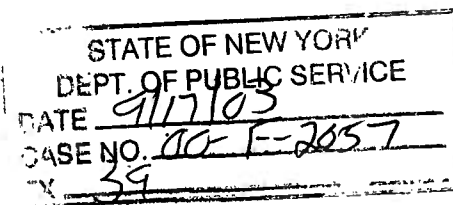


Exhibit 039

**Revised Preliminary Landscape Plan and *Preliminary
Landscape Plan Concept***

December 19, 2002



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December 19, 2002

VIA ELECTRONIC MAIL

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Mr. Andrew C. Davis
Project Review Coordinator
New York State Department of Public Service
Three Empire State Plaza
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Re: *Matter of Besicorp-Empire Development Company, LLC ("BEDCO")*
Article X Case No. 00-F-2057
NYSDEC Project No. 4-3814-00052

Dear Paul and Andy:

Attached please find for your consideration a copy of the Preliminary Landscape Design Concept, dated December 19, 2002 (PLDC), prepared in connection with the settlement negotiations for the referenced project. The attached files contain the text of the PLDC (in Word), three documents relating to tree species (in PDF format) (see Note 2 in the PLDC), and a plan graphic (in .dwg format) showing the existing vegetation and the proposed landscaping.

Please advise if you have difficulty opening these files. We expect the Word and PDF documents to be accessible, but there may be difficulty in opening the plan graphic. For this reason, Epsilon Associates will send a copy of the plan graphic to you today (by overnight delivery) and also to the parties copied on this letter (by first class mail). In Epsilon's transmittal, you will also receive a copy of a document labeled Figure 4, Project Site, which is an aerial photograph that shows the existing vegetation at the Project site. This document is referenced in the PLDC in the discussion of the existing vegetation protection plan.

In response to your recent inquiry, please be advised that soil conditions around the perimeter of the Main Plant site will not preclude the planting of trees in the

Paul Agresta, Esq.
Mr. Andrew C. Davis
December 19, 2002
Page 2

ground in those locations. Therefore, boxes will not be required for tree plantings. Appropriate species will be selected for each portion of the site where plantings are proposed.

If you have any questions, or difficulties reading the attachments, please call.

Sincerely,

BOND, SCHOENECK & KING, PLLC



Virginia C. Robbins

VCR/sm
Attachments

cc (with attachments):

A. Scott Cauger, Esq.
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**PRELIMINARY LANDSCAPE DESIGN CONCEPT
EMPIRE STATE NEWSPRINT PROJECTS**

Prepared by

**Epsilon Associates, Inc.
Maynard, MA**

Prepared for

**Besicorp-Empire Development Company, LLC
Kingston, NY**

December 19, 2002

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BEDCO

PRELIMINARY LANDSCAPE DESIGN CONCEPT

Introduction

The visual analysis for the proposed BEDCO Recycled Newsprint Manufacturing Plant ("RNMP") and Cogeneration Plant (the "Project") indicates that elements of the facilities will be visible from certain viewsheds. Due to the nature of existing vegetation and terrain between the proposed facility and vantage points from which the facility will be visible, it will not be possible to screen the facility entirely with vegetation; however, visual impact can be mitigated through landscaping treatment, including preventative measures to reduce clearing of existing vegetation. In addition to screening purposes, plantings will also be introduced to provide a pleasing pedestrian "streetscape" where appropriate.

To date, a preliminary landscaping plan (Figure 10-1) was submitted in the Article X Application/DEIS ("Application"), demonstrating BEDCO's commitment to landscaping proximate to the facilities. This memo and accompanying plan graphic supplements the information contained in the Application, and sets forth the general concept of anticipated landscaping associated with the facilities.

This memo includes a description of preventative measures to minimize clearing of existing vegetation and an explanation of the effect intended to be achieved by the final landscaping plan. The memo also provides a suggested list of species that may be used to achieve the intended effect. Neither this memo, nor the accompanying plan, should be interpreted to represent the final landscape plan, but they do portray the gist of the "palette" or "design vocabulary" associated with landscaping in the vicinity of the proposed facilities.

For purposes of describing discrete design strategies that are recommended for different portions of the Project site, distinct areas are described in the text below.

Overall Landscape Design Concept

As stated above and in prior Article X documentation, among other design measures, landscaping will be used to reduce the perceived visual impact of the proposed facilities. It is recognized that landscaping cannot completely conceal the facility from certain vantage points. However, vegetation – despite

its visual porosity, even in "leaf-off" conditions -- can reduce the visual impact of structures and plumes that may be periodically visible during operating conditions.

Retention of existing trees where possible is a primary means of mitigating visual impacts. There are existing trees in the vicinity of the facilities estimated at heights ranging to over 100 feet, particularly on the "South 40" parcel. There are also mature trees (though not as tall) along the banks of the Hudson River near the water intake and treatment facilities. As described further below, a protection plan has been developed to prevent unnecessary clearing, and to ensure adequate protection of those areas of vegetation that are to remain intact, both during construction and operation of the facilities.

In areas where there is insufficient existing vegetation to provide a visual buffer and in areas where construction requires removal of vegetation, landscape screening is proposed to reduce the visibility of the proposed facilities, and placement of screening vegetation will be designed to soften the impact of the proposed facilities as much as possible.

In order to reduce the visual impact of the project, the landscaping concept calls for both retention of existing trees to the extent possible, and introduced plantings. For the most part, a naturalistic effect is recommended for landscape screening, and will involve irregular spacing and grouping of trees and tall-growing shrubs, including both evergreen and deciduous species. In areas where pedestrian and/or bicyclist traffic is anticipated, a more formal "streetscape" is proposed, consisting predominantly of regularly spaced deciduous trees.

A suggested plant list is attached. The accompanying plan generically indicates either evergreen or deciduous trees, where the intention is to use a variety of species, rather than to specify a particular type of tree. Where a deciduous species is suggested, then, several of the species identified on the attached list may be appropriate. The intent is to provide reviewers of this memo and plan with an understanding of the types of species that may be used and the character of those species, while providing project designers with a "palette" of species to consider, given the most current design of the proposed facilities.

While it is commonly believed that evergreen species provide the "best" screening due to their visual opacity throughout the year, deciduous species often have the advantage of a broader canopy and taller stature (depending

upon the particular species). Though visually "porous" during leaf-off condition, the lattice-like structure of branches and twigs has the effect of intercepting the line of sight. As a result, the eye focuses on the foreground or mid-ground branches, reducing the visual impact of the object being screened, even if the structures or plume may still be visible beyond the line of sight that has been intercepted by the latticework of branches. For areas where a pedestrian streetscape effect is intended, only deciduous trees are recommended due to their higher branching habits. The "Comments" portion of the attached "Suggested Species" list identifies those species that are appropriate for either screening or for "streetscaping," as well as providing other observations regarding the selection of specific cultivars of the same species.

Lastly, it is recommended that coniferous trees be planted at an average height of 4'-6' (four feet to six feet) in height, and that deciduous trees be planted at 2"-2 ½" (two inch to two and one-half inch) caliper.¹ It should be noted that the larger the specimen at the time of planting, the longer the tree will take to recover from transplant shock. A smaller tree will "catch up" within a few years to the height of a larger tree, while the smaller tree has a better likelihood of survival during the first two critical years after transplanting. Suggested sizes indicated in the attached plant list reflect specimens that are young enough to transplant and survive relatively easily, while still having an initial "presence".

Specific Design Strategies for Distinct Areas of the Site

Water Intake/ Treatment Area

For purposes of description, this area is subdivided into the "West (Hudson River) Side" and the "East (Riverside Avenue) Side." The landscape design treatment for each of these areas will have a distinctly different character. The purpose of landscaping along the West Side is to augment the existing vegetation to provide a naturalistic vegetative buffer and visual screen when viewed from the Hudson River. In contrast, the suggested design approach for plantings along

¹ Deciduous species are typically specified by caliper, not height, due to extreme variability of height based upon growing conditions. In accordance with standards set forth by the American Association of Nurserymen, 2"-2 ½" caliper shade trees are expected to be 12' to 14' in height on average, and 16' in height at maximum.

the East Side is that of a more formalized "streetscape", with regular spacing of trees at a consistent distance from the paved roadway.

The landscape concept for the West Side is to preserve as much of the existing vegetation as possible (see "Existing Vegetation Protection Plan" below), with the addition of both evergreen and deciduous species where gaps occur in the existing swath of vegetation. New plantings should be chosen for their contrast to existing species; for example, where a gap occurs amid a cluster of pines, either a deciduous species or an evergreen with a distinctly different color and habit would be appropriate choices.

The landscape concept for the East Side is to be consistent with the potential pedestrian/bicyclist trail, for which regularly spaced deciduous trees set at a consistent distance to the roadway would be appropriate. Exact spacing should be determined in conjunction with potential pedestrian/bicyclist sidewalk improvements.

Recycled Newsprint Manufacturing Plant (RNMP) Area

For purposes of description, this area is subdivided into the "West (Riverside Avenue) Side," the "Organichem boundary," and the "East (Railroad and Landfill) Side." The purpose of landscaping in all of these areas is to reduce (if not eliminate) the visual impact of the facilities from various angles.

