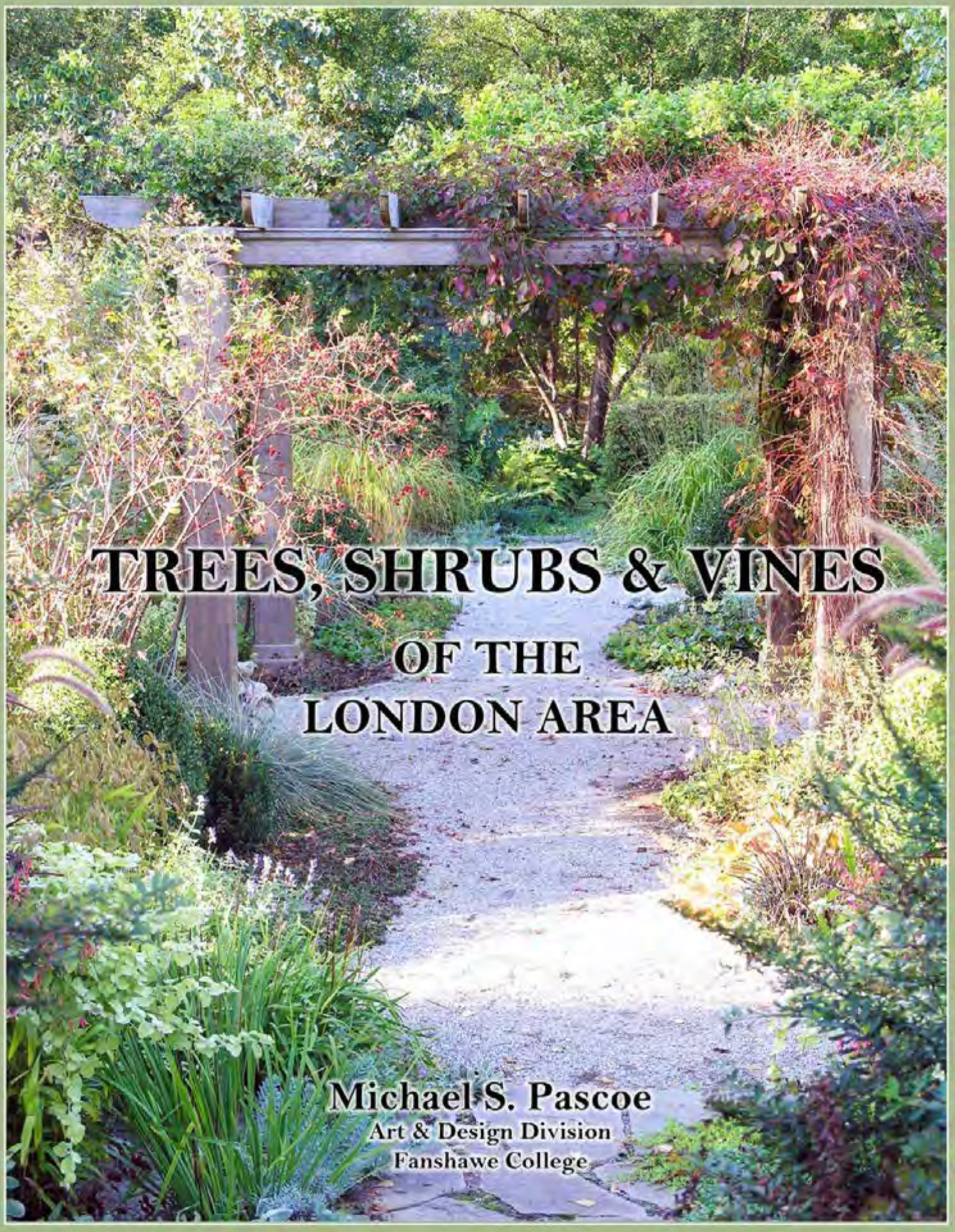

TREES, SHRUBS & VINES

OF THE LONDON AREA

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Art & Design Division
Fanshawe College

TREES, SHRUBS AND VINES
OF THE
LONDON AREA

Fifth Edition, 2002

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Canada

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THE STUDY GUIDE

This study guide is a requirement for WOOD 178 and WOOD 278. Woody Tree, Shrubs and Vines identification courses offered in the programs of Horticulture and Landscape Design at Fanshawe College. The manual will be supplemented with two terms of lectures and guided plant walks as well as the recommended texts listed in the course outline, which is distributed at the start of each course.

Trees and Shrubs of the London Area:

Trees and Shrubs of the London Area can however function as a stand-alone text for those who have a general interest in plants and wish to observe them in local surroundings. The maps in the appendices guide each user to the location of a particular 'woody walk'. The numbers alongside each plant listed indicate the page number for that particular species in Michael Dirr's authoritative reference book, Dirr's Hardy Trees and Shrubs *An Illustrated Encyclopedia*. Additionally a short personal biography is given for each plant based on personal observation and experience. Occasionally the opinion of the author and that of the course reference written by Dirr may be at odds with each other. This opposition of opinion should promote discussion relating to experience, observation, culture and geographic variability.

This publication is divided into two main areas of focus, those being deciduous and evergreen trees/shrubs. Deciduous plants are studied in the autumn semester while evergreens are studied in the winter semester. There will be however, a reinforcing of identification and culture of deciduous species in the winter semester.

Towards the front of this publication is a general introduction to plant nomenclature and how the rules are applied. This is then followed by an introduction to each of the two components (listed above). The plants listed will be discussed in a sequence of walks. However, additions and deletions will occur throughout the course depending on seasonal timing and condition of plants; the learner should be aware of this change.

PLANT NOMENCLATURE

The system of naming plants is very complex with all of us exposed to some degree of it in our lifetimes. There are however, fundamental questions that need to be asked and answered. Why name plants? Why name plants with two different names; the scientific and common name? You will discover as you delve further into this text and plant kingdom that there are distinct differences between a plants common name, which can be mildly familiar and the scientific name, which is often unfamiliar.

The basic difference between a common and a scientific name is that the scientific name is adopted universally while the common name is often regional in nature. For example, an individual in China can talk to you about a specific plant using the scientific name, however, if they used the plant's common name you may have little or no understanding of the conversation or most likely would not be talking about the same plant.

All plants are named under a binomial system developed in the late 1700's by Carl von Linne, who is commonly referred to as Linneaus. This binomial system means that for a plants scientific name there are two main parts. A genus and a specific epithetwhich constitute the species; the species may be further defined by variety, sub species or cultivar. This binomial or twopart name is often called the scientific or Latin name and for the most part has its roots in the Latin, Greek and Italian languages. Plants are also given common names, which in most cases are reliable but as stated earlier are regional or local in nature and may vary from region to region or country to country.

The International Code of Botanical Nomenclature (ICBN) governs plant names using the binomial system worldwide. This governing body sets the parameters for plant naming and ensures that a plant name is adopted universally. Taxonomists, botanists' botanical gardens, educational institutions, researchers, plant breeders and producers may all be involved in the refinement and development of plant names under the auspices of the ICBN.

THE DEVELOPMENT OF A PLANT NAME

GENUS
Group plants together that have more characteristics in common with each other than others do similarities in root, stems, fruit, bloom, buds, leaves etc. The number of plants found under a genus may vary from one, such as the Ginkgo, to Rosa where there are several hundreds.

SPECIES
Embraces the concept that a specific plant has individual characteristics unique to itself, which the name usually alludes to.

VARIETY or SUB SPECIES
A variety is a subclass of the species, which demonstrates a notable difference in nature, which may develop over a period of time. An example of this may be the *Thornless Honey Locust*, which will be discussed later.

CULTIVAR
A group of plants under cultivation that differ in one or more main characteristics from other members of the same species. A cultivar may be derived from an abnormal individual in the wild, developed by hybridization, or selected under cultivation. It is usually perpetuated in cultivation primarily by vegetative propagation or by selection and usually cannot perpetuate itself without human intervention.

COMMON NAMES
Common names are frequently used when discussing plants, however, as previously stated they are sometimes regional in nature. In Ontario for example the Sugar Maple is often referred to as the Hard Maple. If a plant has a cultivar in its scientific name then the cultivar usually composes part of the plants common name. For example, Acer saccharum 'Endowment' would commonly be referred to as the Endowment Sugar Maple or the Endowment Hard Maple.

FAMILY NAMES
Associate similar genera with common characteristics. The size of the family may vary from one genus to several genera, which might include several thousand species such as the Rose family. Family is of minor importance from our professional point of view, however, for this course the student should become familiar with the common families and the general characteristics that places a plant in such families. Often members of the same family may have similar cultural requirements, flower or fruiting structure and form. Recognizing basic families can also assist an individual in keying out an unrecognizable plant in the field.

EXAMPLES:
A plant name then would read as follows: **Genus Species Variety, Sub Species or 'Cultivar'**

If we use the example of the Endowment cultivar of Sugar Maple we see it written as follows:
Acer saccharum since there is no varieties of this tree it is omitted. A cultivar such as Endowment would be written as Acer saccharum 'Endowment'.

*Note: When writing a plant name always observe the following, Genus is capitalized, species is lower case (there are limited exceptions to this rule) and the cultivar is always capitalized and presented in single quotation marks. The Genus and Species should be underlined when using plant names in technical journals or presentations.

If again we use the above example of Endowment Sugar Maple we see it classified as:

Family
Genus
species
"Variety or Cultivar"
Common Name

ACERACEAE *(family)*
Acer *(genus)*
saccharum *(species)*
'Endowment' *(cultivar)*
Endowment Sugar Maple *(common name)*

Some plants will have a variety as well as a cultivar for example the Sunburst Honey Locust is written as follows:

Family
Genus
species
"Variety or Cultivar"
Common Name

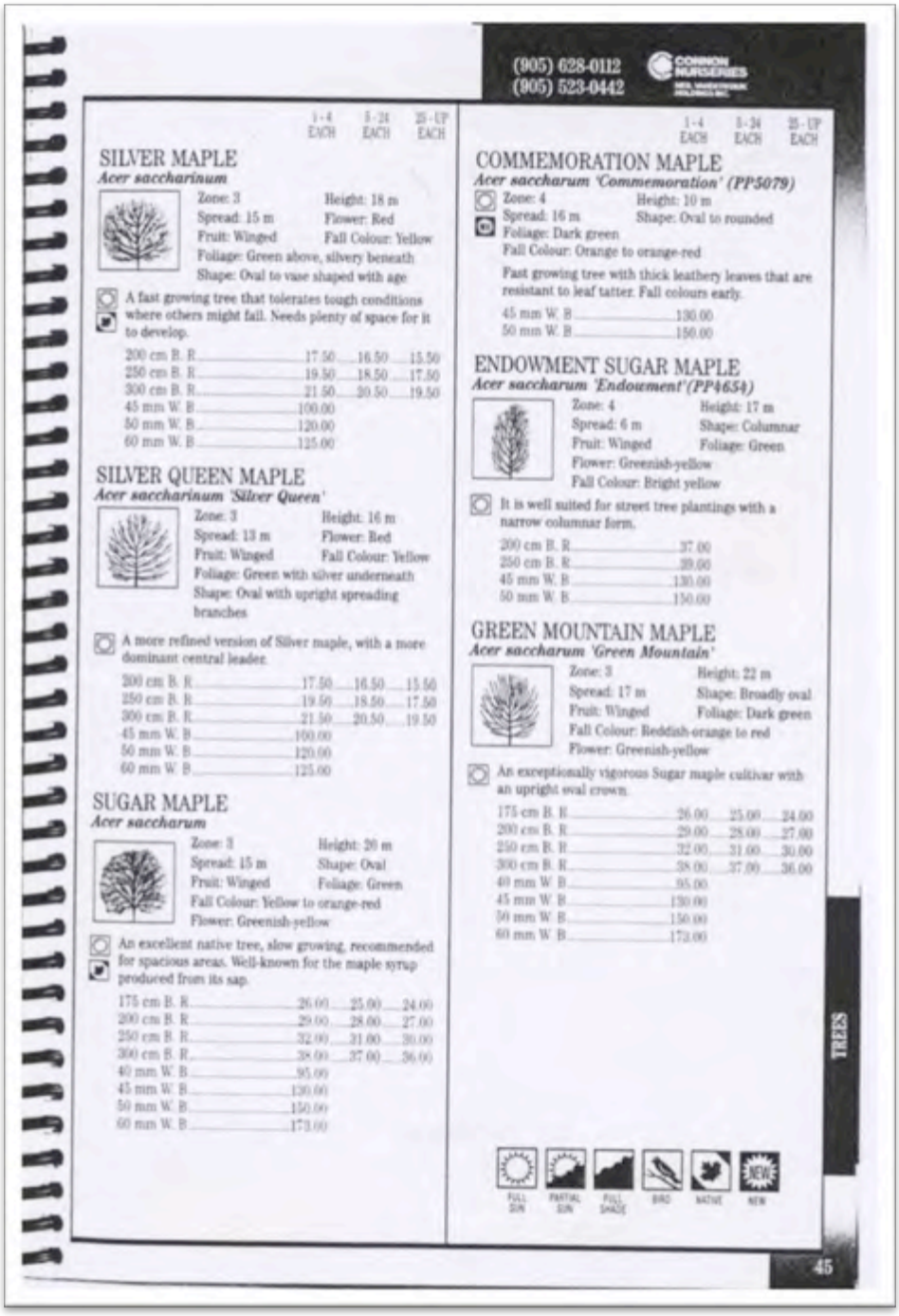
FABACEAE *(family)*
Gleditsia *(genus)*
tricanthos *(species)*
var. inermis *(variety)*
'Sunburst' *(cultivar)*
Sunburst Honey Locust *(common name)*

*Note: Often for the sake of expediency the variety is omitted and the genus and species is not underlined in trade publications and plans.

When using plant names on plans and documents within the landscape trade the genus, species, variety, cultivar and the common name are usually sufficient. The family name has little relevance in landscape design or horticulture production.

CONNONS NURSERY CATALOGUE

In order to emphasise the importance of plant names, relating to the professional trade, a page from a *Connons Nursery Catalogue (NVK Holdings)* is printed below. Please note the use of Common Names and the use of the Genus in alphabetical order. This demonstrates the importance of plant knowledge, both scientific and common, in both the Landscape Design and Horticultural Professions.



(905) 628-0112
(905) 523-0442
CONNON NURSERIES

1-4 EACH | 5-24 EACH | 25-UP EACH

SILVER MAPLE
Acer saccharinum
Zone: 3 | Height: 18 m
Spread: 15 m | Flower: Red
Fruit: Winged | Fall Colour: Yellow
Foliage: Green above, silvery beneath
Shape: Oval to vase shaped with age
A fast growing tree that tolerates tough conditions where others might fail. Needs plenty of space for it to develop.

