuja occidentalis		Eastern White Cedar
(1010)	Thuja occidentalis	'Holmstrup'	Holmstrup Arborbvitae

WOODY PLANT WALK ELEVEN

WELDON LIBRARY
UNIVERSITY OF WESTERN ONTARIO

13	Abies concolor		Silver Fir
92	Chamaecyparis nootkatensis	'Pendula'	Weeping False Cypress
94	Chamaecyparis pisifera	'Filifera'	Thread Leaf Cypress
94	Chamaecyparis pisifera	'Filifera Aurea'	Golden Thread
177	Hedera helix		English Ivy
177	Hedera helix	'Baltica'	Baltic English Ivy
177	Hedera helix	'Thorndale'	Thorndale English Ivy
205	Juniperus chinensis	'Pfitzeriana'	Pfitzer Juniper
206	Juniperus chinensis	'Pfitzeriana Aurea'	Golden Pfitzer Juniper
(504)	Juniperus chinensis	'Hetzii Glauca'	Hetz Juniper
211	Juniperus sabina		Savin Juniper
214	Juniperus virginiana		Eastern Redcedar
271	Picea glauca	'Conica'	Dwarf Alberta Spruce
273	Picea pungens	'Hoopsii'	Hoopsii Blue Spruce
314	Pyracantha coccinea		Scarlet Firethorn
399	Thuja occidentalis	'Emerald'	Emerald Cedar

WOODY PLANT WALK TWELVE
WELDON LIBRARY
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123	Cotoneaster salicifolius		Willowleaf Cotoneaster
(715)	Picea abies	'Ohlendorfii'	Ohlendorf Spruce
273	Picea pungens	'Hoopsii'	Hoopsii Blue Spruce
(720)	Picea pungens	'Koster'	Koster Blue Spruce
277	Pinus cembra		Swiss Stone Pine
280	Pinus nigra		Austrian or Black Pine
(739)	Pinus ponderosa		Ponderosa Pine
283	Pinus resinosa		Red Pine
(741)	Pinus rigida		Northern Pitch Pine
(283)	Pinus strobus		White Pine
397	Taxus cuspidata		Japanese Yew
397	Taxus cuspidata	'Capitata'	Clipped Cone Japanese Yew
399	Taxus X media	'Hicksii'	Hicks Yew
(1010)	Thuja occidentalis	'Pyramidalis'	Pyramidal Cedar
(1011)	Thuja standshii		Japanese Arborvitate
407	Tsuga canadensis		Canada Hemlock
441	Yucca filamentosa		Adam's Needle
441	Yucca filamentosa	'Golden Sward'	Golden Sward Yucca

WOODY PLANT WALK THIRTEEN
RAYNER GARDENS LONDON ONTARIO

(10)	Abies lasiocarpa	'Compacta'	Compact Rocky Mountain Fir
64	Buxus microphylla	var. koreana	Korean Boxwood
92	Chamaecyparis lawsoniana		Lawson Falsecypress
94	Chamaecyparis obtusa		Hinoki Falsecypress
94	Chamaecyparis pisifera	'Boulevard'	Boulevard Falsecypress
(220)	Chamaecyparis pisifera	'Filifera Aurea Nana'	Gold Dwarf Threadleaf Falsecypress
196	Ilex X meserveae	'Blue Prince'	Blue Prince Holly
196	Ilex X meserveae	'Blue Princess'	Blue Princess Holly
(504)	Juniperus chinensis	'Blaauw'	Blaauw Juniper
210	Juniperus horizontalis	'Wiltonii'	Wilton Juniper
210	Juniperus procumbens	'Nana'	Dwarf Japanese Garden Juniper
212	Juniperus scopulorum	'Blue Heaven'	Blue Heaven Juniper
214	Juniperus virginiana	'Canaertii'	Canaertii Juniper
214	Juniperus virginiana	'Grey Owl'	Grey Owl Juniper
220	Larix decidua		Common Larch
247	Mahonia aquifolium		Oregon Grapeholly
(665)	Microiota decussata		Russian Arborvitae
270	Picea abies	'Nidiformis'	Bird's Nest Spruce
271	Picea glauca	'Conica'	Dwarf Alberta Spruce
272	Picea omorika		Serbian Spruce
(721)	Picea pungens	'Glauca Globosa'	Dwarf blue Spruce
285	Pinus sylvestris		Scotch Pine