Landscaping along the West Side of the RNMP is proposed as a mix of deciduous and coniferous trees (potentially including both deciduous and evergreen conifers) to establish a naturalistic vegetative buffer. In order to achieve a naturalistic effect, several different species within the two generic categories of trees (deciduous and coniferous) are recommended to provide a variety of height and form, rather than a consistent "hedge" effect. BEDCO will request permission to establish plantings within the layout for Riverside Avenue as well as on BEDCO property to take advantage of as wide a planting area as possible. It is proposed that the fencing in this area be installed both proximate and at a consistent distance to the edge of paving (e.g. five foot offset) associated with the RNMP facility, such that plantings are located on the outside of the fence, nearest public view.

A similar landscape treatment is proposed along the Organichem boundary, with actual plant locations being determined in conjunction with design of the proposed acoustic barrier wall in this area. While the area available for

landscaping along the Organichem boundary is narrow for the most part, a knoll on the eastern end of the Organichem boundary (adjoining the railroad and landfill side) provides an excellent opportunity for reducing visual impacts from Routes 9 and 20. Consistent with the design approach for screening, it is proposed that this area be planted with a variety of both deciduous and coniferous species.

Along the East Side, there are challenges for planting because of the proximity of the railroad tracks and restrictions on planting above the capped landfill. However, the plan incorporates an alternative to introduce both deciduous and coniferous trees on the embankment supporting the Port Access Highway, predicated upon BEDCO's receipt of necessary approvals from the City of Rensselaer and the New York State Department of Transportation. Because of difficulties associated with handling and establishing trees on steep embankments, it is likely that smaller specimens will be proposed for this area.

Cogeneration Plant Area (South 40)

The primary landscape screening strategy for the South 40 is the preservation of existing vegetation (by means described in the "Existing Vegetation Protection Plan" below). In addition, some plantings will be introduced to augment existing vegetation, including areas of "old field" and areas where retained vegetation may only provide a narrow swath of trees, as well as areas where grading or initial tree clearing may be required for wetland replication, stormwater detention or transmission lines. For purposes of further description of the landscape design strategy for the South 40, discrete portions of this area of the BEDCO property are identified as the "West (Riverside Avenue) Side" and the "transmission line corridor," which to an extent coincides with the wetland replication/stormwater detention area.

As proposed, the cogeneration plant (cogen) will "hug" the Riverside Avenue property boundary so as to avoid unnecessary impacts to wetlands on the eastern side of the parcel. Development on this parcel is intended to facilitate preservation of a swath of existing vegetation along Riverside Avenue. As schematically indicated on the attached landscape concept plan, trees will also be introduced in areas which presently support "old field" vegetation (i.e., the northeastern extents of the parcel). In addition, existing vegetation will be supplemented with introduced trees. Exact locations for new plantings will be identified in the field in conjunction with the survey of vegetation to be preserved (see further below).

In the area beneath the proposed transmission lines, mature trees within a corridor of approximately 100 feet in width must be cleared. To the extent practicable and in consultation with the Army Corps of Engineers, wetland replication areas and stormwater detention basins will be located beneath the proposed transmission lines so as to reduce overall clearing during initial construction, and to serve the dual purpose of establishing an environment that is predominated by short vegetation (e.g., a wet meadow, or an engineered basin in which vegetation is regularly managed), consistent with the necessity of maintaining a "cleared" area beneath transmission lines.

Existing Vegetation Protection Plan

An aerial photograph that shows the existing vegetation within the Project site boundaries is provided at the end of this memo. The following measures will be implemented to protect existing vegetation to the extent possible.

- ◆ Prior to initiation of site preparation activities, limits of work will be marked in the field (using flagging tape, flagging on metal rods, or spray paint).
- ◆ An assessment will be made as to whether certain trees within approximately ten feet (10') of the demarcated limits of work can be reasonably expected to survive (e.g., depending on offset to limits of work and nature of work proximate to the vegetation [whether a cut or fill, installation of foundations, etc.], caliper, spread and anticipated root system given particular species). Trees that are not expected to survive will be cut; roots will be left in place so as not to disturb the roots of other nearby trees.
- ◆ Areas of trees to be retained where extensive construction is proposed (e.g., the South 40) will be fenced with chain link to provide more substantial demarcation and protection than polyethylene fencing or other materials commonly used to identify limits of work.
- ◆ No parking, material stockpiling or equipment storage will be allowed within areas of vegetation to be preserved.
- ◆ Trees designated to be retained, but which have been seriously damaged (in the opinion of a professional arborist), despite precautions, will be replaced using stock of at least 2"-2 1/2" caliper,

with the number of replacement trees being determined in relationship to the caliper of the damaged tree, (e.g., a 12" caliper tree that has been seriously damaged would be replaced by six 2"-2 ½" caliper trees. Replacement trees (like introduced plantings) will be guaranteed for a period of two years following installation.

Suggested Species

Species have been suggested based upon hardiness, pest and disease resistance, aesthetic considerations, and size at maturity. With respect to aesthetic considerations, it is important to note that certain species have been selected for their appropriateness *when viewed from a distance*.

For instance, Japanese Larch, a deciduous conifer, loses its needles in the winter, and may be considered unsightly when viewed from a near (foreground) position. However, the earthen hue of the tree during winter blends well with other deciduous trees, and the species has the advantage of rapid growth, substantial height at maturity, and a strikingly vertical habit, which, when combined with trees of dissimilar habit (e.g., a broad, rounded canopy), provides visual variation to arrest the eye, and reduce awareness of the object being screened (if not concealed). Many species whose aesthetic attributes are typically considered highly desirable with respect to their flowering (e.g., Goldenraintree, flowering crabapples) are in fact not desirable when the purpose of the landscaping is to provide a screening/ visual buffer effect, as striking flowers would have the effect of attracting the eye, rather than homogeneously blending with surrounding vegetation when seen from a distance.

Suggested species and conceptual grouping of dissimilar species is proposed to moderate, rather than draw attention to, the structures in the vicinity of the landscaping.

Suggested Species for Landscape Screening

Species	Average Size at Planting (larger or smaller specimens may be recommended in select locations)	Approx. height ten years after planting ²	Mature Height of Species x Mature Spread ³	Comments
Coniferous Trees				
Arborvitae (<i>Thuja occidentalis</i>)	5'-6' height	12'-15' ($<12''$ growth per year)	40'-60', usually less x 10'-15' spread	Select variety with broad, pyramidal habit. Provides year-round screening. Species should be selected for subtle coloration (vs. exceptionally dark green varieties). Prefers relatively moist soils.
Eastern Red Cedar (<i>Juniperus virginiana</i>)	4'-5' height	17'-20'	40'-50' x 8'-20' spread	Select variety with broad, pyramidal habit. Provides year-round screening; olive coloration. Tolerates poor soils.
Colorado Spruce (<i>Picea pungens</i>)	5'-6' height	15'-16'	Up to 60' under avg. conditions; potential up to 90-135' x 20' spread	Potential for exceptional height at maturity.
Dawn Redwood (<i>Metasequoia</i>)	3'-4' height	+/- 30'	70'-100'+ h. (known to 120')	Deciduous conifer of tall stature with exceptionally fast rate of growth (50' in 15-20 years according to

² Anticipated height over time is highly variable, depending not only upon species, but also the site-specific environment and climactic conditions during the growing period. Little growth is anticipated in the first few years following planting due to "transplant shock". Several sources obtained through Internet search; copies of most comprehensive references attached at the end of this memo.

³ Mature height and spread are taken primarily from Michael Dirr, Manual of Woody Landscape Plants.

<i>glyptostroboides</i>)		(2.5' per year)	x 25' spread	Dirr).
Douglas Fir (<i>Pseudotsuga menziesii</i>)	5'-6' height	20'-25'	40'-80' (can grow to 200' in ideal conditions) x 12'-20' spread	Potential for exceptional height at maturity.
Japanese Larch (<i>Larix kaempferi</i>)	4'-5' height	14'-20'	70'-90' x 25-40 spread	Deciduous conifer. Faster growth than native larch (<i>L. laricini</i>) and more widely available in nursery trade.
Norway Spruce (<i>Picea abies</i>)	4'-5' height	25'-30'	40'-60' (can grow to 100') x 25'30' spread	Holds lower branches/ provides screening to ground level; requires adequate room for that reason. Fast growth rate, particularly in youth.
Red Pine (<i>Pinus resinosa</i>)	4'-5' height	20'-25'	50'-80' (can grow to 125'+) x variable spread	Tolerates adverse conditions. Loses lower branches; provide nearby underplanting for that reason.
Scotch pine (<i>Pinus sylvestris</i>)	5'-6' height	25'-30'	30-60 (can grow to 80-90) x 30-40	Several vigorous specimens in vicinity indicate desirable growing conditions for this species. Dense branching and foliage.
Deciduous Trees				
Tuliptree (<i>Liriodendron tulipifera</i>)	2- 2 ½" caliper (approx. 12'-14' height)	25'-30'	70'-90' (can grow to 150') x 35'-50'	Prefers moist soils. Fast growth; 15'-20' over a 6-8 year period according to Dirr.
Littleleaf Linden (<i>Tilia cordata</i>)	2- 2 ½" caliper (approx. 12'-14' height)	17'-19' (0.5' / yr)	60'-70' x 30'-40'	Select cultivars "Fairview" and "Greenspire" have faster growth rate. Prefers moist, well-drained soils. Highly tolerant of urban conditions.
American Sycamore (<i>Platanus occidentalis</i>)	2- 2 ½" caliper (approx. 12'-14' height)	30'-35'	75'-100'+ x similar spread	One of tallest eastern native deciduous trees next to <i>Liriodendron tulipifera</i> .