200 cm B. R.	17.50	16.50	15.50
250 cm B. R.	19.50	18.50	17.50
300 cm B. R.	21.50	20.50	19.50
45 mm W. B.	100.00		
50 mm W. B.	120.00		
60 mm W. B.	125.00		

SILVER QUEEN MAPLE
Acer saccharinum 'Silver Queen'
Zone: 3 | Height: 16 m
Spread: 13 m | Flower: Red
Fruit: Winged | Fall Colour: Yellow
Foliage: Green with silver underneath
Shape: Oval with upright spreading branches
A more refined version of Silver maple, with a more dominant central leader.

200 cm B. R.	17.50	16.50	15.50
250 cm B. R.	19.50	18.50	17.50
300 cm B. R.	21.50	20.50	19.50
45 mm W. B.	100.00		
50 mm W. B.	120.00		
60 mm W. B.	125.00		

SUGAR MAPLE
Acer saccharum
Zone: 3 | Height: 20 m
Spread: 15 m | Shape: Oval
Fruit: Winged | Foliage: Green
Fall Colour: Yellow to orange-red
Flower: Greenish-yellow
An excellent native tree, slow growing, recommended for spacious areas. Well-known for the maple syrup produced from its sap.

175 cm B. R.	26.00	25.00	24.00
200 cm B. R.	29.00	28.00	27.00
250 cm B. R.	32.00	31.00	30.00
300 cm B. R.	38.00	37.00	36.00
40 mm W. B.	95.00		
45 mm W. B.	130.00		
50 mm W. B.	150.00		
60 mm W. B.	173.00		

1-4 EACH | 5-24 EACH | 25-UP EACH

COMMEMORATION MAPLE
Acer saccharum 'Commemoration' (PP5079)
Zone: 4 | Height: 10 m
Spread: 16 m | Shape: Oval to rounded
Foliage: Dark green
Fall Colour: Orange to orange-red
Fast growing tree with thick leathery leaves that are resistant to leaf tatter. Fall colours early.

45 mm W. B.	130.00
50 mm W. B.	150.00

ENDOWMENT SUGAR MAPLE
Acer saccharum 'Endowment' (PP4654)
Zone: 4 | Height: 17 m
Spread: 6 m | Shape: Columnar
Fruit: Winged | Foliage: Green
Flower: Greenish-yellow
Fall Colour: Bright yellow
It is well suited for street tree plantings with a narrow columnar form.

200 cm B. R.	37.00
250 cm B. R.	39.00
45 mm W. B.	130.00
50 mm W. B.	150.00

GREEN MOUNTAIN MAPLE
Acer saccharum 'Green Mountain'
Zone: 3 | Height: 22 m
Spread: 17 m | Shape: Broadly oval
Fruit: Winged | Foliage: Dark green
Fall Colour: Reddish-orange to red
Flower: Greenish-yellow
An exceptionally vigorous Sugar maple cultivar with an upright oval crown.

175 cm B. R.	26.00	25.00	24.00
200 cm B. R.	29.00	28.00	27.00
250 cm B. R.	32.00	31.00	30.00
300 cm B. R.	38.00	37.00	36.00
40 mm W. B.	95.00		
45 mm W. B.	130.00		
50 mm W. B.	150.00		
60 mm W. B.	173.00		

FULL SUN | PARTIAL SUN | FULL SHADE | BIRD | NATIVE | NEW

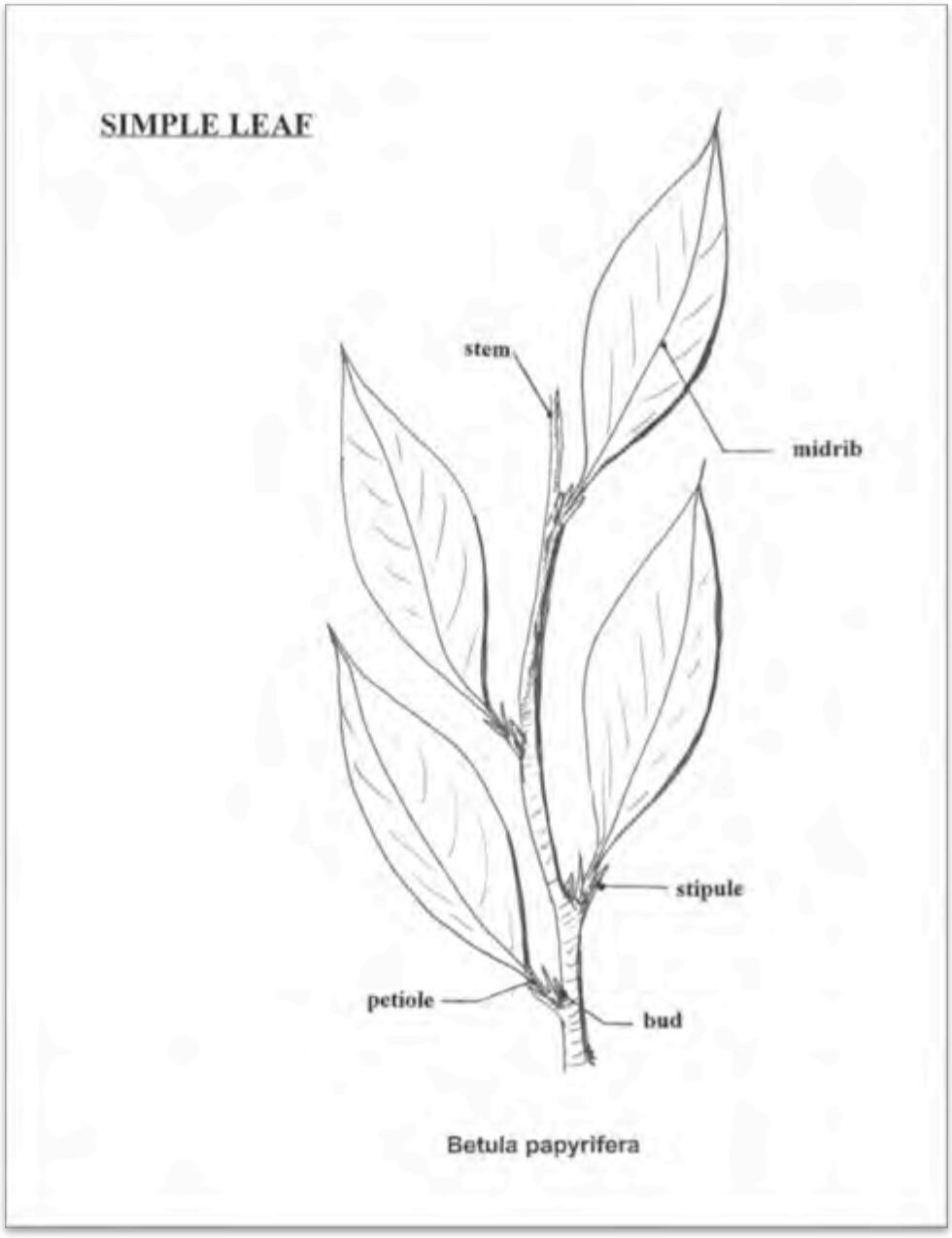
TREES

45

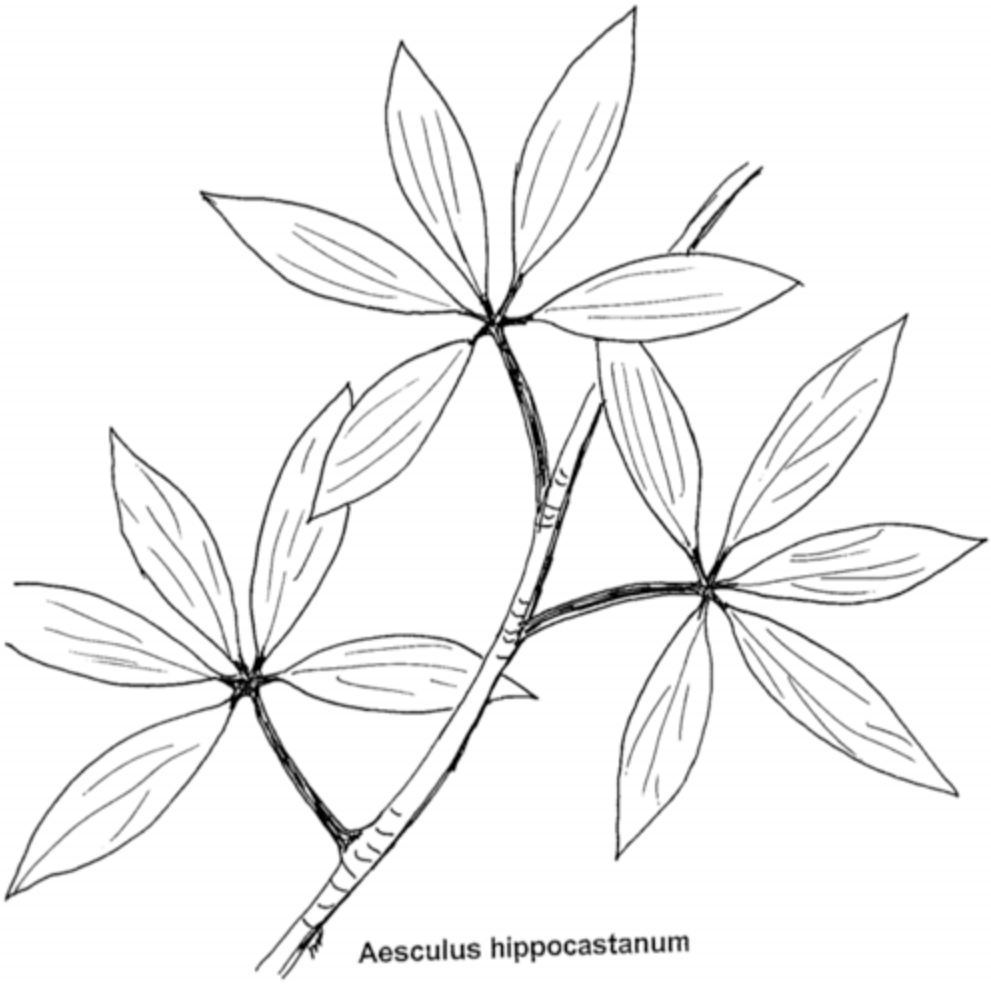
*(Reprinted with the permission Connon Nurseries, NVK Holdings Inc.)

TAXONOMIC TERMINOLOGY

Once a working knowledge of plant names is realised, it is important to be able to record a description of a plant using taxonomic terms. These terms, once understood, can replace filler with a single adjective. The following are some basic terms and diagrams that you should be familiar with in Wood 178 and 278. These terms are by no means conclusive. It is also recommended that you become familiar with other terms found in Dirr's Hardy Trees and Shrubs *An Illustrated Encyclopedia*, by Micheal Dirr.