(1009)	Thuja occidentalis	'Ericoides'	Dwarf White Cedar
(1010)	Thuja occidentalis	'Rheingold'	Rheingold Cedar
(1031)	Tsuga canadensis	'Pendula'	Weeping Hemlock
441	Yucca filamentosa	'Golden Sword'	Variegated Yucca

WOODY PLANT WALK FOURTEEN
CUDDY GARDENS STRATHROY ONTARIO

64	Buxus microphylla	'Winter Beauty'	Winter Beauty Boxwood
64	Buxus microphylla	'Green Mountain'	Green Mountain Boxwood
64	Buxus sempervirens		English Boxwood
(218)	Chamaecyparis obtusa	'Nana'	Dwarf Hinoki Cypress
94	Chamaecyparis obtusa	'Nana Gracillis'	Hinoki Cypress
94	Chamaecyparis pisifera	'Boulevard'	Boulevard Cypress
(288)	Cotoneaster microphylla		Dwarf Cotoneaster
147	Erica carnea		Spring Heath
151	Euonymus fortunei	'Kewensis'	Kew Winter Creeper
(359)	Euonymus fortunei	'Sarcoxie'	Sarcoxie Winter Creeper
195	Ilex glabra	'Compacta'	Compact Inkberry
284	Pinus strobus	'Fastigiata'	Pyramidal White Pine
(855)	Rhododendron species		Rhododendron
(1009)	Thuja occidentalis	'Rheingold'	Rheingold Cedar
407	Tsuga canadensis	'Sargentii'	Sargent's Hemlock
(1031)	Tsuga canadensis	'Jedeloh'	Jedeloh Hemlock
(1031)	Tsuga canadensis	'Jervis'	Jervis Hemlock
430	Viburnum rhytidophyllum		Leather Leaf Viburnum

APPENDICES

TREE DIRECTORY

The following tree directory presents basic information at a glance relating to a tree's form and height. This information has been adapted to our zone and our immediate area of Southern Ontario. However, since we are dealing with microclimates, varying degrees of soil fertility and nutrition, as well as differing levels of environmental stress and plant care, the listed information should only be used as a guide. Remember, there are always exceptions.

Cultivar material is not listed; you are however encouraged to add it to your lists as such material is presented. This would aid in the substantial development of the section on tree form.

TREES CLASSIFIED BY HEIGHT

25 to 35 FEET

Acer campestre	Hedge maple
Acer ginnala	Amur Maple
Acer griseum	Paperbark Maple
Acer palatum	Japanese Maple
Aesculus glabra	Ohio Buckeye
Amelanchier canadensis	Serviceberry
Aralia elata	Devil's Walking Stick
Betula populifolia	Grey Birch
Carpinus betulus	European Hornbeam
Cercis canadensis	Canada Redbud
Chionanthus virginicus	Fringe Tree
Cornus florida	Flowering Dogwood
Craetagus species	Hawthorn
Elaeagnus angustifolia	Russian Olive
Euonymus alatus	Spindle Tree
Fraxinus ornus	Flowering Ash
Halesia carolina	Carolina Silverbell
Juniperus rigida	Needle Juniper
Koelreutaria paniculata	Golden Rain Tree
Magnolia soulangiana	Saucer Magnolia
Magnolia stellata	Star Magnolia
Malus species	Crabapples
Prunus species	Cherry Species
Rhamnus cathartica	European Buckthorn
Salix babylonica	Babylon Weeping Willow
Salix caprea	Goat Willow
Sorbus discolor	Snowberry Mountain Ash
Syringa reticulata	Japanese Tree Lilac