Red oak (<i>Quercus rubra</i>)	2- 2 ½" caliper (approx. 12'-14')	20'-25'	60'-75' x 40' x50'	Fast growing species; tolerant of urban conditions.
Japanese Pagodatree (<i>Sophora japonica</i>)	2- 2 ½" caliper (approx. 12'-14' height)	25'-30'	50'-75' x similar spread	Medium to fast growth; 10'-12' over 5-6 year period according to Dirr. Tolerant of urban conditions.
Japanese Zelkova (<i>Zelkova serrata</i>)	2- 2 ½" caliper (approx. 12'-14' height)	20'-25'	50-80 x50-80	Fast growth in youth (as much as 3-4' in one year); leaves held later in season than most species
Shrubs				
Amur privet (<i>Ligustrum spp.</i>)	2 ½' - 3'	Likely to reach mature size in 10 years	12-15 x 12-15	Largest of hardy privet spp. Typically shorn as a hedge, but should be left unpruned to allow full growth habit.
Corneliancherry dogwood (<i>Cornus mas</i>)	2 ½' - 3'	Likely to reach mature size in 10 years	20-25 x 15-20	Large shrub/ small tree. Can be multiple- or single- stemmed.
Goat willow, aka "Pussy willow" (<i>Salix caprea</i>)	2 ½' - 3'	Likely to reach mature size in 10 years	15-25 x 12-15	Large shrub/ small tree. Will naturalize/ colonize.
Red-twigged dogwood (<i>Cornus sericea</i>)	2 ½' - 3'	Likely to reach mature size in 10 years	7-9 x 10+	Fast growth; establishes on steep slopes very well; will root from branches that arch and touch ground.

*Source:

Dirr, M. 1983. Manual of Woody Landscape Plants. Stipes Publishing, Champaign, IL.

HEIGHT GROWTH OF TREES OF THE MORTON ARBORETUM'S TREE EVALUATION PLOTS

GEORGE WARE
The Morton Arboretum
Lisle, Illinois

The Morton Arboretum's Tree Evaluation Plots were established in 1958 with the planting of 25 species and cultivars in groups of five on a 40-acre tract in the southeastern portion of the Arboretum. Additions made during each of the following four years brought the total number to 106 in 1963 (Kammerer, 1963). Fifty-foot spacings were given the medium-to-large trees in rows 50 feet apart. Small-to-medium trees were spaced 25 feet apart, with rows also 25 feet apart. Most of the trees were purchased from nurseries as six to eight-foot specimens. Small trees were mostly four to six feet in height. Both bare-root and balled and burlapped trees were planted. A few of the groups were grown in Arboretum nurseries. Figure 1 (top) shows the initial plantings of the Tree Evaluation Plots and a portion of the plots in 1989 (bottom).

Kammerer's 1963 report notes that only 15 of the original 25 groups planted in 1958 still had five living specimens. Subsequent plantings suffered similar attrition. Twenty-four groups of trees were planted in 1959 and 1960. Only 12 of the 24 groups

still have **five** living trees in 1963. Apparently, the substratum of the tract of land posed some problems for tree establishment.

The soils of the Tree Evaluation Plots are derived from dense glacial till that has weathered into silty clay loam. Much of the land is gently sloping with clearly defined drainageways. The soils range from poorly drained in drainageways to moderately well-drained on upland flats. The upland soils exhibit perched water tables from March to June of each year. The drainageways receive laterally moving water as the perched water tables of upland areas slowly disappear. All of the soils have moderately slow permeability. Remnants of a tile system are still partly functional, concentrating excessive moisture at blockage points. Thus the soils of the Tree Evaluation Plots comprise a complex mosaic of detrimental spring-moisture excesses. Less than uniform conditions for a 200-foot row of five trees exist in some cases. In a few cases whole groups of five trees have been lost owing to adversities related to the soils.

The Tree Evaluation Plots have been especially instructive in providing indications of the problems encountered by municipalities, park districts, and homeowners in selecting, planting, and managing trees. Though the Tree Evaluation Plots do not closely resemble streetside (parkway) conditions, the somewhat inimical substratum is similar to that of countless recently built neighborhoods. A major difference is that the soils of lawns and parkways are alkaline. The soils of the Tree Evaluation Plots are neutral to slightly acid. Though the land was tilled for many decades, topsoil is still present, having been maintained and enriched by four to five decades of meadow grass that has been mowed no more than two or three times each summer.

Original plantings were accompanied by mulching of trees. Little or no mulch was applied later. The surviving trees in the Tree Evaluation Plots are good "copers", having survived adversities associated with both a difficult substratum and competition from luxuriant greensward.

Average height growth per year is reported in Table 1 for those groups with three or more remaining trees in 1989. Height growth is shown in the first column; number of trees in the second; and age of trees in the third.

Fifteen species or cultivars show

growth rates of at least one foot per year. The fastest rate of growth is shown by: Quercus robur, Platanus occidentalis, Acer saccharinum, Gleditsia triacanthos 'Skyline', Fraxinus excelsior, and Q. palustris.

Figure 2 shows growth rates of both deciduous and coniferous trees for the first ten years. These growth rates were determined by E.L. Kammerer (1948) from observations and measurements of Arboretum trees several years before the establishment of the Tree Evaluation Plots. Six kinds show an attainment of at least 25 feet in ten years: Platanus occidentalis, both Ulmus americana and cultivar 'Moline', Ulmus pumila (noted as "Chinese" elm), Fraxinus pennsylvanica, Acer saccharinum, Tilia cordata, and Magnolia acuminata. Only two Acer saccharinum and Fraxinus pennsylvanica, are common to both lists. Two species of Quercus are in the Tree Evaluation Plots list; none in the other list.

LITERATURE CITED

- Kammerer, E.L. 1948. How fast do trees grow? The Morton Arboretum Bulletin of Popular Information 23: 9-12.
- Kammerer, E.L. 1963. Report on the Arboretum Street Tree Test Plots. The Morton Arboretum Bulletin of Popular Information 38: 45-52.