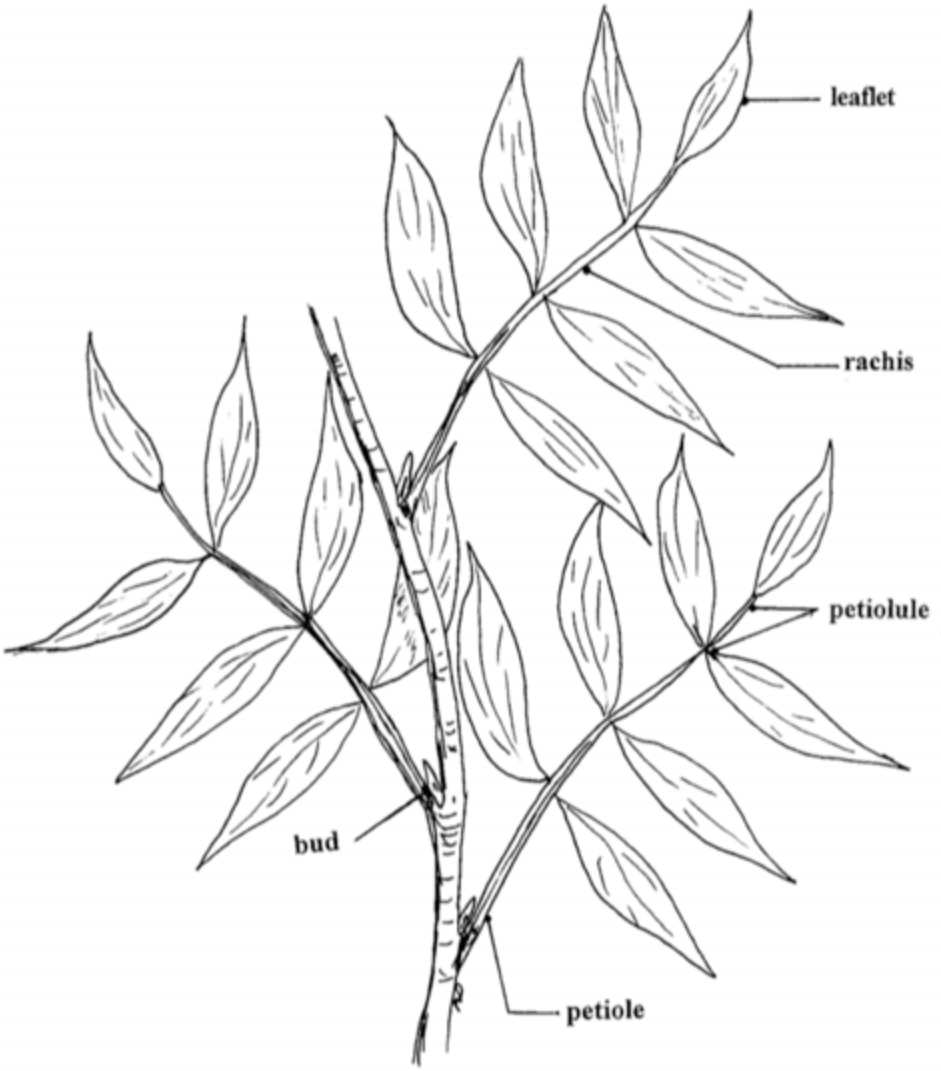


PALMATELY COMPOUND



Aesculus hippocastanum

PINNATELY COMPOUND LEAF



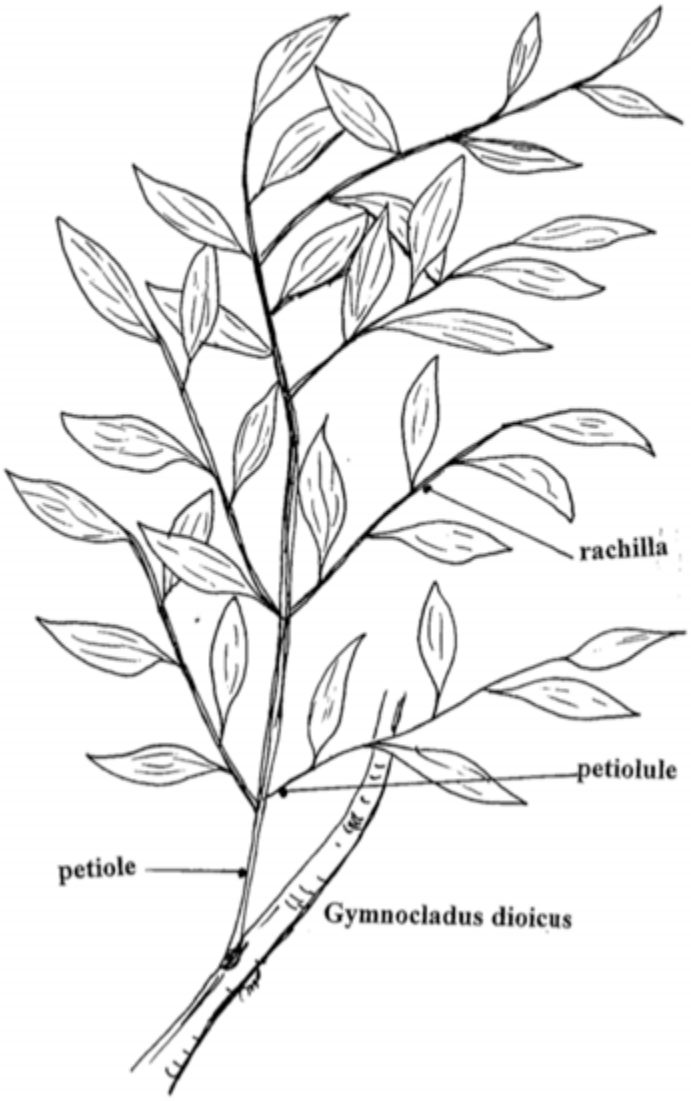
ODD PINNATE

Fraxinus americana

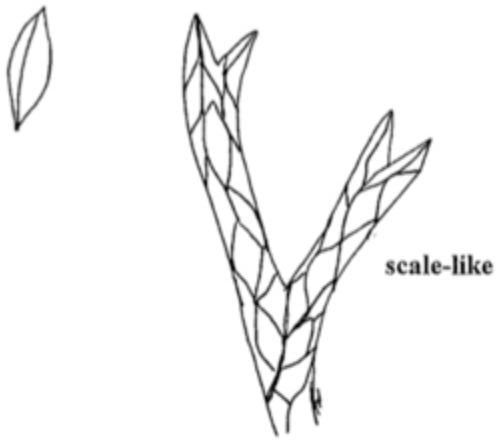
EVEN PINNATE

Gleditsia tricanthos

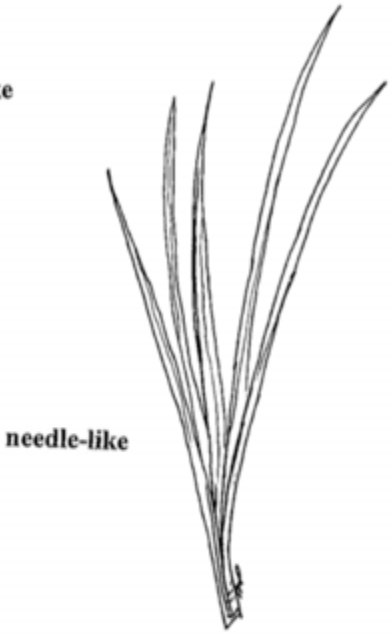
BIPINNATELY COMPOUND



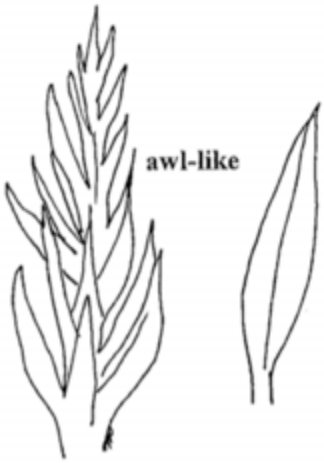
CONIFER FOLIAGE



Thuja occidentalis

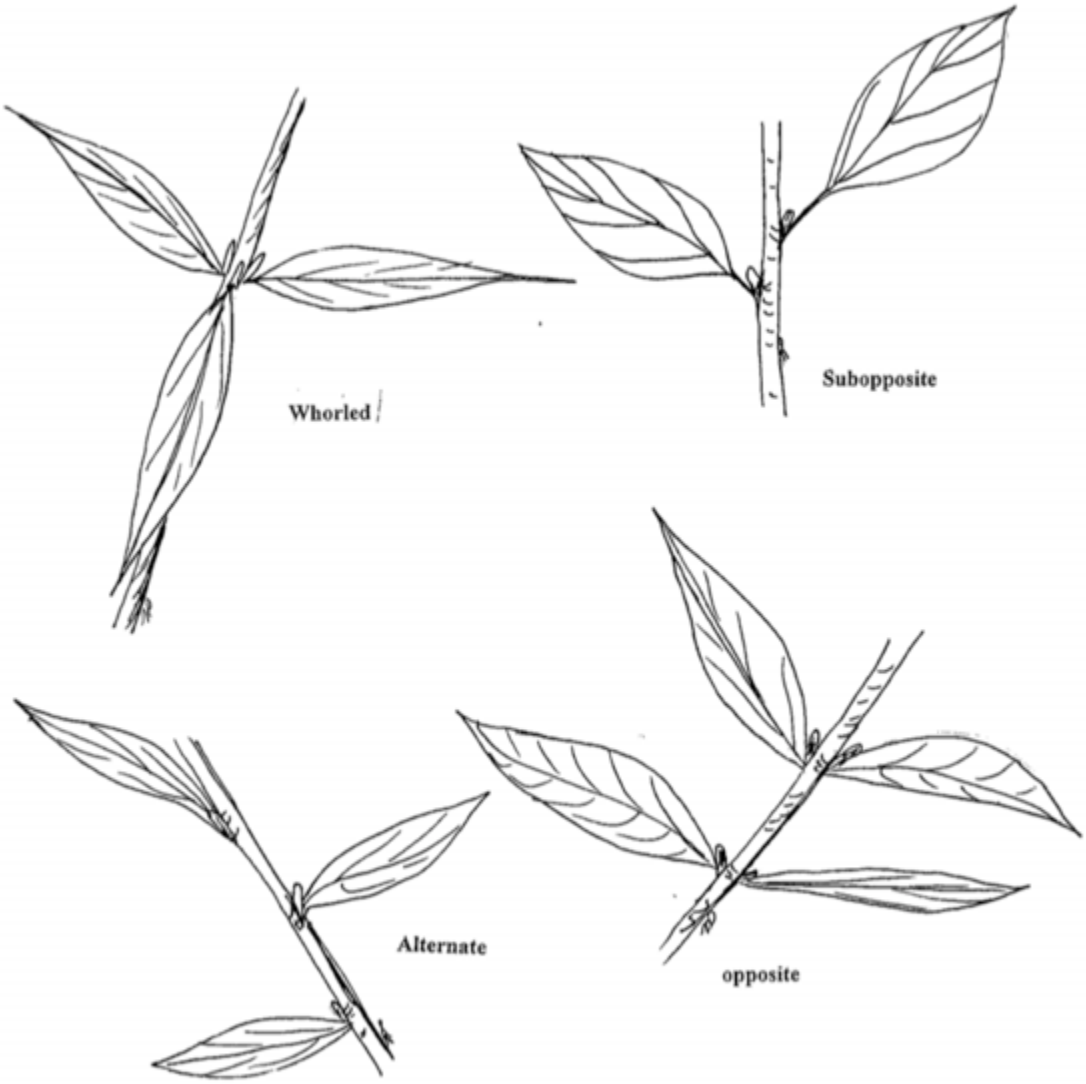


Pinus strobus



Juniperus chinensis

LEAF ARRANGEMENTS



COMMON LEAF SHAPES

Ovate

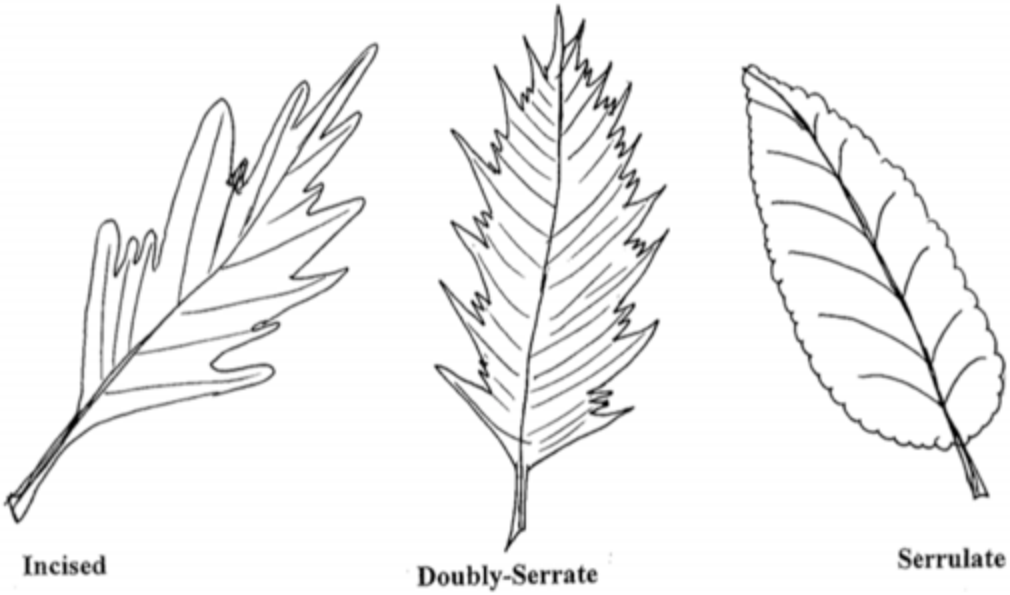
Lanceolate

Elliptical

Cordate

Obovate

COMMON LEAF MARGINS



Incised

Doubly-Serrate

Serrulate

Serrate

Dentate

Entire

COMMON LEAF APICES

Acuminate

Cuspidate

Acute

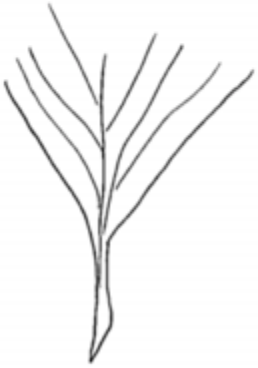
Obtuse

COMMON LEAF BASES

Acute

Cordate

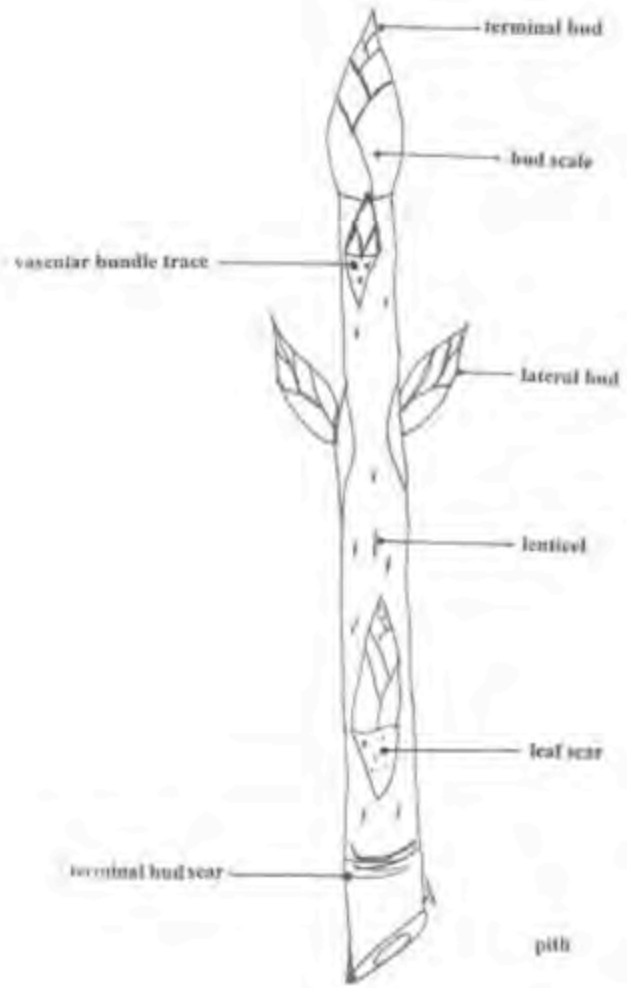
Rounded



Cuneate

Truncate

STEM AND BUD MORPHOLOGY



PLANT HARDINESS ZONES

As you study the page from the Connons Nursery Catalogue, you will note that at the end of the heading for each of the listed genus or cultivar the word in italics, *zone 3*, *zone 4* etc. This denotes the lowest recommended planting zone for that particular plant.