35 to 75 FEET

Abies koreana	Korean Fir
Acer pensylvanicum	Striped Maple
Alianthus altissima	Tree of Heaven
Alnus rubra	Red Alder
Betula pendula	European Birch
Betula papyrifera	Paper Birch
Carpinus Carolinian	Blue Beech
Catalpa bignoniodies	Southern Catalpa
Cercidiphyllum japonicum	Japanese Katsura Tree
Chamaecyparis nootkatensis	False Cypress
Cladrastis lutea	Yellowwood
Diospyros virginiana	Common Persimmon
Green Ash	Fraxinus pensylvanica
Larix decidua	Larch
Liquidambar styraciflua	American Sweetgum
Maclura pomifera	Osage Orange
Magnolia acuminata	Cucumber Magnolia
Malus baccata	Siberian Crabapple
Oxydendrum arboreum	Sorrel Tree
Ostrya virginiana	Ironwood
Palwonia tomentosa	Empress Tree
Phellodendron amurense	Amur Cork Tree
Picea abies	Norway Spruce
Piecea glauca	White Spruce
Picea pungens	Colorado Spruce
Pinus cembra	Swiss Stone Pine
Pinus sylvestris	Scotch Pine
Pinus strobus	Eastern White Pine
Quercus alba	White Oak
Qurecus bicolor	Swamp White Oak
Quercus borealis	Red Oak
Quercus coccinea	Scarlet Oak
Quercus imbricaria	Shingle Oak
Quercus macrocarpa	Burr Oak
Quercus palustris	Pin Oak
Quercus phellos	Willow Oak
Quercus robur	English Oak
Robinia pseudoacacia	Black Locust
Salix alba	White Willow
Salix nigra	Black Willow
Salix pentandra	Laurel Willow
Sassafras albidum	Sassafras
Tilia cordata	Little Leaf Linden
Thuja occidentalis	Eastern White Cedar
Thuja standishii	Japanese Arbor-Vitae

Tsuga canadensis	Eastern Hemlock
Ulmus americana	American Elm
Ulmus parviflora	Chinese Elm
Ulmus pumila	Siberian Elm

75 FEET OR OVER

Abies species	Fir
Acer platanoides	Norway Maple
Acer pseudoplatanus	Sycamore Maple
Acer rubrum	Red Maple
Acer saccharum	Sugar Maple
Aesculus hippocastanum	Horse Chestnut
Betula lenta	Cherry Birch
Betula nigra	River Birch
Carya species	Hickory Species
Catalpa speciosa	Northern Catalpa
Celtis occidentalis	Hackberry
Fagus species	Beech Species
Fraxinus americana	White Ash
Fraxinus excelsior	European Ash
Ginkgo biloba	Maidenhair Tree
Gleditsia tricanthos	Common Locust
Gymnocladus dioicus	Kentucky Coffee Tree
Juglans nigra	Black Walnut
Juglans regia	English Walnut
Liriodendron tulipifera	Tulip Tree
Metasequoia glyptostrodoides	Dawn Redwood
Nyssa sylvatica	Black Gum
Platanus species	Plane Tree Species
Populus species	Poplar Species
Pseudotsuga menziesii	Douglas Fir
Taxodium distichum	Bald Cypress
Tilia species	Linden Species
Zelkova serrata	Japanese Zelkova

TREES CLASSIFIED BY FORM

PYRAMIDAL

Abies	Fir
Betula	Birch
Chamaecyparis	False Cypress
Fagus	Beech
Larix	Larch
Liquidambar	Sweetgum
Magnolia	Magnolia
Metasequoia	Dawn Redwood
Nyssa	Blackgum
Ostrya	Ironwood
Oxydendrum	Sorrel
Picea	Spruce
Pinus	Pine*
Quercus palustris	Pin Oak
Taxodium	Cypress
Thuja	Cedar
Tilia	Linden
Tsuga	Hemlock

*may loose pyramidal form toward maturity

COLUMNAR

Developed cultivar material.