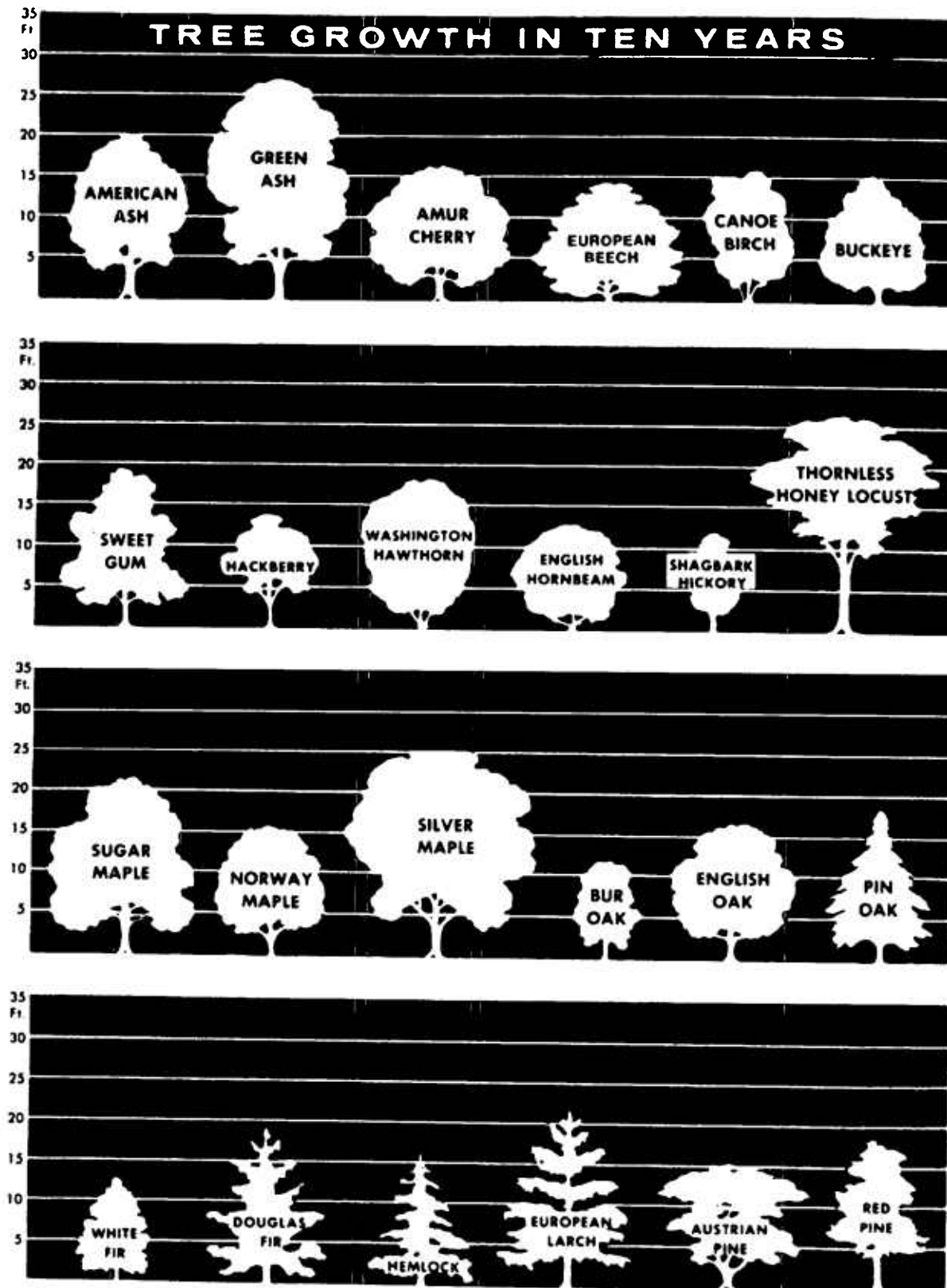


Figure 2. Height growth of trees in 10 years.

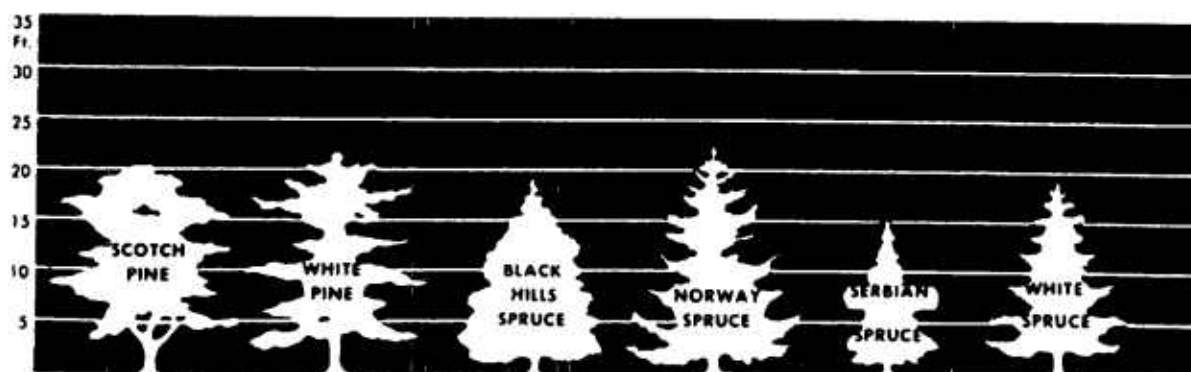
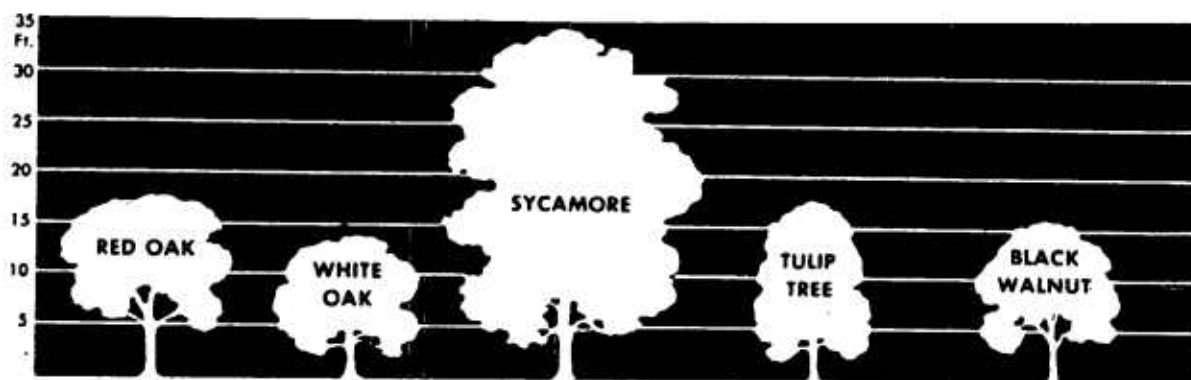
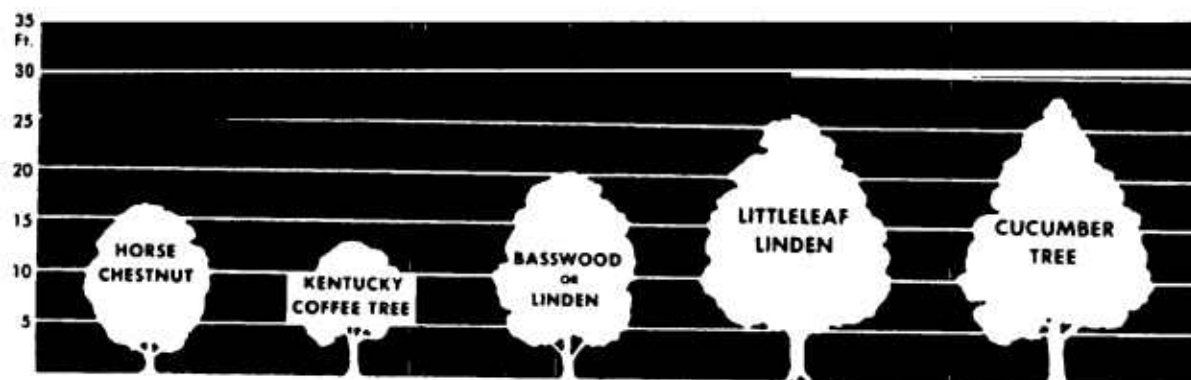
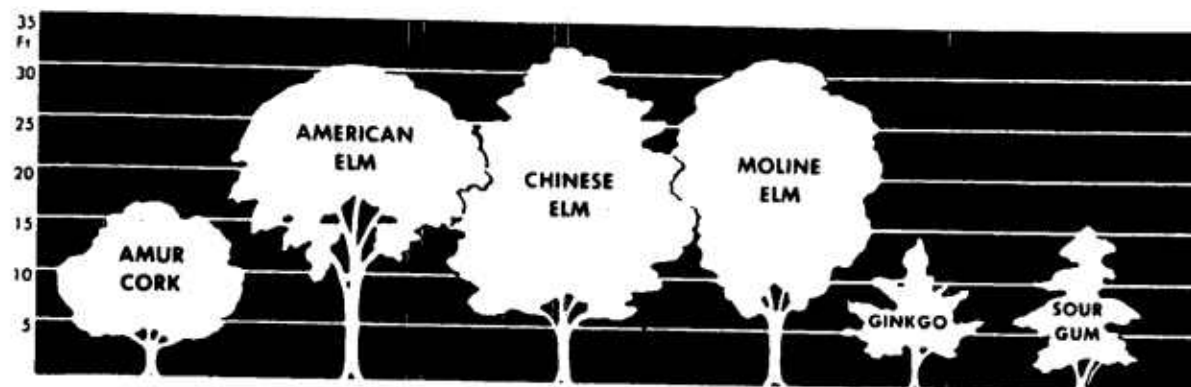


Table 1. Height growth of trees in the Morton Arboretum Tree Evaluation Plots based on 1989 survey.