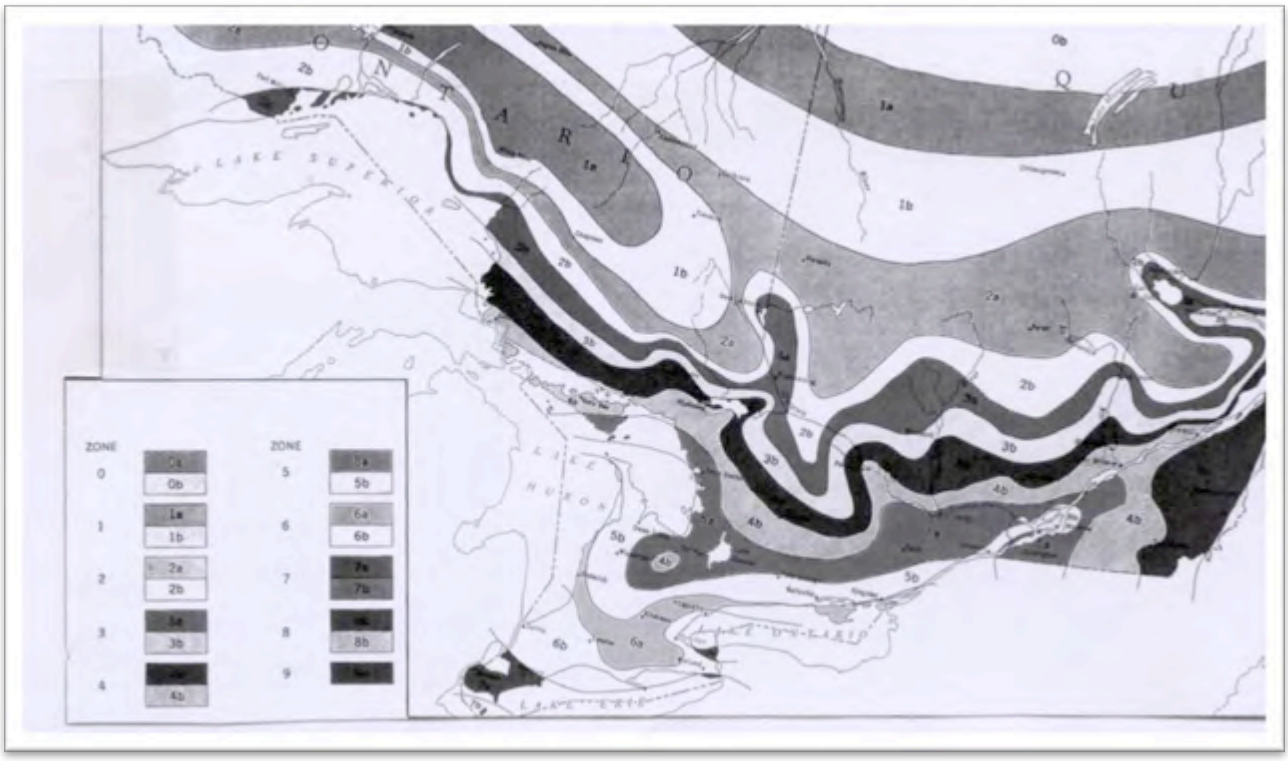
Over a number of years, Canada has developed a mapping system called the Canadian Plant Hardiness Zone Map (See following page for an example of this map). Data relating to temperature has been collected from weather monitoring stations over a number of years. This data was then analysed and an average lowest temperature for an area was determined. This geographic area was then assigned a number based on this temperature. The warmest winter temperature zones are assigned the highest number while the colder regions are assigned a lower number.

Plant survivability of a specific genus, species or cultivar is then assessed in each climatic zone and the plant is assigned a number where it is recommended that plant growth will be successful. This does not mean that a plant cannot and will not survive in a higher climatic zone; in fact it will most likely thrive. In Canada we should be concerned with the colder temperatures that are encountered as we grow plants. We should not however develop a complete reliance on the borders developed on the zone map and further test plants not recommended for the lower zones.

As in nature there are always exceptions to the rules. The zone map of Canada is a very broad assessment of geographic areas and the averaging of the coldest temperatures. Experienced professionals are aware of microclimates within each specific zone where plants not recommended for that area can be cultured with remarkable success, i.e. A zone five rated plant may be grown in a microclimate in zone three. A plant zone should only be used as a guide in selecting plants, experience and knowledge gleaned from seasoned gardeners and professionals may be more pertinent plant hardiness than relying of a broad ranging map of plant zones.

Confusion has resulted in the past with the United States Department of Agriculture Hardiness Zone Map. This map includes Canada in is rating system; however, since it also includes states such as Florida it uses a different numbered rating system. The zones assigned in the Manual of Woody Landscape Plants by Michael Dirr, a recommended text for this course, use the American rating system. The student should be familiar with both zone maps and recognize the London; Ontario assigned zone rating using each of the maps. The USDA Plant Hardiness Zone Map can be found posted in H1033.

CANADIAN PLANT HARDINESS ZONE MAP

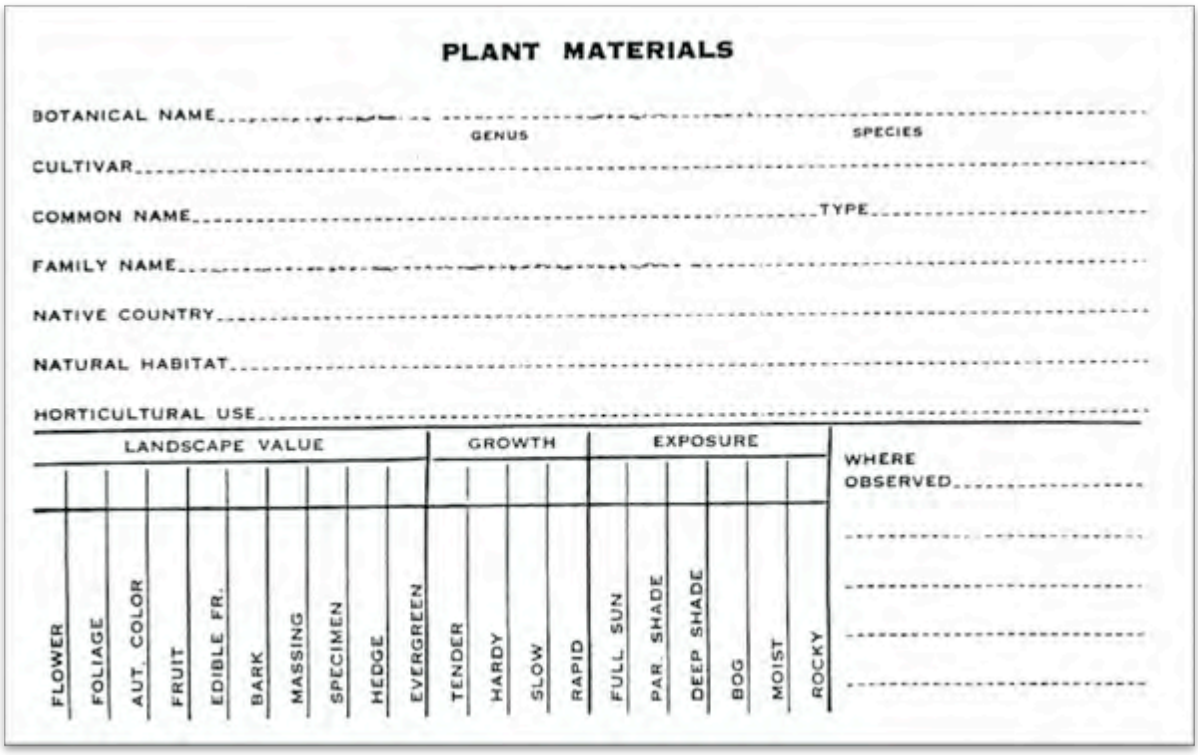


PLANT CARDS

An ideal way of recording plant information and maintaining an ongoing database of this information that is readily available for future reference is through the use of plant cards.

Below is an example of a plant card system and the pertinent information that may be recorded. Additional information may be added to the card as one becomes more familiar with the plant, this might include a photograph of the plant attached to the reverse of the card and notes on personal experience with its use.

Computer database systems are also useful, however, unless they have been personalized, they tend to be less regional and specific in the plant information available. In addition computer systems are not always available at the time you may be drafting a project. Plant cards may be stored in an index box and are convenient and portable for quick reference. Plant cards are available for purchase from the college bookstore.



PLANT MATERIALS

BOTANICAL NAME _____ GENUS _____ SPECIES _____

CULTIVAR _____

COMMON NAME _____ TYPE _____

FAMILY NAME _____

NATIVE COUNTRY _____

NATURAL HABITAT _____

HORTICULTURAL USE _____

LANDSCAPE VALUE											GROWTH				EXPOSURE						WHERE OBSERVED
FLOWER	FOLIAGE	AUT. COLOR	FRUIT	EDIBLE FR.	BARK	MASSING	SPECIMEN	HEDGE	EVERGREEN		TENDER	HARDY	SLOW	RAPID	FULL SUN	PAR. SHADE	DEEP SHADE	BOG	MOIST	ROCKY	

Ministry of Agriculture and Food

ORDER NO. 93-109

DECEMBER 1993
AGDEX 275
17

SELECTING TREES FOR LANDSCAPE PLANTINGS

Reprinted December 1993

(Replaces Factsheets "Native Trees of Ontario for the Landscape", May 1981, "Small Trees for Small Spaces", April 1982, "Trees in our Environment", September 1982, and "Sun Shy Garden Plants", November 1971)

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

When selecting trees for the landscape we must have a clear picture of the purpose for planting the tree. Will it provide visual accent for a home, shade a park bench, break the monotony of a city sidewalk, be a haven for birds or screen the neighbor's view of our patio?

For most of the gardening public the days of large estates and even large city lots are past. As serviced land in metropolitan areas become increasingly expensive we have been forced to build homes on smaller lots. The ranch style or side split of yesterday has been replaced with the narrow back split and the link home.

Changes in house design and lot size have made us look to smaller plants to fulfill design requirements. Deciduous trees which grow 25 m high and 10 m wide are just too big. Since many cities plant a tree in the boulevard in front of the lot, the homeowner does not need and may not have space for a large tree in front of the house.

Large trees are an integral part of many landscape settings. The most important prerequisite in planning for a large tree is that there is ample space for it to grow to full size. Ample space implies both functional distances from buildings and overhead services, and visual distance for scale and design integrity.

Figure 1. This row of Washington hawthorn serves as a visual screen and provides seasonal intrest along the walkway.

The temptation to plant a potentially large shade tree in the back yard must be carefully evaluated before going to the garden centre or talking to the landscape architect. Plan for the family's needs. The desire for a vegetable garden, play spaces for the children, or privicy for an entertaining area may mean that a large tree has no place.

If a large tree doesn't fit into the landscape you have in mind, take heart. There are a number of smaller trees which can fulfill functional and aesthetic roles. A small tree may be more in scale with the design, provide less encumberance on the activities planned, and perhaps will be less intrusive to neighbors as it grows.

When deciding which trees fit your needs, be sure to integrate function with year-round interest and beauty. Trees can function in many ways such as to screen an unwanted view, provide an area of shade during the summer or act as a resting or nesting place for birds. Some have edible fruit too. Trees which have pretty flowers, bright-green disease-free leaves, interesting fruit, vivid fall color and showy bark will be an asset throughout the year.

Soil conditions also have an effect on proper tree selection. If the soil is poorly drained and wet, select a tree that will grow adequately in wet soil. A sugar maple would be a mistake while an ash or silver maple would be appropriate. If in doubt ask at your local nursery or garden centre for trees that will grow well under your conditions.

When selecting a tree, make sure it is winter hardy in your area or in the place you plant it. Agriculture Canada has developed a numbering system for Ontario ranging from zone 1 in the north to zone 7a in the south. These numbers are a guide to the hardiness of a plant. Many nursery catalogues illustrate the hardiness zone map or you can ask your local garden centre for the zone number in your area. A plant listed as being hardy in zone 4 is obviosly hardy in the warmer higher-zone-numbered areas.

The following descriptive lists provide the names, hardiness, sizes and brief cultural notes of some trees useful in Ontario. A nursery, garden centre or landscape architect may suggest additional trees not included here.

Selected list of deciduous trees for small properties

	Hardiness zone	Height (m)	Comments
Acer campestre hedge maple	5b	9	dense tree, yellow fall colour, tolerates heavy pruning, tolerates alkaline soil, few pests
Acer ginnala Amur maple	2b	9	dense tree,red fall colour, toerates heavy pruning, tolerates most soils, few pests
Acer palmatum Japanese maple	6	5	many dwarf, red-leafed and cut-leafed cultivars, red fall colour, very slow growing, sun or partial shade, avoid exposed location, moist loam soil
Acer pensylvanicum striped maple*	2b	10	green and white striped bark, yellowish fall colour, thrives in shade
Amelanchier laevis Alleghany serviceberry*	3b	9	white flowers in early May, tasty red fruit, orange to red fall colour, smooth grey bark, thrives in sun or shade
Carpinus caroliniana bluebeech, musclewood*	3b	10	orange to red fall colour, muscle-like grey bark, thrives in shade, very hard wood, slow to grow after transplanting, few pests
Cercis canadensis eastern redbud*	6	9	pink flowers in May, yellow fall colour, sun or partial shade, moist loam soil
Cladrastis lutea yellowwood	4b	11	white flowers in June, yellow fall colour, smooth grey bark, moist loam soil
Cornus alternifolia alternate-leaf dogwood*	3b	6	small purple fruit, orange to red fall colour, horizontal branching, thrives in sun or shade, moist loam soil
Cornus florida flowering dogwood	6b	10	white flowers in late May, red fruit, purple-red fall colour, horizontal branching, thrives in sun or filtered shade, moist loam soil
Cornus mas corneliancherry dogwood	5b	7	small yellow flowers in late April, red fruit, large shrub or tree, sun or filtered shade
Crataegus phaenopyrum Washington hawthorn	5	7	white flowers in June, red fruit last into winter, glossy green leaves, thorns
Elaeagnus angustifolia Russain-olive	2b	10	small yellow flowers in June, silver green leaves and fruit, grows well in infertile soil, tolerates pruning and highway salt
Hamamelis virginiana witch hazel*	4b	5	yellow flowers in October, yellow fall colour, large shrub or small tree, thrives in sun or shade, moist loam soil
Laburnum x watereri Waterer laburnum	7	5	beautiful yellow flowers in June, broad vase shape, full sun, moist loam soil
Magnolia x soulangiana saucer magnolia	5b	8	showy white, pink or purple flowers (depending on cultivar) in May, full sun, avoid exposure, moist loam soil
Magnolia stellata star magnolia	5b	5	showy white, fragrant flowers in early May, bronze fall colour, slow growing shrub or small tree, full sun, moist loam soil
Malus crabapple	2-5	3-8	many cultivars with white, pink or red flowers and yellow or red fruit, select for disease resistance, full sun, most soils
Ostrya virginiana hophornbeam*	3	10	yellow to orange fall colour, scaly bark, thrives in shade, very hard wood, slow to grow after transplanting, few pests
Prunus maackii Amur choke cherry	2b	8	white flowers in late May, small black fruit, yellow fall colour, handsome bark, full sun, well drained soil
Prunus sargentii Sargent cherry	5	8	pink flowers in May, orange to red fall colour, vase shaped form, handsome bark, full sun, well drained soil
Salix pentandra luarel willow	1	12	glossy green leaves, tolerates heavy pruning, fast growing, thrives in wet soil
Sorbus mountain-ash	3-5	8-11	several species, white flowers in late May, orange to red fruit, disease susceptible, full sun
Syringa reticulata Japanese tree lilac	2	8	white flowers in June, handsome cherry-like bark, full sun, tolerates pollution