WEEPING

Salix babylonica
Babylon Weeping Willow
Tilia Pendant Silver Linden

ROUNDED OR GLOBE FORM

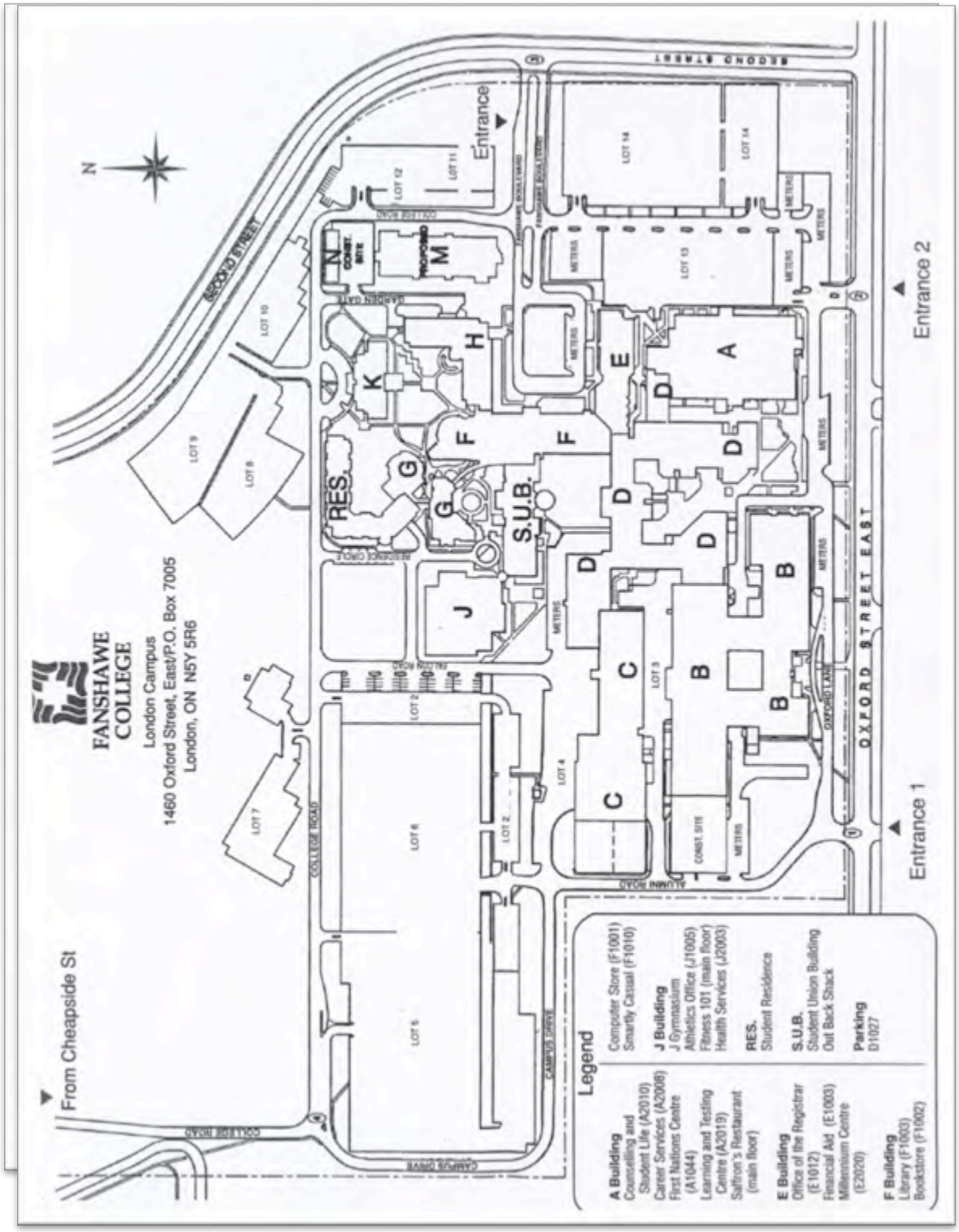
Acer palmatum	Japanese Maple
Cornus mas	Cornelian Cherry
Dogwood	Magnolia soulangiana
Saucer Magnolia	Malus species
Crabapple Species	Quercus alba
White Oak	Robinia pseudoacacia
Black Locust	Pinus species
Pine*	