TAXA	Height increase (ft/yr)	No. of trees	No. years planted
<i>Acer campestre</i>	0.75	3	28
<i>A.c. leiocarpum</i>	0.62	4	28
<i>A. ginnala</i>	0.38	4	27
<i>A. miyabei</i>	1.17	4	17
<i>A. platanoides</i> 'Charles F. Irish'	1.00	5	31
<i>A.p.</i> 'Cleveland'	0.50	4	24
<i>A.p.</i> 'Crimson King'	0.48	5	31
<i>A.p.</i> 'Emerald Queen'	0.70	5	25
<i>A.p.</i> 'Erectum'	0.84	3	29
<i>A.p.</i> 'Olmsted'	0.61	4	29
<i>A.p.</i> 'Schwedleri'	0.52	5	31
<i>A.p.</i> 'Summershade'	0.76	4	29
<i>A.p.</i> 'Super-form'	0.77	3	26
<i>A. rubrum</i>	0.53	5	31
<i>A.r.</i> 'Armstrong'	0.70	3	25
<i>A.r.</i> 'Bowhall'	0.52	5	26
<i>A.r.</i> 'Columnare'	0.87	3	26
<i>A. saccharinum</i>	1.41	5	26
<i>A. saccharum</i> 'Green Mountain'	0.75	5	22
<i>A. tataricum</i>	0.74	5	27
<i>Aesculus glabra</i>	0.54	5	23
<i>A. hippocastanum</i>	0.35	5	32
<i>A. h.</i> 'Umbraculifera'	0.80	3	27
<i>Alnus glutinosa</i>	0.89	5	26
<i>Carpinus betulus</i> 'Columnar-is'	0.78	5	30
<i>Celtis occidentalis</i>	0.74	4	31
<i>Cladrastis lutea</i>	0.84	4	30
<i>Crataegus x mordenensis</i> 'Toba'	0.62	3	28
<i>C. phaenopyrum</i>	0.26	4	30
<i>Euonymus bungeanus</i>	0.21	5	29
<i>F. chinensis</i> var. <i>rhynchophylla</i>	0.29	5	28
<i>Fraxinus excelsior</i>	1.23	5	31
<i>F. excelsior</i> 'Hessei'	0.71	5	27
<i>F. mandshurica</i>	0.71	5	27
<i>F. pennsylvancia</i> var. <i>subintegerrima</i>	1.05	5	26
<i>F.p.</i> 'Summit'	0.58	5	22
<i>F. quadrangulata</i>	0.58	5	28
<i>F. tomentosa</i>	1.14	5	26
<i>Ginkgo biloba</i>	0.32	4	26
<i>Gleditsia triacanthos</i> 'Imperial'	1.14	5	31
<i>G.t.</i> 'Shademaster'	0.70	5	29
<i>G.t.</i> 'Skyline'	1.41	5	31
<i>Gymnocladus dioicus</i>	0.49	5	31
<i>Liquidambar styraciflua</i>	0.53	5	31

WARE

Liriodendron tulipifera	1.12	3	31
Magnolia kobus var. borealis	0.44	4	28
M. salicifolia	0.81	5	28
Malus 'Red Jewel'	0.45	5	17
Malus 'Snowdrift'	0.62	5	17
Ostrya virginiana	0.49	4	30
Platanus occidentalis	1.48	5	27
Pyus calleryana 'Aristocrat'	0.92	4	16
Quercus coccinea	0.67	5	26
Q. imbricaria	0.72	5	28
Q. palustris	1.23	5	30
Q. robur	1.55	5	17
Salix pentandra	0.92	5	27
Sophora japonica	0.81	5	30
Tilia americana 'Redmond'	1.02	5	31
T. cordata	0.47	3	31
T.c. 'Fairview'	0.95	5	15
T.c. 'Greenspire'	0.70	3	25
T. x euchlora	0.47	4	26
Ulmus carpinifolia 'Koopmannii'	0.60	3	28
U. pumila x rubra 'Green King'	1.12	5	30

Catalog of Conifers

Page 1

Acorn Ridge Gardens and Nursery carries a wide variety of interesting garden conifers. This catalog provides descriptions of types we carry from time to time. However, the actual stock available at any point in time is subject to prior sale, availability from our suppliers, and how well young plants are growing to sell-able sizes. Sizes and prices of plants for sale available upon request.

Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Abies alba</i> 'Pendula'	Weeping European Silver Fir	A graceful, weeping form with soft, green needles attached to long, pendulous branches	Modest grower to 10' x 3'	Sun Zone 4
<i>Abies concolor</i> 'Compacta'	Dwarf Colorado White Fir	Dwarf and irregular shrub form with dense grey foliage	Slow grower to 4' x 3'	Sun Zone 4
<i>Abies concolor</i> 'Conica'	Dwarf Colorado White Fir	Dwarf, pyramidal shape with distinctive, dense blue-gray needles	Modest growing to 8' x 3'	Sun Zone 4
<i>Abies lasiocarpa</i> 'Arizonica Compacta'	Dwarf Rocky Mountain Fir	A dwarf and quite dense, broadly conical shape, bright blue needles. Distinguished by purple color of young cones	Slow growing to 4' x 2'	Sun Zone 4
<i>Abies lasiocarpa</i> 'Glauca Compacta'	Dwarf Rocky Mountain Fir	Dwarf, narrow pyramid form with silver blue congested foliage	Slow growing to 4' x 2'	Sun Zone 4
<i>Abies procera</i> 'Glauca'	Blue Noble Fir	This tree, native to Oregon, has very blue needles. Will become full size tree	10' x 4'	Sun Zone 5
<i>Abies procera</i> 'Silver'	Noble Fir	Silver form of the Noble Fir.	10' x 4'	Sun Zone 5
<i>Abies sibirica</i> 'Argentea'	Siberian Fir	A tall slender tree with long, soft green needles	10' x 4'	Sun Zone 2
<i>Chamaecyparis nootkatensis</i> 'Argenteovariegata'	Silver variegated Alaska-Cedar	This Nootka Cypress has bright silver-tipped foliage. Will grow to 20-30 feet.	8' x 4'	Sun to part shade Zone 5
<i>Chamaecyparis nootkatensis</i> 'Aureovariegata'	Yellow variegated Alaska-Cedar	This Nootka Cypress has splashes of gold against dark green foliage. Will grow to 20-30 feet.	8' x 4'	Sun to part shade Zone 5
<i>Chamaecyparis nootkatensis</i> 'Glauca'	Blue Nootka Cypress	A large shrub or small tree, quite dense, with beautiful blue-green foliage.	4' x 2'	Sun to part shade Zone 5

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Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Chamaecyparis nootkatensis</i> 'Pendula'	Weeping Alaska-Cedar	This tree is on nearly everyone's top 10 conifer list. Its branchlets hang gracefully from its horizontal branches. Will grow a foot a year and can reach substantial heights.	10' x 4'	Sun to part shade Zone 5
<i>Chamaecyparis nootkatensis</i> 'Sullivan'	Sullivan Alaska-Cedar	Narrow pyramidal form of Alaska Cypress has attractive foliage and slightly weeping branch tips	4' x 15"	Sun to part shade Zone 5
<i>Chamaecyparis pisifera</i> 'Filifera Aurea'	Dwarf Golden Thread Cypress	Weeping mound of bright yellow lacy foliage.	2' x 3'	Sun Zone 4
<i>Chamaecyparis pisifera</i> 'Plumosa Albopicta'	Variegated Falsecypress	A relatively large pyramidal shaped shrub with silvery-white variegation on dark green soft foliage.	5' x 3'	Sun Zone 4
<i>Chamaecyparis thyoides</i> 'Andelyensis'	Dwarf Atlantic White Cedar	Compact, slow-growing broad pyramidal form with dense, bluish-green foliage	5' x 2'	Sun Zone 5
<i>Chamaecyparis thyoides</i> 'Aurea'	Yellow Variegated Atlantic White Cedar	A shrubby form of Atlantic White Cedar with yellow foliage and irregular habit.	4' x 3'	Sun Zone 4
<i>Chamaecyparis thyoides</i> 'Blue Sport'	Blue Atlantic White Cedar	Beautiful blue-gray foliage adorns this broad, upright shrub, with a somewhat open, pendulous form.	5' x 4'	Sun Zone 4
<i>Chamaecyparis thyoides</i> 'Little Jamie'	Dwarf Atlantic White Cedar	Similar to Andelyensis, but much slower growing. A conical form	3' x 1.5'	Sun Zone 4
<i>Chamaecyparis thyoides</i> 'Red'	Dwarf Atlantic White Cedar	Compact, dense, columnar form. Blue-green summer foliage, red winter foliage. Distinguished by star shaped ends of leaves.	5' x 3'	Sun Zone 4
<i>Juniperus communis</i> 'Effusa'	Effusa Common Juniper	This juniper forms a layered mat of dark green/silvery needles. Excellent groundcover for weed control	1' x 4'	Sun to part shade Zone 5
<i>Juniperus communis</i> 'Gold Cone'	Gold Common Juniper	This columnar form has bright golden yellow foliage. Very soft branches	6' x 2'	Sun Zone 4
<i>Juniperus communis</i> 'Pencil Point'	Pencil Point Common Juniper	Very narrow columnar form with soft green needles.	2' x 1'	Sun Zone 3