** Asterisk indicates tree native to Ontario*

Selected list of deciduous trees for large properties

	Hardiness zone	Height (m)	Comments
Acer platanoides Norway maple	5	15-23	several form and leaf colour cultivars available, casts dense shade, tolerates pollution, and most soils
Acer saccharinum silver maple*	2b	18-27	cutleaf cultivar available, leaves light green on underside, fast growing, thrives in moist to wet soils
Acer saccharum sugar maple*	4	18-27	subtle yellow flowers in early spring, yellow to orange-red fall colour, casts moderate shade, not pollution tolerant, moist loam soil
Betula papyrifera paper birch*	2	15-24	distinct white bark, yellow fall colour, fast growing, moderately short lived, full sun, best on moist loam soil; European white birch simular but slightly shorter lived and slightly drooping form
Catalpa speciosa northern catalpa	5b	12-18	orange-white flowers in late June, long slender pods, large heart-shaped leaves, no fall colour, tolerates dry soil but best on moist loam
Corylus colurna Turkish hazel	5	15	broad pyramid form, scaly bark, tolerates pollution and most soils, few pests
Fagus sylvatica European beech	6	15-24	yellowish-bronze fall colour, moderately slow growing, hard to transplant, smooth grey bark, tolerates heavy pruning when started young, moist loam soil
Fraxinus americana white ash*	3b	15-22	purplish fall colour, fast growing, tolerates moist to wet soils; green ash is simular except for its yellowish fall colour
Ginkgo biloba ginkgo, maidenhair tree	4	12-18	fan shaped leaves, yellow fall colour, tolerates pollution, a long lived tree in its native Orient, few pests; purchase a male clone to avoid fruiting
Gleditsia triacanthos inermis thornless honeycust*	4	15-20	several cultivars available differing only slightly in form, yellow fall colour, fruitless, casts very light shade, survives dry soil but best on moist loam
Liriodendron tulipifera tuliptree*	5b	12-24	greenish-yellow tulip-like flowers, yellow fall colour, somewhat hard to transplant in large size, moist loam soil
Phellodendron amurense Amur corktree	3	10-15	yellow fall colour, black aromatic fruit on some trees, corky bark, tolerates pollution and most soils, few pests
Platanus x acerifolia London planetree	6	18	yellowish-brown fall colour, showy green under bark after peeling, broad massive tree when old, tolerates heavy pruning when started young, tolerates many soils
Quercus rubra red oak*	3	12-25	red through brown fall colour, strong wooded, fast growing amoung oaks, well drained soil
Sophora japonica Japanese pagodatree	6b	7-18	creamy white, fragrent flowers in August, green twigs, casts moderate to light shade, tolerates city conditions
Tilia cordata littleleaf linden	3	12-15	yellowish, fragrant flowers in late June, broad pyramid form, tolerates heavy pruning when started young, several cultivars available

**Asterisk indicates tree native to Ontario*

Selected list of evergreen trees

	Hardiness zone	Height (m)	Comments
Abies concolor white fir	4	18-30	gray-green needles, moderate growth rate, tolerates dry soil but best with adequate moisture, tolerates moderate pollution
Abies lasiocarpa 'Compacta' dwarf Arizona fir	3	6	blue-green needles, slow growing, compact, tolerates dry soil
Chamaecyparis nootkatensis 'Pendula' weeping nootka falsecypress	6b	24-30	medium green needles, moderate growth rate, conspicuous specimen with weeping lateral branches
Juniperus juniper	3-4	5-8	several species, very narrow to broad pyramid shape, bluish green needles, tolerate dry soil and pollution
Metasequoia glyptostroboides dawn redwood	6	18	medium green needles shed each fall, fast growing, fine texture, no insect or disease pests, moist loam soil, tolerates pollution
Picea abies Norway spruce	2b	20-30	dark green needles, long cones, moderately fast growth, tolerates city conditions
Picea glauca 'Conica' dwarf Alberta spruce	4	3	light green needles, very dwarf compact pyramid, very slow growing, may winterburn in very exposed site
Picea omorika Serbian spruce	3b	20-30	needles dark green above and white below, moderate growth rate, more narrow than other spruces, may winterburn in very exposed site
Picea pungens glauca blue Colorado spruce	2	15-25	blue-green needles, several cultivars with bright blue needles, moderate growth rate, tolerates dry soil and highway salt
Pinus cembra Swiss stone pine	2	10-20	dark green needles, narrow pyramid, slow growing, best on loam soil
Pinus nigra Austrian pine	4	12-20	long, dark green needles, moderately fast growing, broad pyramid, tolerates pollution and highway salt
Pinus resinosa red pine*	2b	15-30	needles dark green in summer and lighter in winter, reddish bark, moderate growth rate, thrives on dry sandy soil
Pinus strobus white pine*	2b	20-30	long, soft needles, moderately fast growth, long cones, poor growth on wet alkaline soil, not pollution or highway salt tolerant
Pinus sylvestris Scots pine	2	10-25	medium green needles, moderate growth rate, orange bark when mature, poor growth in wet soil, Christmas tree
Pseudotsuga menziesii glauca Rocky Mountain douglas-fir	3	15-30	bluish green needles, unique bracted cones, moderate growth rate, tolerates dry soil, potential Christmas tree
Thuja occidentalis white-cedar*	2	5-13	dark green needles, moderate growth rate, narrow form, tolerates heavy shearing, not tolerant of highway salt
Tsuga canadensis eastern hemlock*	4	18-23	small dark green needles, moderate growth rate, branch tips nodding, thrives in shade, cool moist soil, tolerates heavy pruning when started young

**Asterisk indicates tree native to Ontario*

12M
ISSN 0225-7882

Ministry of Agriculture and Food
Ontario

ORDER NO. 89-115
MAY 1989
AGDEX 275
Factsheet

PLANTING TREES IN THE LANDSCAPE

(Reprinted January 1993)

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SELECTING THE CORRECT TREE

An important first step in planting a tree is to have selected an appropriate tree for the site. The famous plant explorer E.H. Wilson once said: "There is nothing more laudable than to plant a tree, except to plant two trees, provided the right tree be planted". Soil conditions, hardiness, purpose (accent, shade, screening, bird food, etc.) and design integrity are important considerations before planting a tree. Gardening publications and your local nursery or garden centre are good sources of plant selection information.

Deciding what size of tree to buy will depend on your budget. Purchasing a large tree installed by a landscape contractor will be more expensive than a potted tree from the garden centre. The large tree may provide the instant functional or design result you want while the small tree you planted can be enjoyed as it grows. Whatever the size of tree, proper planting and maintenance practices will insure survival and good growth.

TIME OF YEAR

Spring, when it is only natural for us to be excited about the garden, has been the traditional time for planting trees. However, many trees can be planted successfully in the fall.

When considering the proper planting time we must remember that our preference for sun and warm temperatures conflicts with the optimum time for transplanting. Soil moisture, soil temperature and the inherent nature of the species are the most important factors affecting planting time.

Spring planting should begin as soon as the soil is nicely workable after the winter thaw. Do not dig or work wet soil. Glazing the sides of a wet planting hole will inhibit proper root development into the surrounding soil. Tree planting should **not** wait until Victoria Day weekend. In southern Ontario soil conditions usually are favorable by mid-to-late April. By this time soil temperatures have begun to warm somewhat yet summer droughts are still a long way off. Early planting enables the tree to grow roots before the stress of summer heat.

Species which regenerate roots slowly after transplanting (magnolia, tuliptree, beech, hawthorn, walnut, cherry) should be planted in early spring. Birches should be spring planted also, although their root regeneration is not slow after transplanting.

Fall is a good planting time for many trees. For fall planting to be successful it must be completed early enough for roots to regenerate to support the tree during the winter. Soil temperatures must be warm enough to allow new root growth to start immediately after planting. In southern Ontario Planting in September would allow roots to take advantage of warm soil temps. Once soil temps fall to 5°C root growth is very slow and root regeneration would not occur.

PLANTING PROCEDURES

The Planting Hole Dig the hole large enough to easily accommodate the root system and provide space for the backfill soil. Never twist or bend the root system to fit into a small hole. The hole should be at least 30 cm wider than the soil ball or up to 60 cm for large root balls. Time spent in digging an adequately large planting hole will be rewarded by future growth of the tree.

Planting Depth When installing any tree whether from a container or in a soil ball plant it at the same depth or slightly above that it grew in the nursery. Planting too deep or settling as a result of improper planting results in insufficient soil oxygen and retarded root growth. In poorly drained soils it is better to plant 10 to 15 cm or more above grade by mounding the soil. This allows better aeration for root growth. Do not place loose soil under the soil ball. Excavate only deep enough so that the root ball will be at or slightly above grade. This ensures that the tree will not settle resulting in insufficient aeration.

Drainage Internal drainage of the soil is important for good root growth. In heavy clay soil water usually drains from the planting hole very slowly, resulting in insufficient oxygen to support root growth. Too much water accounts for losses of transplanted trees more often than too little water. Solving the inadequate drainage problem is not easy. A drainage system extending below and away from the planting hole, such as a dry well or French drain, is rarely effective or worth the effort and expense of construction. As alternatives plant above grade or in raised beds to allow the tree roots to grow above the wet soil. Also, select plants that tolerate high levels of soil water. Even in adequately drained soils it is a good practice to plant slightly higher than the tree grew in the nursery. This allows the new roots to grow closer to the surface where soil oxygen is more available.

Soil Preparation Good growth and establishment of a transplanted tree depends to a great extent on the soil conditions. A planting site that is poorly drained and constantly wet or that is very hot and dry will be detrimental to proper tree growth.

It is always best to use the soil that was dug out of the hole for planting. A "foreign" soil high in organic matter should not be used. The use of organic matter such as peat or compost mixed liberally with the planting soil has been questioned. Research has shown that organic amendments do not benefit and may retard tree growth after planting. In a clay soil the addition of organic matter results in excessive moisture retention. In a sandy soil organic matter helps to retain water but results in increased capillary movement away from the young developing roots. Organic matter is beneficial for amending extended and continuous planting space for raised beds.

Fertilizing the Backfill Soil The benefit of mixing a complete fertilizer into the planting hole has been questioned by professional horticulturists. If you are planting into an area that has been fertilized frequently (a lawn) nutrition will be adequate at planting time. In a new home site a complete fertilizer high in phosphorus may be beneficial. Mix 75 grams of complete fertilizer or 20% superphosphate per 36 litres (1 bushel) of soil. Be sure the fertilizer does not contain herbicides. An easier alternative is to use a water soluble fertilizer high in nitrogen when watering the tree. Use as directed by the manufacturer.

Removing the Container Trees purchased in plastic, metal or fabric containers must have the container removed before planting. The roots should be left intact or loosened only slightly. Be sure that the roots do not dry out prior to backfilling the hole. Trees purchased in "plantable" or biodegradable pots may be planted in the container. Garden centres usually recommend leaving the pot on because spring purchased trees do not have a solid root ball. Be sure to remove the upper rim of the pot and make numerous holes in the sides so the pot will break-down more quickly and so roots will have holes to grow out of. If the "plantable" container is removed it should be cut away carefully after the tree is in the planting hole.

Balled in burlap trees should have the rope removed from around the trunk once the soil ball is properly in the hole and partially backfilled. If the rope is not removed it will constrict and girdle the trunk as it grows. Large trees are often inserted in wire baskets by the nursery to aid transport and maintain an intact soil ball. Wire loops folded in toward the trunk should be removed. Intact wire baskets under the soil will not damage the tree or its roots.

Backfilling and Watering When filling the hole tamp the soil lightly to insure good soil/root contact. If the soil is very wet delay planting. Do not compact wet soil. In most cases it is advisable to shape the soil to make a shallow saucer slightly inside the margin of the hole. This saucer facilitates water penetration when watering. Where water may accumulate in the saucer or where numerous waterings during the first growing season will not be necessary remove the saucer after several waterings. Thorough watering at planting helps to settle loose soil and supplies moisture to the roots.

PROCEDURES AFTER PLANTING

Staking Rigid staking for two to three years results in poor trunk development, so stake only if necessary. It may be necessary to take a bareroot or large tree in order to prevent it from being blown over by the wind. Small trees rarely need to be staked. In most instances one rigid stake placed 15 cm away from the trunk is sufficient. An old piece of garden hose threaded with wire makes a good tie that will not injure the trunk. Remove the tie and stake after one growing season. If staking for more than one season is necessary soil conditions are adversely affecting proper root growth.

Watering The most common cause of tree failure is related to watering practices. Overwatering kills trees more than underwatering. Watering should relate to the soil, the plant and the environment.

If the soil is clay water remains for extended periods. This often results in waterlogging. When the soil is waterlogged root growth can not occur. Without adequate root growth the tree will not survive.

Some species of trees survive and grow adequately in very moist soil that is low in oxygen. Trees such as red and silver maple, ash, linden, willow and sycamore (planetree) survive very moist soil provided initial root growth has occurred after planting.

During the first growing season a thorough watering once a week is not usually too much provided no appreciable rain has fallen. Check the soil. If it is adequately moist 2 to 3 cm below the surface do not water. If your new tree is in a lawn a light sprinkling of the grass will not provide adequate water for the tree's root zone.

Mulching A mulch such as bark or stone chips around the tree, extending somewhat beyond the width of the planting hole, reduces weed growth and conserves moisture. A mulch also delays soil freezing in the fall and thawing in the spring. The mulch should be approximately 5 to 7 cm thick. If the mulch layer is too deep it may retard the movement of oxygen into the soil. On poorly drained soil it may be best to use a very thin layer or no mulch at all, because of excess water and low soil oxygen levels. A mulch layer such as sphagnum peat should be avoided. When it dries-out water is shed rather than penetrating through into the soil.

Pruning Extensive top pruning at transplanting time should be avoided because it will hinder root regeneration and delay establishment. Selectively prune any broken branches, those that are too closely spaced or one that may compete with the central leader. After one to two growing seasons, when the tree has become established, it may be pruned. Remove limbs with narrow crotch angles and those that are still too closely spaced. An authoritative pruning manual will be your guide to proper pruning. With a small amount of corrective pruning in the early years most trees will not require extensive pruning

for many years. As the tree matures a professional arborist can be contacted.

Pest Control Be on the alert for insect and disease problems. Do not indiscriminately spray the tree because you think the tree may have something. Have the something identified by a local nursery, garden centre or professional horticulturist, then follow the most appropriate control procedures. In areas where rodents may be a problem keep the base of the trees free of tall grass and weeds, install a tree guard or apply a repellent.

Winter Protection Most trees are able to withstand winter conditions. Trunk splitting is due to differential expansion as a result of extensive ice formation or extreme temperature fluctuations on the sunlit side of the trunk. Recently planted trees, particularly those species that are susceptable to winter front cracking (Norway maple and planetree) may benefit from a protective wrap on the trunk. Splitting as a result of high water content in the trunk from a wet fall will not be prevented by a trunk wrap. One of the best ways to provide winter protection is to see that the tree does well during the growing season. Carbohydrates manufactured in the tree and absorbed nutrients are important for the natural process of winter acclimation.