*may develop rounded form toward maturity

HORIZONTAL BRANCHING

Abies	Fir
Cercis	Redbud
Cornus	Dogwood
Metasequoia	Redwood
Nyssa	Blackgum
Picea	Spruce
Pinus strobus	White Pine
Quercus alba	White Oak
Quercus palustris	Pin Oak
Taxodium	Cypress

FANSHAWE COLLEGE



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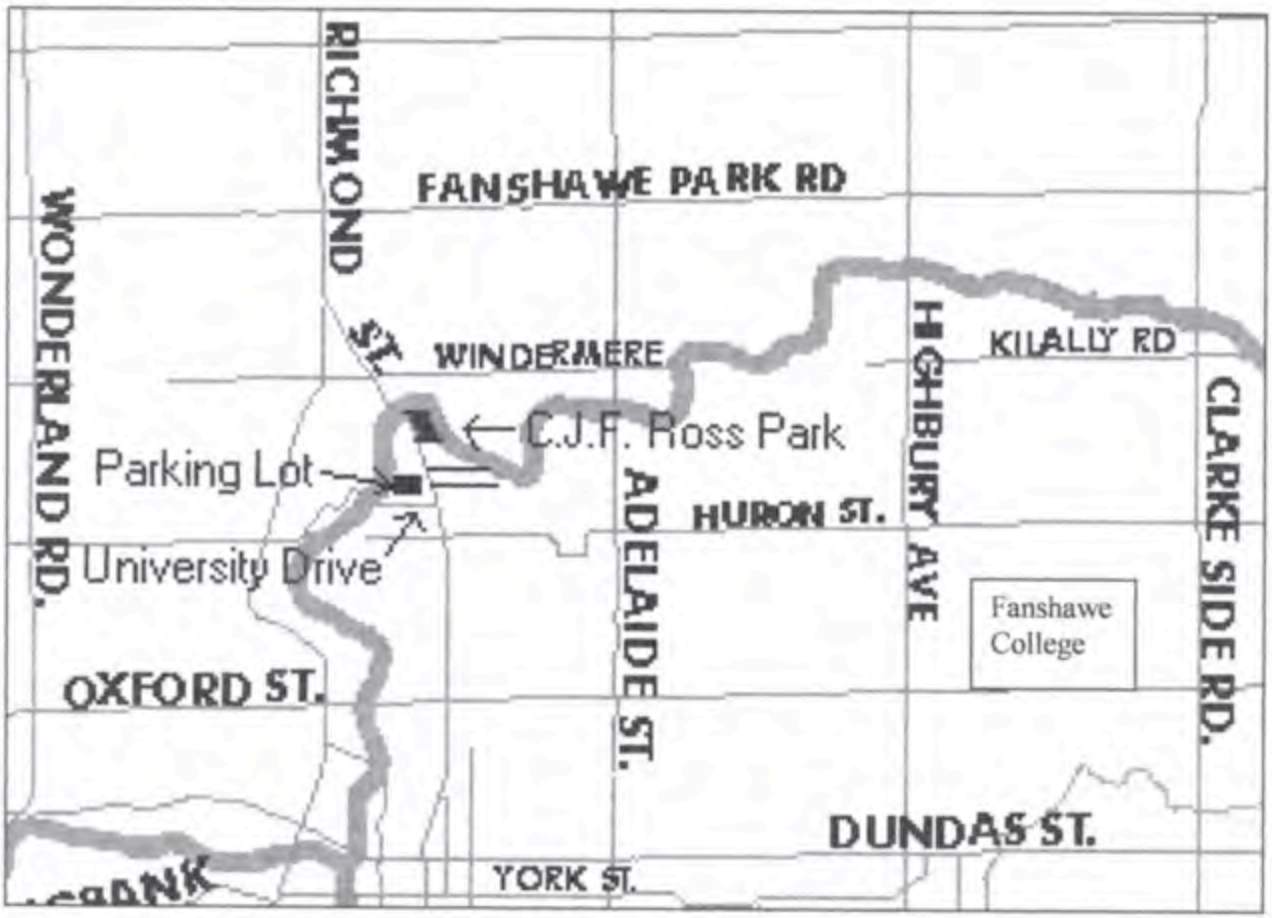
STUDENT PARKING LOT