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Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Juniperus sabina</i> 'Blue Forest'	Savin Blue Forest Juniper	Blue foliage, spreading growth habit with upturned sprays, appearing like a miniature forest	1' x 5'	Sun Zone 5
<i>Juniperus sabina</i> 'Calgary Carpet'	Calgary Carpet Juniper	Soft green foliage on low growing dense, layered form. Color stays green through winter	1' x 5'	Sun Zone 5
<i>Juniperus sargentii</i> 'Glaucua'	Sargent Juniper	A slow growing spreading plant with nice blue foliage. (AKA <i>J. chinensis</i> var. <i>sargentii</i> 'Glaucua')	1' x 5'	Sun Zone 5
<i>Juniperus squamata</i> 'Blue Carpet'	Blue Carpet Singleseed Juniper	Plant this instead of Blue Rug Juniper, which is susceptible to Tip Blight. A vigorous carpet of dense blue foliage with graceful branch tips.	1' x 6'	Sun Zone 4
<i>Juniperus squamata</i> 'Blue Star'	Blue Star Singleseed Juniper	Dense, compact mound form; bright blue foliage with narrow tips radiating from hub, giving this plant a "Star" appearance	1' x 2'	Sun Zone 4
<i>Juniperus virginiana</i> 'Globosa'	Dwarf Eastern Red Cedar	A globe shape dwarf with dark green, dense foliage	1' x 1'	Sun Zone 4
<i>Juniperus virginiana</i> 'Grey Owl'	Eastern Red Cedar	A large, spreading shrub with soft silvery gray foliage. Color persists through winter. Will grow wider than tall.	2' x 4'	Sun Zone 5
<i>Juniperus x media</i> 'Daub's Tested'	Golden Hybrid Juniper	Very low growing, with blue-green foliage and golden-yellow tips. Can be pruned to keep from spreading.	6' x 8'	Sun Zone 4
<i>Juniperus x media</i> 'Sea Green'	Hybrid Juniper	Compact, spreader with fountain-like, arching branches and dark green foliage. (Previously listed as <i>J. chinensis</i> 'Sea Green')	3' x 4'	Sun Zone 4
<i>Picea abies</i> 'Argenteospica'	Variegated Norway Spruce	New growth are creamy white, turning green as the season progresses. Growth rate similar to species (will become large tree)	8' x 3'	Sun Zone 4
<i>Picea abies</i> 'Diffusa'	Diffusa Dwarf Norway Spruce	Dwarf, conical shrub with thin overlapping branches and twigs creating dense appearance	5' x 3'	Sun Zone 3

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Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Picea glauca</i> 'Alberta Globe'	Alberta Globe White Spruce	This is a slow growing mounding globe form of the Alberta Spruce. Dense grassy-green foliage	1' x 1'	Sun Zone 5
<i>Picea glauca</i> 'Cecelia'	Cecelia White Spruce	Beautiful dwarf has dense ascending mound habit. Stiff blue-gray needles	2' x 2'	Sun Zone 2
<i>Picea glauca</i> 'Pendula'	Weeping White Spruce	Small, distinctive erect tree with weeping branches of blue-gray foliage	8' x 3'	Sun Zone 2
<i>Picea glauca</i> 'Pixie'	Dwarf White Spruce	Pixie is like a very dwarf and more dense Alberta Spruce. Very slow growing, conical form. Suitable for rock garden.	1.5' x 8"	Sun Zone 5
<i>Picea glauca</i> 'Sanders Blue'	Blue Alberta Spruce	This plant is quite similar to Alberta Spruce, but has blue foliage. It often develops some green foliage after several years in the ground, resulting in a tapestry affect.	3' x 2'	Sun Zone 4
<i>Picea omorika</i> 'Nana'	Dwarf Serbian Spruce	A squat pyramid of dense branches bearing silvery backed blue-green needles	5' x 3'	Sun Zone 4
<i>Picea orientalis</i> 'Barnes'	Dwarf Oriental Spruce	Slow growing dwarf, spreading form of Oriental Spruce. Dark green, very small needles	2' x 2'	Sun Zone 4
<i>Picea orientalis</i> 'Bergman's'	Dwarf Oriental Spruce	A dwarf form that is more spreading than 'Barnes'. Dark green foliage	2' x 2'	Sun Zone 4
<i>Picea orientalis</i> 'Connecticut Turnpike'	Dwarf Oriental Spruce	Slow growing, globe form.	3' x 4'	Sun Zone 4
<i>Picea orientalis</i> 'Early Gold'	Variegated Oriental Spruce	Full size Oriental Spruce with yellow tips on new growth. Color remains yellow-green rather than turning the dark green of the species.	6' x 3'	Sun Zone 4
<i>Picea orientalis</i> 'Nana'	Dwarf Oriental Spruce	Slow growing, globe form. Short, glossy dark green needles	2' x 2'	Sun Zone 4

Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Picea pungens</i> 'Fat Albert'	Fat Albert Colorado Blue Spruce	Full-bodied, conical form. Good steel blue foliage. Will form a large, dense tree.	8' x 6'	Sun Zone 3
<i>Picea pungens</i> 'Glauc Globosa'	Dwarf Globe Colorado Blue Spruce	Beautiful blue foliage on globe form. (Similar to Montgomery). There is a very nice specimen in the back yard foundation bed. May become pyramidal shape in later years	3' x 4'	Sun Zone 3
<i>Picea pungens</i> 'Iseli Fastigiata'	Columnar Colorado Blue Spruce	This columnar form has ascending branches and excellent blue color.	6' x 2'	Sun Zone 3
<i>Picea pungens</i> 'Montgomery'	Dwarf Globe Colorado Blue Spruce	Beautiful blue foliage on globe form. May become pyramidal in later years	3' x 4'	Sun Zone 3
<i>Picea pungens</i> 'St. Mary'	Dwarf Colorado Blue Spruce	Slow growing, dense, slightly conical plant with small blue needles. Suitable for rock garden.	2' x 3'	Sun Zone 3
<i>Picea pungens</i> 'Thuem'	Dwarf Colorado Blue Spruce	Irregular mounding conical form with excellent powder blue color. (Similar to Montgomery).	3' x 3'	Sun Zone 3
<i>Pinus cembra</i>	Swiss Stone Pine	Slow growing, short, narrow tree. Needles are bluish-green	6' x 3'	Sun Zone 3
<i>Pinus cembra</i> 'Glauca Compacta'	Dwarf Swiss Stone Pine	Slower growing than species. Upright, with blue foliage	4' x 2'	Sun Zone 3
<i>Pinus cembra</i> 'Pygmaea'	Dwarf Swiss Stone Pine	Dwarf, upright form, with soft congested blue-green needles.	2' x 2'	Sun Zone 4
<i>Pinus cembra</i> 'Silver Sheen'	Swiss Stone Pine	A tall pyramidal tree with silvery blue needles	5' x 3'	Sun Zone 4
<i>Pinus flexilis</i> 'Vanderwolf's Pyramid'	Limber Pine	Broad, upright form has long, soft bluish needles. Ascending branches.	7' x 3'	Sun Zone 4
<i>Pinus x hakkodensis</i>	Hybrid Pine	This cross between <i>Pinus parviflora</i> (Japanese White Pine) and <i>Pinus pumila</i> (Japanese Stone Pine) has an irregular spreading growth habit with slightly twisted blue needles.	3' x 4'	Sun Zone 5

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Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Pinus koraiensis</i> 'Compacta Glaucá'	Dwarf Korean Pine	Slow growing conical form with silver-blue foliage	3' x 2'	Sun Zone 4
<i>Pinus koraiensis</i> 'Morris Blue'	Korean Pine	A very blue form of the Korean Pine. Moderate grower, pyramidal form	4' x 3'	Sun Zone 4
<i>Pinus mugo</i> 'Mops'	Dwarf Mugo Pine	Dwarf, compact globe form of the mugo pine. This will stay small without pruning	2 x 2	Sun Zone 2
<i>Pinus mugo</i> 'Valley Cushion'	Dwarf Mugo Pine	Very dwarf, compact mound form of the mugo pine. Grows wider than tall. This will stay small without pruning	1.5' x 2.5'	Sun Zone 2
<i>Pinus parviflora</i> 'Adcock's Dwarf'	Dwarf Japanese White Pine	Small blue-green recurved needles. This attractive plant is suitable for the rock garden	2 x 3	Sun Zone 5
<i>Pinus parviflora</i> 'Al Fordham'	Dwarf Japanese White Pine	Slow growing upright form with short green needles and silver beneath	3 x 2	Sun Zone 5
<i>Pinus parviflora</i> 'Fuku-zu-mi'	Dwarf Japanese White Pine	This low spreading dwarf selection has thick clusters of blue-green recurved needles	2 x 3	Sun Zone 5
<i>Pinus parviflora</i> 'Glaucá Nana'	Dwarf Japanese White Pine	Short twisted blue needles. Upright open form,	2' x 1.5'	Sun Zone 5
<i>Pinus parviflora</i> 'Watnong'	Dwarf Japanese White Pine	Slow growing, medium green needles. Forms a quite regular pyramidal shrub	3' x 2'	Sun Zone 5
<i>Pinus strobus</i> 'Bergman's Variegated'	Variegated Eastern White Pine	Upright pyramidal form with yellow splashes of color against green foliage.	Modest grower 8' x 3'	Sun Zone 4
<i>Pinus strobus</i> 'Bloomer's Dark Globe'	Dwarf Eastern White Pine	As its name implies, this is a globe form with darker than usual green needles. Slow growing	2' x 3'	Sun Zone 3
<i>Pinus strobus</i> 'Blue Shag'	Dwarf Eastern White Pine	The soft needles on this dwarf Eastern White Pine have a bluish tint	3' x 3'	Sun Zone 3
<i>Pinus strobus</i> 'Brevifolia'	Eastern White Pine	Short needles identify this compact, and narrow, upright form	3' x 15"	Sun Zone 3