Fertilizing after Planting Newly-planted trees will benefit from proper fertilization. Although there are differences of opinions many professional horticulturists agree that surface fertilization is a good method. If you did not mix a complete fertilizer with the backfill soil, evenly distribute a high nitrogen fertilizer to the surface of the planting hole area. Apply 50 grams of a 20% nitrogen or 100 grams of a 10% nitrogen fertilizer per square metre. This amount will be sufficient for the year of planting.

Water soluble fertilizer applied with the water for the tree is an alternative to dry fertilizer. Soluble nutrients reach the root system quickly but also leach away quickly, thus multiple applications during the season are necessary. Use soluble fertilizer as directed by the manufacturer.

RELAX

Now that your trees have been planted properly sit back and enjoy them. Remember that some maintenance in the years after planting will insure good growth.

WOODY PLANT WALKS

Learners are expected to participate in field studies using the 'Woody Walk' lists found in this publication. Approximately eight walks will be given in each of the semesters. Deciduous plants will be covered in the September semester while Evergreens will be taught in the January semester. The walks are listed in sequence and will be studied unless otherwise advised. Each list has a map reference in the appendices, which will identify the departure point for each lecture. Please be prepared for the weather and be prompt, as lectures will start on schedule.

Walks will occur in all whether conditions and over a variety of terrain; please be prepared. Note taking should be kept to a minimum to enable you to focus on the lecture component of the walk. Ideally plant cards may be used and as much information pre-recorded on them as possible.

Students in previous courses have found that the use of personal tape recorders, cameras and video cameras are helpful during the walks. You will be encouraged to collect and record plant information from sources other than the plant walks, as there is variability in plant growth characteristics from one location to the next. In public areas an individual designated by the instructors may collect a sample, which will be displayed in the classroom. Samples collected in the field may be identified by masking tape affixed to the stem with the Dirr reference number recorded on the tape. In non-public study locations this may not be permitted. Learners will be instructed on proper collection techniques in the field.

A common schedule for Wood 178 and 278 is two classes of 'Woody Plant Walks' followed by an in class test.

WOODY PLANT WALK ONE
FANSHAWE COLLEGE

16	Acer campestre		Hedge Maple
17	Acer ginnala		Amur Maple
18	Acer griseum		Paperbark Maple
24	Acer rubrum		Red Maple
41	Amelanchier canadensis		Shadblow Serviceberry
78	Caryopteris X clandonensis	'Kew Blue'	Kew Blue Spirea
(247)	Cornus alba	'Sibirica Variegata'	Siberian Varigated Dogwood
(262)	Cornus kousa	var. chinensis	Kousa Dogwood
(339)	Elaeagnus commutata		Wolf-Willow
164	Fraxinus pensylvanica	'Marshall's	Marshall's Seedless Ash Seedless
167	Ginkgo biloba		Maidenhair Tree
168	Gleditsia triacanthos 'Sunburst'	var. inermis	Sunburst Honey Locust
168	Gleditsia triacanthos	var. inermis 'Shademaster'	Shademaster Honey Locust
176	Hamamelis virginiana		Common Witchhazel
183	Hydrangea arborescens	'Annabelle'	Annabelle Hydrangea
(449)	Hydrangea paniculata	'Kyushu'	Kyushu Panicle Hydrangea
190	Hypericum prolificum		Shrubby St. Johnswort
216	Kerria japonica	'Pleniflora'	Double Flowering Spirea
220	Larix decidua		European Larch
254	Metasequoia glyptostroboides		Dawn Redwood
326	Quercus robur	'Fastigiata'	Columnar English Oak
	Sorbus sorbifoia		Swedish Mountainash

390	Syringa reticulata	'Ivory Silk'	Silk Ivory Japanese Tree Lilac
420	Viburnum dentatum		Arrowwood Viburnum
424	Viburnum lantana	'Mohican'	Mohican Viburnum

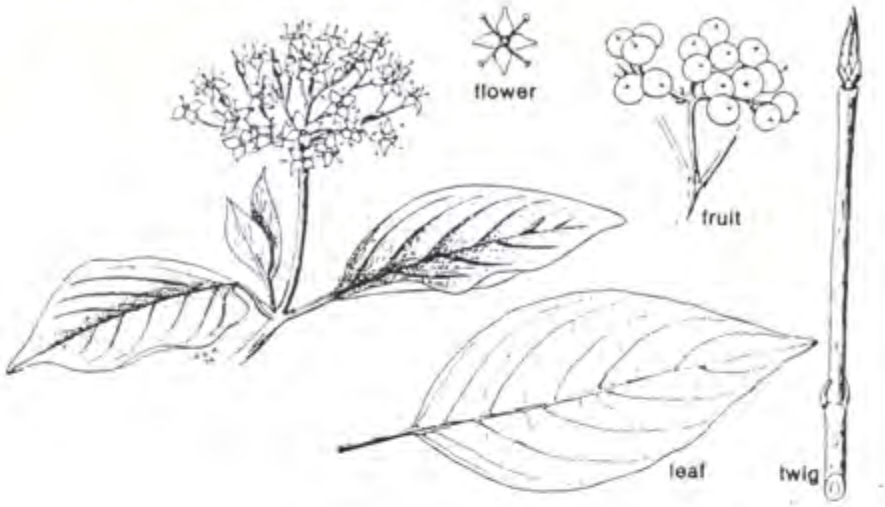
WOODY PLANT WALK TWO
FANSHAWE COLLEGE

21	Acer palmatum	var. atropurpureum 'Bloodgood'	Bloodgood Japanese Maple
41	Amelanchier canadensis		Shadblow Serviceberry
(144)	Buddleia davidii	'Purple Prince'	Purple Prince Butterfly Bush
102	Cornus alba	'Elegantissima'	Silverleaf Dogwood
110	Cornus sericea		Redosier Dogwood
148	Euonymus alatus	'Compactus'	Winged Euonymus
158	Forsythia X intermedia		Border Forsythia
218	Koelreuteria paniculata		Panicled Goldenrain Tree
219	Kolkwtzia amabilis		Beautybush
224	Ligustrum amurense		Amur Privet
242	Magnolia X soulangiana		Saucer Magnolia
264	Parthenocissus quinquefolia		Virginia Creeper
267	Philadelphus coronarius	'Aureus'	Golden Mock Orange
(705)	Philadelphus coronarius	'Snowflake'	Snowflake Mockorange
290	Polygonum aubertii		Silver-Vine Fleeceflower
294	Potentilla fruiticosa	'Goldfinger"	Goldfinger Potentilla
(779)	Prunus X cistena		Sandchery
339	Rhodotypos scandens		Black Jetbead
367	Sorbaria sorbifolia		Ural Falsespirea
372	Spiraea X bumalda	'Goldflame'	Goldflame Spiraea
373	Spiraea japonica	'Little Princess'	Little Princess Spirea
372	Spiraea japonica	'Goldmound'	Goldmound Spiraea

374	Spiraea nipponica	'Snowmound'	Snowmound Nippon Spirea
391	Syringa vulgaris		Common Lilac
420	Viburnum carlessii		Koreanspice Viburnum
425	Viburnum opulus		European Cranberrybush Viburnum
(1094)	Weigela florida	'Bristol Ruby'	Bristol Ruby Weigela
439	Wisteria sinensis		Chinese Wisteria
440	Xanthoceras sorbifolium		Yellowhorn

this Native Plant ... Jim Pringle

Red-osier dogwood brightens winter landscape



Cornus sericea.

Illustration from Ryan, A.G. *Native Trees and Shrubs of Newfoundland and Labrador*, p. 31

Cornus sericea is the same red-osier dogwood that has long been known as *C. stolonifera*. The change was dictated by an amendment to the International Code of Botanical Nomenclature that was intended to replace a vague provision that had permitted conflicting interpretations of certain nomenclatural problems to persist indefinitely. In recent years, the name *C. sericea* has become commonly used in standard references, horticultural as well as botanical.

Red-osier dogwood is an attractive component of the landscape throughout the year. It is especially notable in winter, after the leaves have fallen, because of its distinctive red stems. These, especially the young twigs and branchlets, become brighter red during the cold season.

This species is usually found in swamps or at least in low places where the soil is reliably moist, although it is sufficiently tolerant of mesic conditions to be useful as an ornamental. Red-osier dogwood shrubs reach a height of 1 to 3 metres and, when allowed to assume their natural form, may eventually form patches or thickets. The former name *C. stolonifera* refers to its spreading by means of prostrate or shallowly subterranean branches, which give rise to roots and new upright stems at increasing distances from the original centre of the plant.

To beginning naturalists, the relationship of red-osier dogwood to the well-known flowering dogwood, *C. florida*, may not be evident, because red-osier dogwood lacks the four large, petal-like bracts that surround the true flower-clusters of flowering dogwood. The true flowers, however, are similar in structure, each having four small, basally united sepals, four basally united petals equal in size and shape, four stamens, and one pistil with an inferior ovary that becomes a one-seeded, berry-like drupe. The leaves likewise indicate the relationship of this species to other dogwoods, having the distinctive *Cornus* combination of entire (non-toothed) leaf margins and pinnately arranged secondary veins that curve and closely parallel the margin.

Although lacking petal-like bracts, red-osier dogwood nevertheless presents an attractive floral display in early summer with its numerous creamy white flowers in broadly rounded to nearly flat-topped clusters. The fruits are 7 to 9 mm in diameter, white or slightly greyish, borne on reddish stalks. These fruits are often eaten by birds. The white fruits present an attractive combination with the reddish-purple leaves in autumn.

Because its red branchlets contribute colour to the winter landscape, red-osier dogwood is sometimes cultivated as an ornamental shrub. Individual clones can be selected for especially attractive winter colour. A closely related Asiatic species, *C. alba*, which likewise has red twigs, is more commonly cultivated; not having the stoloniferous habit of *C. sericea*, it forms more compact shrubs and presents no problem of unwanted spreading. Ironically, therefore, the native *C. sericea* is perhaps more commonly represented in cultivation by the cultivar 'Flaviramea', selected for its yellow twig colour. *Cornus stolonifera*, however, has superior winter colour, and is preferred where there is room for it to form patches or thickets.

Along the RBG trails, red-osier dogwood is a common species in moist to wet places, including Hickory Valley and the swampy area below the Teaching Garden. One of the most attractive specimens, as observed over several winters, is in a small valley just west of the Pinetum. ❧

WOODY PLANT WALK THREE
FANSHAWE COLLEGE

22	Acer platanoides		Norway Maple
34	Ailianthus altissima		Tree of Heaven
41	Amelanchier canadensis		Shadblow Serviceberry
(93)	Amelanchier alnifolia		Saskatoon Serviceberry
58	Betula pendula	'Dalecarlica'	Dalecarica European Birch
88	Cercis canadensis		Eastern Redbud
104	Cornus florida		Flowering Dogwood
127	Craetagus X mordensis	'Toba'	Toba Hawthorn
142	Elaeagnus angustifolia		Russian Olive
144	Elaeagnus umbellata		Autumn Olive
156	Fagus sylvatica	'Fastigiata'	Columnar European Beech
163	Fraxinus americana		White Ash
164	Fraxinus pensylvanica		Green Ash
164	Fraxinus pensylvanica	'Patmore'	Patmore Ash
182	Hydrangea anomala	ssp. petiolaris	Climbing Hydrangea
(452)	Hypericum kalmianum		Kalm St. Johnswort
203	Juglans nigra		Black Walnut
216	Kerria japonica	'Pleniflora'	Double Flowering Kerria
228	Liriodendron tulipifera		Tulip Tree
(635)	Malus baccata	'Columnaris'	Columnar Siberian Crabapple
263	Parrotia persica		Persian Parrotia
344	Ribes odoratum		Clove Currant
370	Sorbus aucuparia		European Mountainash

(983)	Syringa patula	'Miss Kim'	Miss Kim Lilac
403	Tilia cordata		Littleleaf Linden
435	Viburnum trilobum		American Cranberrybush Viburnum
435	Viburnum trilobum	'Bailey Compact'	Bailey Compact Viburnum
(1094)	Weigela florida	'Variegata'	Old Fashion Weigela

ALLELOPATHY

Some landscape plants such as Juglans and various Carya species are allelopathic; produce a toxic substance that will suppress the growth of some species of plants within the underlying canopy area. The specific substance produced by Juglans nigra (Black Walnut) and related species is called hydrojuglone, which oxidizes into a toxic substance called juglone. This chemical is of concern when trees are encountered in the landscape, as it will limit what may be grown under or near them. Professionals are left with only two solutions to the problem, one being removal of the problem tree and the other, planting Juglone tolerant plants such as those listed below. Mature Juglans and Carya species present dramatic forms in the landscape and every effort should be made to retain healthy trees. Further reading is provided in the Ministry of Agriculture and Food information bulletin entitled Black Walnut Toxicity included in this manual.