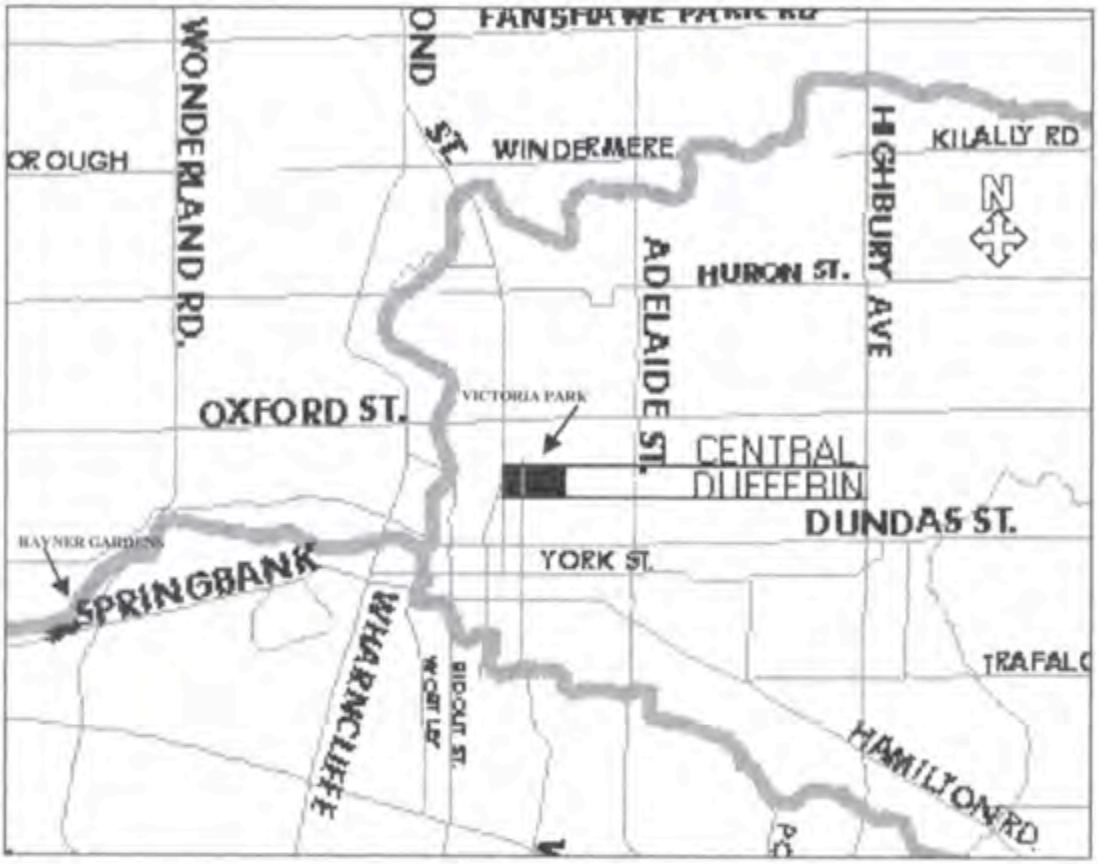


***Park at C.J.F. Ross Park, cross Richmond Street and walk through main gates at University Drive. The parking lot is about 200 metres along University Drive on the right side, across the lawn and down the slope.**

WELDON LIBRARY
UNIVERSITY of WESTERN ONTARIO

*** Enter the University off of Western Rd. , turning east onto Lambton Drive, and another right turn off of the circle to the pay parking lot. Walk North for about 400 metres until you reach the library on your left side. Meet at the front steps of Weldon Library.**