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Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Pinus strobus</i> 'Golden Candles'	Variegated Eastern White Pine	The buds and surroundign leaves of this low spreading shrub are golden- yellow in spring and early summer	4' x 4'	Sun Zone 3
<i>Pinus strobus</i> 'Greg'	Dwarf Eastern White Pine	This is an excellent slow growing dwarf conifer suitable for the rock garden. Soft cushion of dense gray- green needles.	1' x 1.5'	Sun Zone 3
<i>Pinus strobus</i> 'Horsford'	Dwarf Eastern White Pine	Diminutive, dense cushion with soft, green needles. Suitable for rock garden.	1' x 1.5'	Sun Zone 3
<i>Pinus strobus</i> 'Merrimack'	Dwarf Eastern White Pine	Globe, dense mound form. Nice blue-green foliage	2' x 3'	Sun Zone 3
<i>Pinus strobus</i> 'Minuta'	Dwarf Eastern White Pine	One of the slowest growing of the globe Eastern White Pine dwarfs. Short blue-green needles	1' x 2'	Sun Zone 3
<i>Pinus strobus</i> 'Torulosa'	Eastern White Pine	The corkscrew like twisted needles and branches give this tree its distinctive look. Open growing, full size tree.	10' x 5'	Sun Zone 3
<i>Pinus sylvestris</i> 'Albyn's'	Dwarf Scots Pine	Slow growing, prostrate form with blue-green needles. An excellent plant for the garden.	6" x 6'	Sun Zone 3
<i>Pseudolarix amabilis</i>	Golden Larch	Broadly pyramidal large deciduous conifer. Beautiful gold color in fall works especially well with compatibly colored mums.	3' x 3'	Sun Zone 4
<i>Sciadopitys verticillata</i>	Japanese Umbrella Pine	A stately narrow tree with thick, glossy, almost tropical looking, green needles arranged like spokes of a wheel around each terminal bud.	5' x 3'	Part Shade Protect from Southern sun in winter. Zone 5
<i>Taxus cuspidata</i> 'Greenwave'	Japanese Yew	Dark green foliage on low mounding spreading habit with distinctive graceful, arching branches	2' x 5'	Sun to Part Shade Zone 5

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Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Taxus x media</i> 'Beanpole'	Hybrid Yew	Very narrow columnar form. Slow growing and dense	1' x 1'	Sun to Part Shade Zone 5
<i>Taxus x media</i> Brincka Upright	Hybrid Yew	Somewhat narrow columnar form. Will become large (20' x 6'), given enough time	5' x 2'	Sun to Part Shade Zone 5
<i>Thuja occidentalis</i> 'Danica'	Dwarf Eastern Arborvitae	Dwarf, globe form. Very dense, bright green foliage. One of the nicest selections for the garden	2' x 2'	Sun to Part Shade Zone 3
<i>Thuja occidentalis</i> 'DeGroots Spire'	Columnar Eastern Arborvitae	This tall, very narrow form of Arborvitae makes a handsome vertical accent in the garden. Medium green foliage. Little or no snow/ice damage due to its narrow form.	8' x 2'	Sun to Part Shade Zone 3
<i>Thuja occidentalis</i> 'Golden Globe'	Globe Eastern Arborvitae	As the name implies, this arborvitae is globose with golden-yellow foliage. Color persists well through winter.	3' x 3'	Sun to Part Shade Zone 3
<i>Thuja occidentalis</i> 'Holmstrup'	Conical Eastern Arborvitae	This is a relatively slow growing arborvitae, forming a dense irregular to conical shape. Rich green foliage holds color through winter.	6' x 3'	Sun to Part Shade Zone 3
<i>Thuja occidentalis</i> 'Linesville Witches' Broom'	Dwarf Arborvitae	This dwarf globe form was found as a witches' broom in Linesville, PA by Joe Stupka. Soft light green needles make this a very appealing plant for the garden	3' x 3'	Sun to Part Shade Zone 5
<i>Thuja occidentalis</i> 'Malonyana'	Columnar Arborvitae	Columnar, dense form with glossy green foliage. Can grow to 20-30'	6' x 3'	Sun to Part Shade Zone 4
<i>Thuja occidentalis</i> 'Pendula'	Weeping Eastern Arborvitae	This weeping form of arborvitae has striking cascading foliage. Stake, at least in early years for best effect.	4' x 3'	Sun to Part Shade Zone 4
<i>Thuja occidentalis</i> 'Sherwood Frost'	Variegated Eastern Arborvitae	This conical form has creamy-white variegation giving it its distinctive look.	6' x 3'	Sun Zone 3

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Botanical Name	Common Name	Description	Growth Rate Size in 10 yr.	Sun/Shade Zone
<i>Thuja occidentalis</i> 'Spiralis'	Arborvitae	Narrow pyramidal form with branches spirally arrange. Dark green foliage.	5' x 3'	Sun Zone 3
<i>Thuja occidentalis</i> 'Sunkist'	Variegated Eastern Arborvitae	This fast growing form of arborvitae is conical in habit with dense, bright gold-tipped foliage.	6' x 3'	Sun Zone 3
<i>Tsuga canadensis</i> 'Albospica'	Variegated Canadian Hemlock	New growth tips are intensely white, contrasting well with the dark green foliage of the mature needles. Open branching form	10' x 4'	Part Shade to Shade Zone 4
<i>Tsuga canadensis</i> 'Curly'	Dwarf Canadian Hemlock	This is an irregular shaped, upright, dense form with rigid branches and short, curled needles.	4' x 3'	Part Shade to Shade Zone 4
<i>Tsuga canadensis</i> 'Hussi'	Dwarf Canadian Hemlock	Upright dwarf, irregular habit. Dark green color, short needles	1.5 x 1.5	Part Shade to Shade Zone 4
<i>Tsuga canadensis</i> 'Jeddeloh'	Dwarf Canadian Hemlock	This globe, dwarf form is unique in that it has a depression in the top center of the globe like a "nest". The dense foliage is composed of medium green needles.	2' x 2'	Part Shade to Shade Zone 4
<i>Tsuga canadensis</i> 'Palomino'	Dwarf Canadian Hemlock	This dwarf globe form has irregular, congested branches that exhibit cinnamon-colored tips.	1' x 1'	Part Shade to Shade Zone 4
<i>Tsuga canadensis</i> 'Pendula'	Weeping Canadian Hemlock	This hemlock grows to a large mound of long pendulous branches. Stake young plants for a few years for best effect.	8' x 4'	Part Shade to Shade Zone 4

METASEQUOIA GLYPTOSTROBOIDES IN URBAN FORESTRY

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ABSTRACT --Metasequoia, fast-growing and relatively free of diseases and insect pests, is well adapted to a broad area in the eastern U.S. and is becoming a popular amenity tree. Much work remains to be done to determine the range of genetic variation in growth rate, rootability, and adaptability to different urban conditions. Fifty of the largest specimens are listed.

Metasequoia glyptostroboides, the "dawn redwood" thought extinct for 20,000,000 years until it was found alive and well in the mountains of central China in 1941, is on its way to becoming a popular shade and amenity tree in America's urban landscape. About 10,000 a year are planted and the number has been rising, according to Mr. R. Henkel of Princeton Nurseries, Resistant to air pollution (Petsch 1978), this handsome, sun-and moisture-loving relative of California's redwoods has adapted well to a broad area of the eastern United States from central Alabama to southern New England (Kuser 1982). In Maplewood, New Jersey Metasequoia has been successfully used as a street tree since the early 1950's, when it was first planted by Mr. R. Walter, Director of Parks and Shade Trees. In its native China, it is one of four main species involved in urban forestry (National Academy of Sciences 1975). Fast-growing and nearly disease-free, it has grown as tall as 104' in 34 years since its introduction into the Western world in 1948 (Table I).

Not enough is known of the range of genetic variation in Metasequoia. Trees growing in the U.S. appear to have originated from seed received in January 1948 by Dr. E. Merrill of the Arnold Arboretum from W. C. Cheng in Mo-Tao-Chi, Hupeh Province, China. There is no record of introductions from

elsewhere in the 450-mile-long by 50-mile-wide range in western Hupeh, northern Hunan, and eastern Szechwan provinces, where vast forests of the species are reported by Dr. K. Ching of Oregon State University to grow in an area as yet little exploited by man. U.S.-grown trees vary in at least seven characteristics: form, branch angle, crown density/shade tolerance, resistance to Dothiorella canker (Santamour 1977), rootability of different clones, bark roughness, and growth rate.

Metasequoia's reproductive behavior is characterized by trees' attaining female before male sexual maturity. Usually macrosporangiate strobili (female conelets) are produced when trees are 30' - 50' high; in the absence of pollen, these mature into normal-appearing cones containing empty seeds. Microsporangiate strobili are produced when trees are 60' - 90' high on catkins similar to those of baldcypress. At New Brunswick, New Jersey, these release pollen between March 15 and March 30 and are then shed by the tree. Catkins cut March 3 this year at Rutgers and forced in water indoors produced pollen March 7, but those cut February 8 and February 22 were not far enough advanced at cutting to do so. At time of pollen-flight, the emerald-green female strobili are 4-5 mm long and pollen readily sticks to them. Pollination appears to be relatively ineffective at distances of more than 100 meters, and inbreeding depression is evident in the poor seed germination and lower vigor of progeny from isolated trees (Kuser 1983).