JUGLONE TOLERANT PLANTS

HERBACEOUS PERENNIALS

Ajuga reptans	Bugleweed
Alcea rosea	Hollyhock
Arisaema triphyllum	Jack-in-the-Pulpit
Asarum canadense	Wild Ginger
Astilbe X	Garden Astilbe
Athyrium	Lady Fern
Campanula latifolia	Bellflower
Chrysanthemum sp.	Garden Mums
Doronicum sp.	Leopard's Bane
Dryopteris cristata	Shield Fern
Epimedium sp.	Barrenwort
Galium odoratum	Sweet Woodruff
Geranium sp.	Garden Geraniums
Helianthus tuberosus	Jerusalem Artichoke
Helleborus sp.	Garden Hellebore
Hemerocallis sp.	Daylily
Heuchera sp.	Coral Bells
Hosta fortunei 'Glauca'	
Hosta lancifolia	
Hosta marginata	
Hosta undulata 'Variegata'	
Iris siberica	Siberian Iris
Matteuccia struthiopteris	Ostrich Fern
Mertensia virginica	Virginia Bluebells
Monarda didyma	Bee Balm
Myosotis sylvatica	Garden-forget-me-not
Oenothera fruticosa	Common Sundrops
Onoclea sensibilis	Sensitive Fern

Osmunda cinnamonea	Cinnamon Fern
Phlox sp.	Summer Phlox
Poa sp.	Blue Grass
Podophyllum peltatum	Mayapple
Polemonium reptans	Jacobs Ladder
Polygonatum commutatum	Solomon's Seal
Polystichum sp.	Christmas Fern
Primula sp.	Garden Primrose
Pulmonaria sp.	Lungwort
Sanguinaria canadensis	Bloodroot
Sedum sp.	Sedum
Stachys sp.	Lamb's Ears
Tradescantia virginiana	Spiderwort
Trillium sp.	Trillium
Uvularia sp.	Uvularia
Viola sp.	Violets
Vinca minor	Common Periwinkle

JUGLONE TOLERANT PLANTS

BULBS

Chionodoxa luciliae	Glory of the Snow
Crocus sp.	Garden Crocus
Endymion hispanicus	Spanish Bluebell
Eranthis hyemalis	Winter Aconite
Galanthus sp.	Snowdrops
Hyacinthus sp.	Hyacinthus
Muscari sp.	Grape Hyacinth
Narcissus sp.	Daffodils
Scilla siberica	Siberian Squill
Tulipa sp.	Tulips

JUGLONE TOLERANT PLANTS

TREES

Acer palmatum	Japanese Maple
Carya sp.	Hickories
Catalpa sp.	Catalpa
Juniperus virginiana	Red Cedar
Picea abies	Norway Spruce
Quercus sp.	Oaks
Syringa sp.	Lilac
Tsuga canadensis	Canada Hemlock

JUGLONE TOLERANT PLANTS

VINES AND SHRUBS

Clematis sp.	Clematis
Daphne mezereum	Daphne
Euonymus alatus	Burning Bush
Forsythia sp.	Forsythia
Hibiscus syriacus	Rose of Sharon
Kolkwitzia amabilis	Beauty Bush
Lonicera tatarica	Tattarian Honeysuckle
Parthenocissus quinquefolia	Virginia Creeper
Philadelphus sp.	Mockorange
Rhododendron	
'Pinxterbloom'	
'Gibraltar'	
'Balzac'	
Rubus occidentalis	Black Raspberry
Viburnum lantana	Wayfaring Tree

JUGLONE TOLERANT PLANTS

ANNUALS

Begonia sp.	Calendula sp.
Ipomea sp.	Viola sp.

Note: Where a Genus is listed most species are also tolerant of Juglone, additionally; where a species is listed most cultivars of that specific species will be tolerant of Juglone.

Ministry of Agriculture and Food
Ontario

ORDER NO. 84-050
NOVEMBER 1984
AGDEX 246
80

Factsheet

BLACK WALNUT TOXICITY

(Reprinted February 1992)

Olga Piedrahita, Horticultural Research Institute of Ontario, Vineland Station

INTRODUCTION

Walnut toxicity has been known for centuries. In 37 A.D. Plinius noted that the "shadow" of the Persian walnut was poisonous to other vegetation. However, it was not until 1928 that juglone, a toxic compound, was isolated from black walnuts and reported to be toxic to some plants. Juglone has been isolated from many plants in the walnut and hickory families including: Persian walnut *(Juglans negia),* black walnut *(J. nigra),* butternut *(J. cinerea* and *J. sieboldiana),* as well as the hickories *(Carya ovata, C. alba, C. olivaeformis,* and *Pterocarya caucasica).*

Juglone has been isolated from the roots, leaves, bark and husks of the nuts of the black walnut. However, toxicity has only been observed when roots of the black walnut make direct contact with roots of susceptible plants.

SYMPTOMS

Plants may grow for several weeks to several years before any injury from black walnut toxicity occurs. When injury occurs, the first symptom observed is flagging of terminal growing points, followed by wilting of a portion, or all, of the plant. Wilting occurs very rapidly and is not reversible. Some plants may have a mild tolerance to black walnuts and show stunted growth, lack of flower development and reduced vigor.

Figure 1. One row of tomato plants showing walnut toxicity symptoms. Diseased plants are stunted in growth and wilted.

Walnut toxicity has been extensively studied in tomatoes. Tomato plants affected with walnut toxicity show xylem vessels filled with tyloses (calluses). These tyloses increase in numbers until water movement is blocked and wilting occurs. Brown discoloration of the vascular tissues is also evident when the stems are cut longitudinally. Brown discoloration has been found in other affected plants.

Plants showing toxicity symptoms can be dug out and a search made for walnut roots. Walnut roots can be easily recognized — they have a thick bark which turns yellow when removed, they stain water when immersed, they have a distinctive odor when cut, and an aromatic taste when chewed. The presence of walnut roots verifies that black walnut is responsible for wilted or stunted plants.

DAMAGE

The toxic effect of juglone may vary considerably depending on the tolerance level of different plant species. It has been suggested that some of the more tolerant plants have a shallow root system, while walnuts are deep rooted. Toxicity of black walnut results when hydrojuglone, a non-toxic compound, is oxidized to juglone. Oxidation to juglone occurs when walnut roots come in contact with other roots that contain oxidizing compounds. Symptoms appear only after direct contact of black walnut roots with the roots of other plants. However, direct contact of the roots is not necessary in poorly drained soils. For example, research in white pine and walnut plantings in Southern Ontario indicated that black walnut suppressed or killed the white pines only in those areas which were poorly drained. Under dry soil conditions, the white pines often suppressed the walnut.

Toxicity of black walnut roots has been known to persist in the soil for more than a year after walnut trees have been removed. This toxicity can be reduced if the tree stump is killed with a herbicide. However, the roots must decompose before all the juglone is broken down, and all danger of toxicity has disappeared.

The roots of a mature black walnut may extend 15 to 18 metres (50 to 60 ft) away from the trunk. Thus, damage may occur up to that distance from the tree. Vegetation planted close to the trunk of the tree often is not affected by the walnuts. This is because the roots are often deeper close to the trunk than further away from the trunk.

Various reports have indicated that young walnut trees do not cause toxicity. Symptoms on other plants appear when the walnut trees are seven to eight years old.

OTHER PROBLEMS

Black walnut chips or sawdust for bedding have been implicated in causing acute laminitis in horses and ponies. The disease is an inflammation of the hoof which can result from newly-cut walnut chips in the bedding. The available evidence suggests that the toxic agent combines with water or other substance to form another toxic compound. It is not known if juglone is the toxic agent in this case.

Toxicity to horses has also been reported in areas where black walnuts are abundant. Acute laminitis and high respiratory rate have been found in horses which have their stables and paddock close to walnut trees. Pollen shedding can also cause allergies to humans and horses alike.

PLANT SUSCEPTIBILITY

Many plants have been reported as **susceptible** to black walnut toxicity. Some of these plants include: tomatoes, alfalfa, apple, pear, blackberry, blueberry, mountain laurel, azaleas, rhododendrons, shrubby cinquefoil *(Potentilla fruticosa)*, red pine, white pine and other evergreens.

Some plants have been reported or observed as showing toxicity symptoms **occasionally**. They include the following: poverty grass *(Danthonia)*, sweet peppers, common lilac, Persian lilac, viburnum, autumn crocus, peony, crabapple, magnolia, red raspberry, peach and *Euonymus* sp.

Other plants have **not** been affected or have shown improved growth in the proximity of walnut roots. They include the following: Kentucky bluegrass, timonthy, red top, orchard grass and other grasses, white clover, beets, snapbeans, lima beans, onions, parsnips, sweet corn, black raspberry, grapes, wild roses, forsythia, virginia creeper, poison ivy, narcissus, salvia, impatiens, *Rudbeckia* sp. red cedar, oaks, maples, hickories and other native hardwoods. There has been one report of beets with strong flavor which may be related to black walnut roots.

In a survey performed at the University of Guelph in 1980 it was found that many plants were growing in association with walnut trees (Table 1). Some of these plants have been reported once or twice as being affected by juglone. Soil conditions and moisture in specific sites render plants more or less susceptible to walnut toxicity. This would explain why plants like lilac and Viburnum appear as tolerant to juglone in the Guelph study.

In summary, black walnut toxicity can be a serious problem in areas adjacent to black walnut trees. Toxicity may be caused by other walnut species and hickories. Symptoms on other plants appear only after direct contact with black walnut roots. Planting of walnuts should be avoided in urban areas. In areas where walnuts are already planted, "tolerant" plants should be selected for planting. Finally, avoid planting any walnuts adjacent to horse stables or paddocks and avoid the use of bedding containing black walnut chips.

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TABLE 1. PLANTS SEEMINGLY TOLERANT TO JUGLONE

Scientific Name	Common Name
Anemone apennia	anemone
Arisaema triphyllum	jack-in-the-pulpit
Athyrium	lady fern
Bulbinopsis bulbosa	
Cyclamen	cyclamen
Epimedium	epimedium
Erythronium	dog's-tooth-violet
Gentiana asclepiadea	gentian
Gentiana septemfida	
Helleborus cvs.	green hellebore
Heuchera	alumroot
Hosta cvs.	plantain-lily
Iris cvs.	iris
Lilium cvs.	lilies
Matteuccia struthiopteris	ostrich fern
Myosotic alpestris	forget-me-not
Narcissus	narcissus
Ophiopogon	lily turf
Poa	blue grasses
Podophyllum emodi	may-apple
Polygonatum verticillatum	Solomon's seal
Polystichum	Christmas fern
Primulas	primroses
Ranunculus ficaria	pilewort
Solanum aviculare	nightshade
Thalicturm	meadow-rue
Tricyrtis hirta	toad lily
Trifolium repens	white clover
Trillium	trillium
Uvularia	bellwort, wild oats
Vinca minor	periwinkle
Carya	hickories
Euonymus alatus	burning bush
Forsythia	forsythia
Juniperus virginiana	red cedar
Lonicera	honeysuckles
Parthenocissus quinquefolia	virginia creeper
Philadelphus	mockorange
Quercus	oaks
Rhus radicans	poison ivy
Rubus occidentalis	black raspberry
Syringa	lilacs
Viburnum	viburnums
Vitis	grape
	lima bean
	snap bean
	beet
	sweet corn
	onion
	parsnip

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ISSN 0225-7882

WOODY PLANT WALK FOUR
MEDWAY VALLEY TRAIL

20	Acer negundo	Boxelder
(59)	Acer nigrum	Black Maple
24	Acer rubrum	Red Maple
25	Acer saccharum	Sugar Maple
(181)	Carpinus caroliana	Blue Beech
77	Carya ovata	Shagbark Hickory
86	Celtis occidentalis	Common Hackberry
103	Cornus alternifolia	Pagoda Dogwood
109	Cornus racemosa	Gray Dogwood
155	Fagus grandifolia	American Beech
163	Fraxinus americana	White Ash
226	Ligustrum vulgare	European Privet
235	Lonicera tatarica	Tatarian Honeysuckle
261	Ostrya virginiana	Ironwood
269	Physocarpus opulifolius	Common Ninebark
289	Platanus occidentalis	American Sycamore
292	Populus deltoides	Eastern Cotonwood
293	Populus tremuloides	Trembling Aspen
(839)	Rhamnus cathartica	Common Buckthorn
343	Rhus typhina	Staghorn Sumac
346	Robinia pseudoacacia	Black Locust
356	Sambucus canadensis	American Elder
402	Tilia americana	Basswood

409	Ulmus americana	American Elm
435	Viburnum trilobum	American Cranberrybush Viburnum

WOODY PLANT WALK FIVE
UNIVERSITY OF WESTERN ONTARIO
STUDENT PARKING LOT

16	Acer campestre		Hedge Maple
20	Acer negundo		Boxelder
(40)	Acer platanoides	'Drumondii'	Harlequin Maple
57	Betula papyrifera		Paper Birch
76	Carya glabra		Pignut Hickory
77	Carya ovata		Shagbark Hickory
87	Cercidiphyllum japonicum		Katsuratree
88	Cercis canadensis		Eastern Redbud
102	Cornus alba		Tatarian Dogwood
156	Fagus sylvatica	'Asplenifolia'	Fern Leaf Beech
156	Fagus sylvatica	'Pendula'	Weeping Beech
167	Ginkgo biloba		Maidenhair Tree
169	Gymnocladus dioica		Kentucky Coffetree
(500)	Juglans cinerea		Butternut
203	Juglans nigra		Black Walnut
228	Liriodendron tulipifera		Tulip Tree
256	Morus alba		White Mulberry
326	Quercus robur		English Oak
328	Quercus rubra		Red Oak
(839)	Rhamnus cathartica		European Buckthorn
346	Robinia pseudoacacia		Black Locust

355	Salix matsudana	'Tortuosa'	Corkscrew Willow
369	Sorbus americana		American Mountainash
406	Tilia tomentosa		Silver Linden
409	Ulmus Americana		American Elm
427	Viburnum plicatum	var.tomentosum	Doublefile Viburnum

a Garden Plant to know ... Chris Graham

Prehistoric Tree Stands The Test Of Time

Ginkgo biloba, the maidenhair tree
Illustration by Jocelyne Bond

At a time when so much attention is being focused (and rightfully so) on preserving biodiversity and stemming the tide of species extinction, it may seem odd to discuss a plant that has survived natural and human pressures for at least 70 million years. Or is it?

Ginkgo biloba, the maidenhair tree, is often referred to as a "living fossil". Paleobotanists have determined that the genus *Ginkgo* first appeared during the lower Jurassic period some 180 million years ago and the Order to which it belongs, the *Ginkgoales* has been traced back nearly 250 million years. All other members of the *Ginkgoales* have been lost to time and thus *Ginkgo biloba* remains as the monotypic plant of the family *Ginkgoaceae*.

In addition to the genus being persistent through time, individual plants of *Ginkgo biloba* are renowned for their longevity both in native habitats and under cultivation. Plants approaching 1,000 years of age are not uncommon in China, Japan and Korea with one specimen estimated to be at least 3,000 years old.

Several attributes may help explain the tenacity of this tree. *Ginkgo biloba* is known to be virtually free of any current insect or disease pests. While it is impossible to be certain, it seems likely that this would also be true for pests that may have come and gone through the millennia. In its native range it is described as a persistent pioneer species, meaning that it has the ability to survive through many successional cycles. One of the most interesting characteristics of *Ginkgo*, which may contribute to its persistence, is the ability of mature trees to regenerate through specialized structures known as burls, which may develop at the base of the trunk or aerially on limbs. Aerial burls are stalactite-like growths that develop on the underside of large lateral branches. In Japan these growths are known as "chichi" (nipple or breast). These leafless spur shoots grow straight down until they reach the ground where they root and form new shoots. Basal "chichi" develop from suppressed shoot buds usually in response to some kind of trauma to the base of the trunk. Logging, erosion or growing in proximity to a large stone have all been known to trigger the growth of basal "chichi". In one instance a large *Ginkgo* growing near the hypocentre of the atom bomb blast over Hiroshima, Japan was able to regenerate, presumably from basal "chichi" after its trunk was destroyed in the explosion.