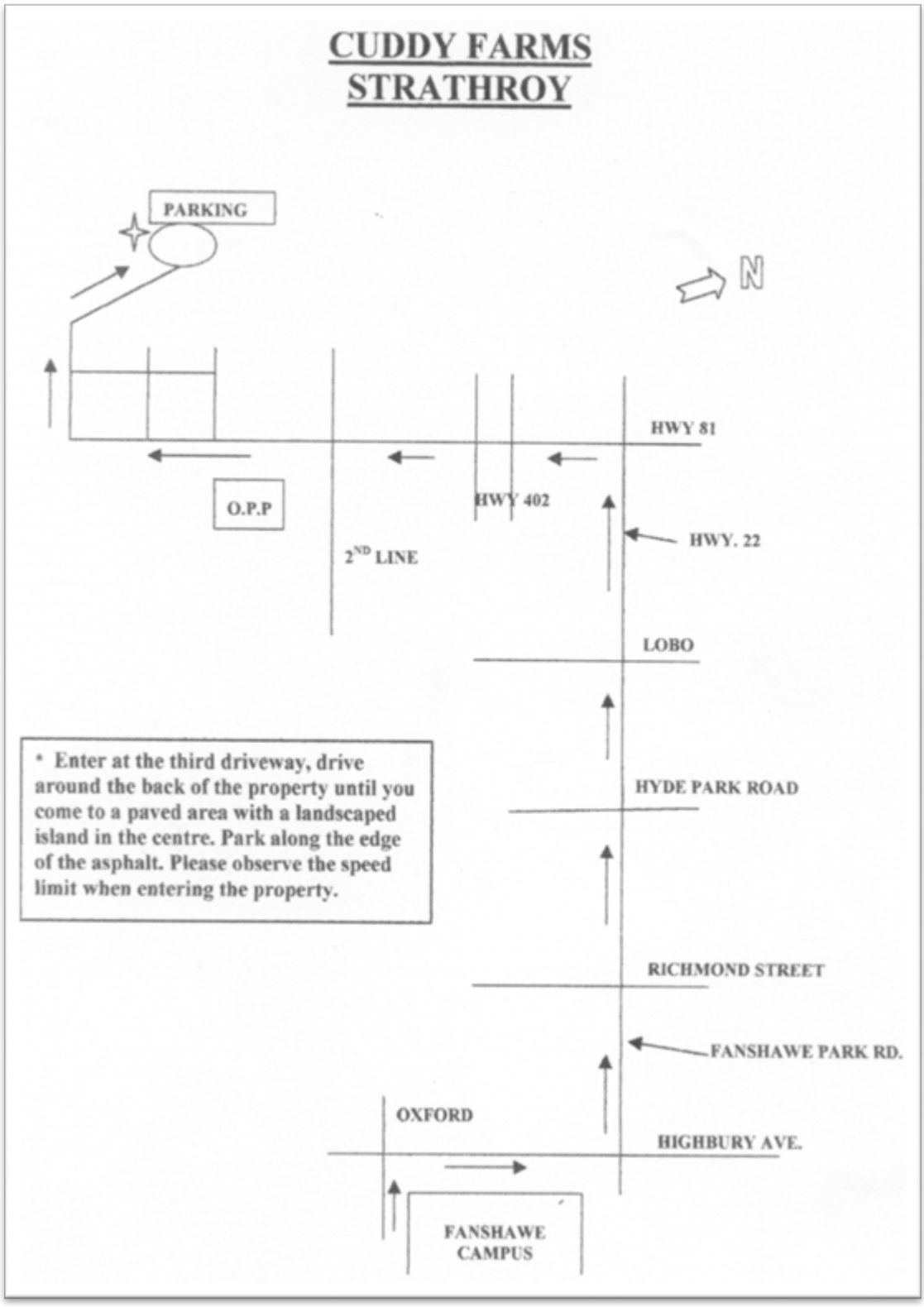
VICTORIA PARK & RAYNER GARDENS



*<u>Victoria Park</u> – Parking can be obtained on most of the surrounding streets. There is meter parking to the west of the bandshell on Clarence street. Meet at the bandshell.

*<u>Rayner Gardens</u> – Coming sounth along Wonerland Road, before you get to Springbank Drive, there is a parking lot beside the blue Parks and Recreation building. The gardens are located at there very corner of Wonderland and Springbank.

CUDDY FARMS
STRATHROY



* Enter at the third driveway, drive around the back of the property until you come to a paved area with a landscaped island in the centre. Park along the edge of the asphalt. Please observe the speed limit when entering the property.

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