Young Metasequoias are usually planted as container-grown stock although sometimes as larger B & B specimens. There appear to be no records of bare-root planting. The tree grows fast in its first few years after planting; in New Jersey mean height of 21 trees grown from the Arnold Arboretum's 1948 seed was 25.3 m at the end of the 1981 growing season, indicating mean growth of 0.74 m/yr up to age 34. One in my lawn at Princeton, NJ grew from six feet to 12 feet tall in its second summer after planting.

Few pests and diseases affect Metasequoia. In the Washington, DC area, Dothiorella canker caused by common apple white-rot fungus (Botryosphaeria ribis) has been a problem (Stipes et al. 1971), but in 75 other areas surveyed in 1981-2, no diseases and few insect pest were reported. Three survey respondents listed attacks by Japanese beetles.

Maintenance problems reported so far are minimal. The tree has a tendency to form "armpits" on its trunk below lower branches, but in Maplewood, Metasequoias trimmed up to 8' have not done this. Trees grown in competition with

others have generally produced straight, clean trunks, while open-grown specimens with many lower branches have not. No sidewalk heaving has been reported at Maplewood, but more trials may be needed to confirm this, because the tree is a heavy and shallow rooter.

Much research on Metasequoia remains to be done. Range-wide provenance testing is strongly desirable to determine the nature and extent of genetic variation in the species' morphology, growth rate, hardiness, and wood specific gravity. Decay resistance testing of heartwood needs to be done, to find whether Metasequoia ranks with its relatives Sequoia, Taxodium, and Cryptomeria and deserves attention as a potential timber species. In China, it is reported to be decay-resistant (Liu et al. 1978) and the nature of some of its heartwood extractives has been determined (Enoki et al. 1977).

Work should be done in the following nine areas:

1. Provenance testing for growth rate, hardiness, and wood specific gravity.
2. Decay resistance testing; all of us on the Meta-sequoia committee should be on the lookout for a heartwood log measuring 30-45 cm (12"-18") in diameter which can be sent to the Forest Products Laboratory for testing. This might become available from a tree cut for roadbuilding, construction, etc.
3. Progeny testing to find which trees produce the fastest-growing seedlings (I'm doing this).
4. Rootability testing to find which clones are easiest to root, and how much difference exists (I'm doing this).
5. Follow-up testing of Santamour's Dothiorella-resistant clones.
6. Evaluation of the currently popular, widely-propagated clone "National" vs. others for form, growth rate, and disease resistance under urban conditions.
7. Testing whether pruning up to 8 feet does indeed prevent "armpitting."
8. Testing in several locations of tendency to heave sidewalks.
9. Testing in several locations with different soil and drainage conditions, of size of cutout area

in pavement or between sidewalk and street, needed for survival and vigorous growth.

10. Hybridization could be explored. Metasequoia, like all other members of Taxodiaceae except Sequoia, has a haploid chromosome number $n=11$ (diploid $2n=22$). Although neither Dr. S. Krugman's attempt to cross Metasequoia with Sequoia (both ways) nor Dr. K. Chambers' attempt to cross it with Sequoiadendron succeeded, other possibilities remain. If the Chinese can cross Taxodium with Cryptomeria (Kellison et al. 1982) and the British can cross Cupressus and Chamaecyparis (accidentally), surely we should try some crosses between Metasequoia and related taxodiads.

Table 1. Height, circumference, and crown spread of the 50 largest metasequoias reported in the 1981/82 survey.

Location	Date Planted	Height	Circumference at 4½'	Spread	Points
Bailey Arboretum, Locust Valley, New York	1949	79'	12' 10"	40'	243
College of William and Mary, Williamsburg, Virginia	1949	104'	9' 6"	45'	229
Auburn University, Auburn, Alabama	1952	90'	10' 3"	51'	226
Princeton University, Princeton, New Jersey	1949	85'	10' 6"	40'	221
Winterthur Gardens, Winterthur, Delaware	1949	78'	10' 9"	40'	217
Willowwood Arboretum, Gladstone, New Jersey	1950	82'	10' 0"	42'	212
Smith College Botanical Garden, Northampton, Massachusetts	1949	72'	10' 0"	42'	202
Morris Arboretum, Philadelphia, Pennsylvania	1953	70'	8' 9"	40'	185

Location	Date Planted	Height	Circum- ference at 4½'	crown Spread	Points
Oregon State University, Corvallis, Oregon	1949	76'	8' 5"	31'	185
Longwood Gardens, Kennett Square, Pennsylvania	1949	70'	8' 8"	36'	183
University of California Botanical Garden, Berkeley, California	1949	90'	7' 1"	24'	181
Biltmore House, Asheville, North Carolina	1950	81'	7' 6"	30'	179
Peter Finnerty, Princeton, New Jersey	1949	83'	7' 1"	36'	177
Marquand Park, Princeton, New Jersey	1949	71'	8' 0"	30'	175
Carleton Goff, Barrington, Rhode Island	1949	76'	7' 3"	39'	173
Alexander St., Princeton, New Jersey	1949	72'	7' 8"	36'	173
Duke University Gardens, Durham, North Carolina	1949	66'	8' 0"	38'	172
Arnold Arboretum, Jamaica Plain, Massachusetts	1949	70'	7' 10"	24'	170
Broadmead, Princeton, New Jersey	1949	98'	5' 6"	24'	170
Burnet Woods, Cincinnati, Ohio	1948	79'	6' 9"	39'	170
Peavy Arboretum, Corvallis, Oregon	1949	67'	7' 8"	40'	169
University Botanic Garden, Cambridge, England	1949	75'	7' 1"	27'	167
Coker College, Hartsville, South Carolina	1952	71'	7' 4"	32'	167

Location	Date Planted	Height	Circum- ference at 4½'	crown Spread	Points
UCLA Botanical Garden, Los Angeles, California	1948	94'	5' 6"	22'	165
J. J. Willaman, Plymouth Meeting, Pennsylvania	ca. 1950	83'	6' 4"	24'	165
Botanische Tuinen, Utrecht, Netherlands	1949	60'	7' 0"	23'	160
Forest Research Institute, Rotorua, New Zealand	1950	51'	8' 2"	38'	158
Samuel Humes, Lawrenceville, New Jersey	ca. 1950	73'	6' 4"	24'	155
Los Angeles State and County Arboretum, Los Angeles, California	1948	85'	4' 9"	12'	145
Missouri Botanical Garden, St. Louis, Missouri	1950	65'	5' 9"	28'	145
Dawes Arboretum, Newark, Ohio	1950	58'	6' 7"	10'	140
National Arboretum, Washington, D.C.	ca. 1949	53'	6' 8"	25'	139
University of Washington Arboretum, Seattle, Washington	1954	71'	5' 2"	18'	138
Scott Horticultural Foundation, Swarthmore, Pennsylvania	1949	60'	5' 11"	22'	137
Ladham House, Kent, England		59'	5' 10"	c 32'	137
Brooklyn Botanic Garden, Brooklyn, New York	1954	67'	5' 2"	24'	135
Rutgers University, New Brunswick, New Jersey	ca. 1950	70'	4' 9"	24'	133
Children's Hospital, Boston, Massachusetts		60'	5' 4"	36'	133
Secrest Arboretum, Wooster, Ohio	1949	69'	4' 8"	15'	129

Location	Date Planted	Height	Circum- ference at 4½'	Crown Spread	Points
Mount Auburn Cemetery, Cambridge, Massachusetts	?	62'	5' 0"	23'	128
Hoyt Arboretum, Portland, Oregon	1964	56'	5' 4"	24'	126
North Carolina State University, Raleigh, North Carolina	?	51'	5' 9"	22'	125
Callaway Gardens, Pine Mountain, Georgia	1961	70'	4' 0"	25'	124
Mrs. R. P. Nash, South Euclid, Ohio	ca. 1954	70'	4' 0"	25'	124
Royal Horticultural Society Garden, Wisley, England	1948	70'	3' 6"	30'	119
Bernheim Forest Arboretum, Clermont, Kentucky	1964	55'	4' 9"	20'	117
Ayrault House, Newport, Rhode Island	ca. 1949	61'	3' 7"	28'	111
Beacon Hill Park, Victoria, B.C., Canada	ca. 1949	52'	4' 2"	20'	107
University of Connecticut, Storrs, Connecticut	1963	69'	2' 6"	24'	105
Strybing Arboretum, San Francisco, California	?	34'	5' 3"	27'	104

Data are reported for only the largest tree at each location. Points are determined by the ranking system followed in "National Register of Big Trees" (American Forestry Association, 1982): one point for each foot of height, one point for each inch of circumference, and one-quarter point for each foot of crown spread.

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