In spite of the long history of *Ginkgo biloba* it remains unclear as to whether or not the species still exists in the wild. In China it has been cultivated for over 1,000 years, particularly by Buddhist and Taoist monks who grew it in temple gardens. This led noted plant hunter E.H. Wilson of the Arnold Arboretum to conclude, in the early part of this century, that *Ginkgo* was probably extinct in the wild. More recent and ongoing work by American and Chinese botanists suggests that Wilson's opinion which was based on limited field work may have been incorrect since they have located significant populations in the Tian Mu Shan nature reserve in Zhejiang Province.

Ginkgo biloba is useful as an ornamental tree, a food crop and for its medicinal properties.

Ornamentally, a mature *Ginkgo* makes a very handsome specimen tree though it does have a somewhat gangly appearance while young. It is hardy to at least –30 degrees C (–22 degrees F) and is tolerant of a wide range of soil conditions. At RBG we have found that while it performs best on well drained sites, it does require adequate water for maximum growth. Plants growing in poorly drained or draughty soils survive but grow very slowly. Its site tolerance and near immunity to insects and diseases make it a popular tree for urban environments though recent research suggests that claims of its ability to withstand air pollution better than other trees may have been overstated.

The specific epithet, *biloba*, is derived from its two-lobed simple leaves which are bright green and arranged alternately on the stem or in small spur clusters. Leaf size and shape among seedling populations can be quite variable and some cul-

tivars have been selected for their foliage characteristics. Fall colour is a wonderful golden yellow.

Ginkgo biloba is dioecious (separate male and female plants) and the flowers of neither have any particular ornamental merit. Female plants will not seed until they are about 20 years old. The "fruit", which can be borne in abundance, looks like a small golden-orange plum. Since *Ginkgo* is a gymnosperm (thus related more closely to yews and junipers than maples) the "fruit" is actually a naked seed. The fleshy outer covering of the seed becomes extremely malodorous as it begins to decompose. Therefore only male trees should be considered for garden use.

In Asia the nuts of *Ginkgo* (what is left after removing the fleshy covering) are considered a delicacy and are grown in commercial orchards. The seeds are collected shortly after they fall and put into containers where they stand for a few days to allow the fleshy coat to soften. They are then washed with water to separate the nut from the coating which floats to the surface and is skimmed off. Gloves must be worn for this process as the flesh contains anacardic acid which can cause severe skin rash. Raw nuts are considered toxic to humans and so are boiled in water until the shells crack. The kernels, which have a chestnut-like flavour, are used in soups, fried dishes or eaten plain. Consumption is usually limited to a few kernels as apparently, even cooked, they can be toxic in quantity.

Ginkgo has been used in traditional Chinese medicine for many centuries. References are made to the external use of the leaves to treat skin disorders and the internal use of leaf preparations to treat respiratory problems.

Many pharmacologically active compounds have been extracted from *Ginkgo* leaves. In Europe, leaf extracts are used to treat a variety of circulatory and respiratory problems. They are also purported to be effective in the treatment of dizziness and short-term memory loss. Commercial preparations made from *Ginkgo* leaf extracts gross an estimated $500 million U.S. per year in Europe alone. Providing the raw product to support this industry is no small task. One plantation in South Carolina, for example, harvests leaves from 10 million *Ginkgos* planted over 1,000 acres. The plants are grown in rows at close spacings and coppiced to keep them small which facilitates mechanical harvesting of the leaves.

RBG has several specimens of this ultimate botanical survivor. Perhaps the best are a group of three plants (two female, one male) in the centre island of the Rock Garden parking lot. I estimate their age at about 75 years, so in *Ginkgo* terms they are still youngsters.

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WOODY PLANT WALK SIX
UNIVERSITY OF WESTERN ONTARIO
WELDON LIBRARY

17	Acer ginnala		Amur Maple
(59)	Acer nigrum		Black Maple
22	Acer platanoides	'Columnare'	Columnar Norway Maple
23	Acer pseudoplatanus		Sycamore Maple
24	Acer rubrum		Red Maple
33	Aesculus parviflora		Bottlebrush Buckeye
34	Ailanthus altissima		Tree of Heaven
45	Aralia spinosa		Devil's Walking Stick
61	Buddleia alternifolia		Alternate-Leaf Beauty Bush
72	Carpinus betulus	'Fastigiata'	Pyramidal Hornbeam
88	Cercis canadensis		Canada Redbud
80	Catalpa speciosa		Northern Catalpa
98	Cladrastris lutea		American Yellowwood
(282)	Cotinus coggygria	'Purpureus'	Smoke Bush
118	Cotoneaster apiculatus		Cranberry Cotoneaster
155	Fagus grandifolia		American beech
(408)	Gleditsia tricanthos	var. inermis	'Ruby Lace' Ruby Lace Honeylocust
228	Liquidambar styraciflua		American Sweetgum
238	Maclura pomifera		Osage Orange
254	Metasequoia glyptostroboides		Dawn Redwood
261	Ostrya virginiana		American Hophornbeam

264	Parthenocissus tricuspidata		Boston Ivy
301	Prunus maackii		Amur Chokecherry
321	Quercus alba		White Oak
322	Quercus coccinea		Scarlet Oak
323	Quercus imbricaria		Shingle Oak
326	Quercus robur	'Fastigiata'	Pyramidal English Oak
365	Sophora japonica		Scholar-Tree
406	Tilia tomentosa		Silver Linden

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Dawn redwood, another prehistoric gem

Just as many organisms are disappearing from Nature's pattern today - some of them through the carelessness and shortsightedness of man - never to return, *Metasequoia* mysteriously disappeared from North America fifteen million years ago. Only as a fossil had it been known to man and our knowledge of it had been gained only through looking back into the tantalizing mists of ages past." This passage is from the address given by Dr. Norman W. Radforth, RBG's first Director, at the planting and dedication of the Garden's first dawn redwood on June 19, 1953.

Dr. Radforth's comments on plant conservation are certainly as valid today as they were in 1953, but how did RBG acquire one of these "living fossils"?

The genus was first described in 1941 by Miki, a Japanese palaeobotanist, working with fossils from Japan that dated back to the Pliocene Epoch. Prior research had assigned these fossilized plant remains to *Sequoia langsdorfii*, a forerunner to the modern giant redwoods of California, whose range during the Tertiary and Upper Crustaceous Periods (it was then believed) extended through the upper latitudes of Asia, Europe and North America as far north as the Arctic. Miki questioned the northern distribution of this otherwise warm climate species and, upon further investigation, identified taxonomic differences in leaves and cones. He named the new genus *Metasequoia*. Most researchers then thought that this newly described genus had been extinct for perhaps 60 million years.

A scant four years later, a Chinese forester named Tsang Wang, encountered three large trees unknown to him growing in northeastern Szechuan Province, China. From specimens collected at that time and others gathered a year later, Professor Wan-Chun Cheng and Dr. H.H. Hu (the latter having trained at the Arnold Arboretum, Jamaica Plain, Massachusetts) determined that the unknown extant gymnosperm was the same as the fossil *Metasequoia* described by Miki in 1941. The living plants of this monotypic genus were given the name *M. glyptostroboides*.

Specimens were sent by Drs. Cheng and Hu to Dr. E.D. Merrill, then Director of the Arnold Arboretum. Merrill not only confirmed their finding but immediately sent the researchers a $250 grant to support a three-month expedition to search for additional plants and collect seed. In all, over 1,000 trees of various ages were identified growing in scattered popu-

lations along small streams and hillsides in Szechuan and neighbouring Hupeh Provinces. The largest tree measured 35 metres in height and had a trunk diameter of 2.3 metres.

Seed from the expedition reached the Arnold Arboretum on January 5, 1948. Some of the seeds were sown immediately and germinated within two weeks; others were packaged and sent to botanical gardens and arboreta representing a broad range of climates around the world to determine the growing conditions that would favour the new species. From later research it was ascertained that dawn redwood can also be propagated asexually

from both hardwood and softwood cuttings.

We now know that *Metasequoia glyptostroboides* is hardy from zones 5b to 9, transplants easily and, while quite adaptable, prefers a sunny location with deep, rich, moist but well-drained soils. Under ideal conditions, growth is rapid (up to a meter per year) and reports of trees reaching 15 metres in 20 years are not uncommon. Mature plants typically have a decidedly pyramidal habit with a strong central leader and can exceed 30 metres in height.

Given its fast growth rate and large size, there was some initial hope that dawn redwood might become a significant plant for the forest products industry. However, with only about two-thirds the strength of California redwood, it proved to be too light and weak to have any value as a solid wood product.

M. glyptostroboides is a deciduous conifer belonging to the Cupressaceae. Bright green summer leaves, which are needle-like and arranged oppositely on slender branchlets, turn a wonderful rusty orange in autumn. When in full leaf the overall appearance of the plant is fine and feathery. The winter texture is somewhat coarser although defoliation does reveal handsome, deep furrowed bark which, with age, begins to flake in long fibrous shreds.

As with most conifers, the flowers of dawn redwood are ornamentally insignificant, as are the small cylindrical cones. Most references suggest that male flowers are produced only on relatively mature trees and that the production of viable seed is limited to plants growing in areas with hot summers and long growing seasons.

In 1952 Dr Radforth returned from a trip to British Columbia accompanied by a few young plants grown from cuttings taken from seedlings whose source was the Arnold Arboretum. On June 19, 1953 one of these specimens was planted in Hendrie Park by RBG Board President, Judge William F. Schwenger, Q.C. The planting was dedicated to Mr. Bruce Murdoch, a conservationist and well-known feature writer for the *Hamilton Spectator*. Regrettably, the first planting failed and needed to be replaced by one of its siblings in 1958. The tree, now a magnificent specimen, can be seen growing adjacent to the Harvey Clematis Collection.

Only a few cultivars of *M. glyptostroboides* have been introduced and fewer still are currently available. Cultivar 'National', selected for its narrow pyramidal habit, was introduced by the U.S. National Arboretum in 1958. RBG's specimen of this cultivar, which is growing in the corner of the lower nursery, was received in 1966 and is now approximately 18 metres tall with a crown diameter of 5 metres. Another upright growing cultivar with strongly ascending branches is 'Sheridan Spire'. A review of the RBG nursery catalogue collection revealed that Sheridan Nurseries, Georgetown, Ontario, first offered this plant in their 1977 trade list. While the cultivar does not appear in Sheridan's current catalogue, it is listed by the land-based grower, Duncan & Davies. An example of 'Sheridan Spire' can be found growing in the Pinetum.

With the possible exception of the upright growing cultivars, *M. glyptostroboides* is too large a tree for most residential landscapes. However, for gardeners who feel they have the space, it is an elegant addition to the landscape and a great conversation piece!

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WOODY PLANT WALK SEVEN
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18	Acer griseum		Paperbark Maple
31	Aeculus glabra		Ohio Buckeye
30	Aesculus X carnea		Red Horsechestnut
32	Aesculus hippocastanum		Common Horsechestnut
34	Aesculus pavia		Red Buckeye
(78)	Aesculus turbinata		Japanese Horsechestnut
35	Akebia quinata		Fiveleaf Akebia
61	Buddleia alternifolia		Alternate-Leaf Beauty Bush
(136)	Betula albo-sinensis		Chinese Paper Birch
56	Betula nigra		River Birch
58	Betula pendula		European Birch
70	Campsis radicans		Common Trumpetcreeper
86	Celtis occidentalis		Common Hackberry
104	Cornus florida		Flowering Dogwood
106	Cornus kousa	var. chinensis	Kousa Dogwood
107	Cornus mas		Corneliancherry Dogwood
115	Corylus colurna		Turkish Filbert
(282)	Cotinus coggygria	'Purpureus'	Purple Leaved Smokebush
150	Euonymus europeaus		European Euonymus
156	Fagus sylavatica		European Beech
216	Kerria japonica	'Pleniflora'	Double Flowering Kerria
219	Kolkwitzia amabilis		Beautybush

(585)	Lonicera tatarica	'Nana'	Dwarf Honeysuckle
253	Malus	'Red Jade'	Red Jade Crabapple
(666)	Morus alba	'Pendula'	Weeping Mulberry
266	Phellodendron amurense		Amur Corktree
288	Platanus X acerifolia		London Planetree
(760)	Polygonum cuspidatum	var. compactum	Dwarf Japanese Fleeceflower
315	Pyrus calleryana	'Chanticleer'	Chanticleer Pear
(797)	Ptelea trifoliata		Hop Tree
322	Quercus coccinea		Scarlet Oak
328	Quercus rubra		Red Oak
(829)	Quercus shumardii		Shumard Oak
372	Spiraea X bumalda	'Goldflame'	Goldflame Spiraea
376	Spiraea X vanhouttei		Bridalwreath Spiraea
377	Stephanandra incisa	'Crispa'	Cutleaf Stephanandra
384	Symphoricarpos X chenaultii		Coralberry
409	Ulmus Americana		American Elm
425	Viburnum opulus	'Compactum'	Compact European Cranberrybush
438	Weigela florida	'Minuet	Dwarf Purple Leaf Weigela

WOODY PLANT WALK EIGHT
VICTORIA PARK

(59)	Acer nigrum		Black Maple
22	Acer platanoides		Norway Maple
22	Acer platanoides	'Crimson King'	Crimson King Norway Maple
22	Acer platanoides	'Schwedleri'	Schwedler Norway Maple
25	Acer saccharinum		Silver Maple
26	Acer saccharum		Sugar Maple
31	Aesculus glabra		Ohio Buckeye
32	Aesculus hippocastanum		Horsechestnut
32	Aesculus hippocastanum	'Baumanii'	Bauman Horsechestnut
32	Aesculus octandra		Yellow Buckeye
57	Betula papyrifera		Paper Birch
86	Celtis occidentalis		Common Hackberry
155	Fagus grandifolia		American Beech
163	Fraxinus americana		White Ash
167	Gingko biloba		Maidenhair tree
(408)	Gleditsia tricanthos		Honey Locust
168	Gleditisia tricanthos	var. inermis	Thornless Honey Locust
169	Gymnocladus dioicus		Kentucky Coffeetree
228	Liquidambar styraciflua		Sweet Gum
228	Liriodendron tulipifera		Tulip Tree
288	Platanus X acerifolia		London Plane Tree
289	Platanus occidentalis		Sycamore
321	Quercus alba		White Oak

324	Quercus macrocarpa		Burr Oak
(831)	Quercus prinus		Chestnut Oak
326	Quercus robur		English Oak
328	Quercus rubra		Red Oak
352	Salix alba	'Tristis'	Golden Weeping Willow
402	Tilia americana		American Linden
403	Tilia cordata		Little Leaf Linden
404	Tilia X europaea		European Linden
409	Ulmus americana		American Elm

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