

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

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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.



Figure 1. Initial plantings of the Tree Evaluation Plots in 1958 (top) and as they looked in 1989 (bottom).

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.

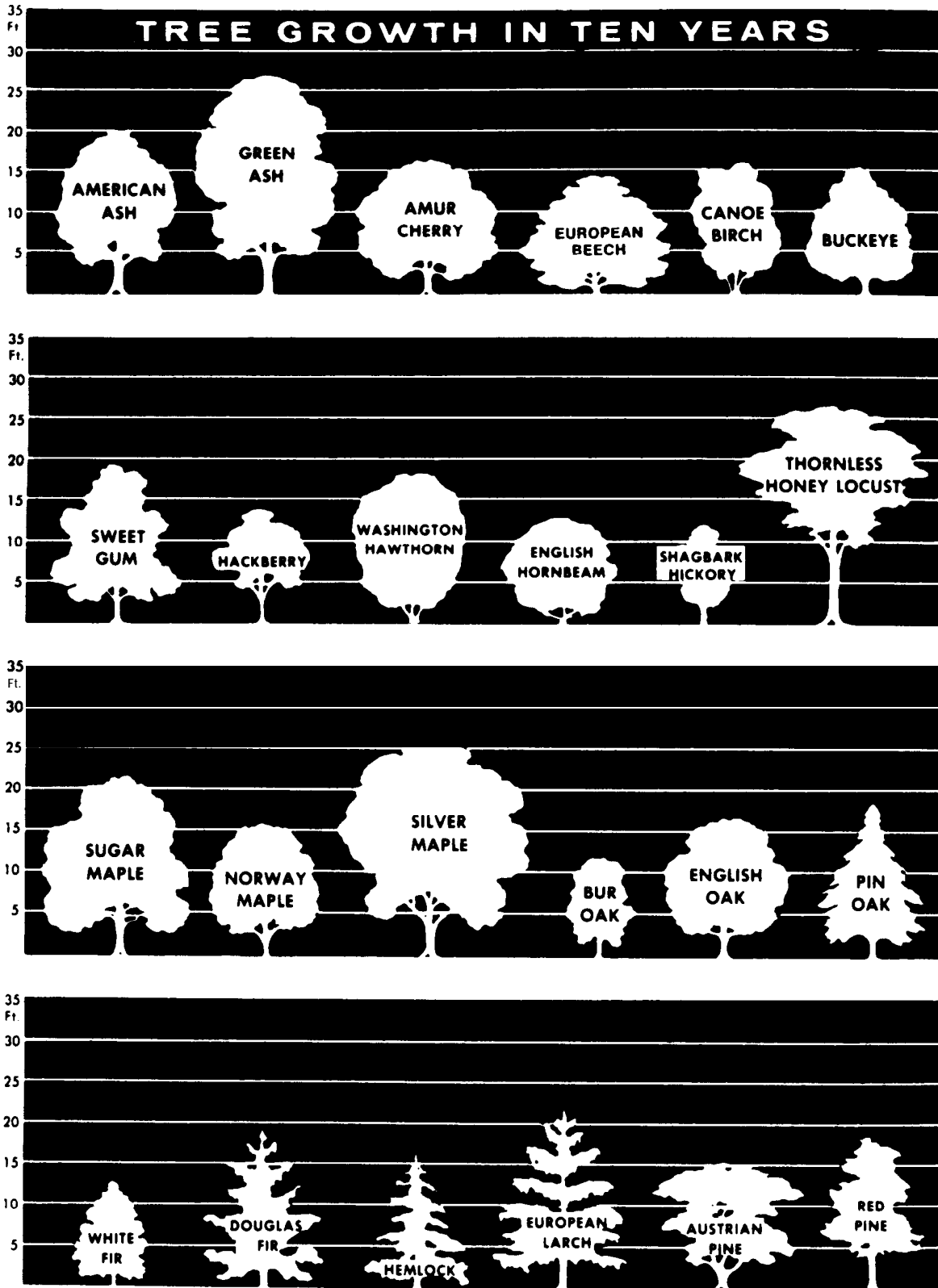


Figure 2. Height growth of trees in 10 years.

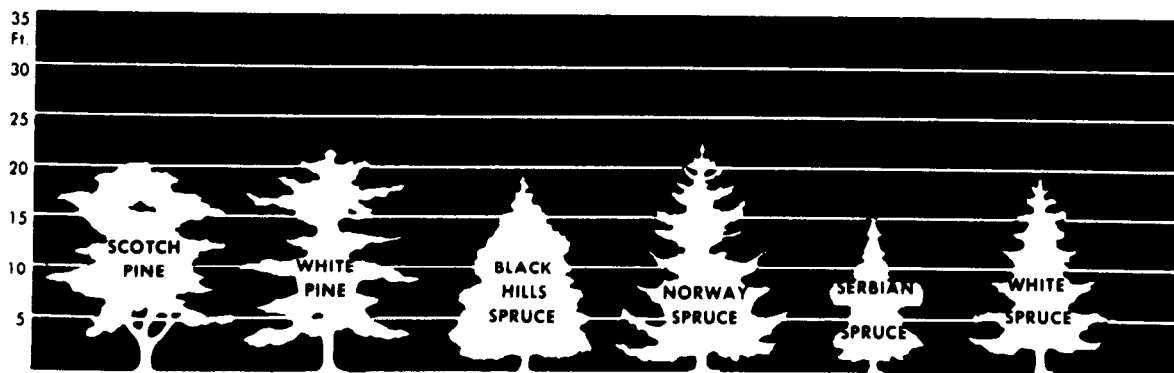
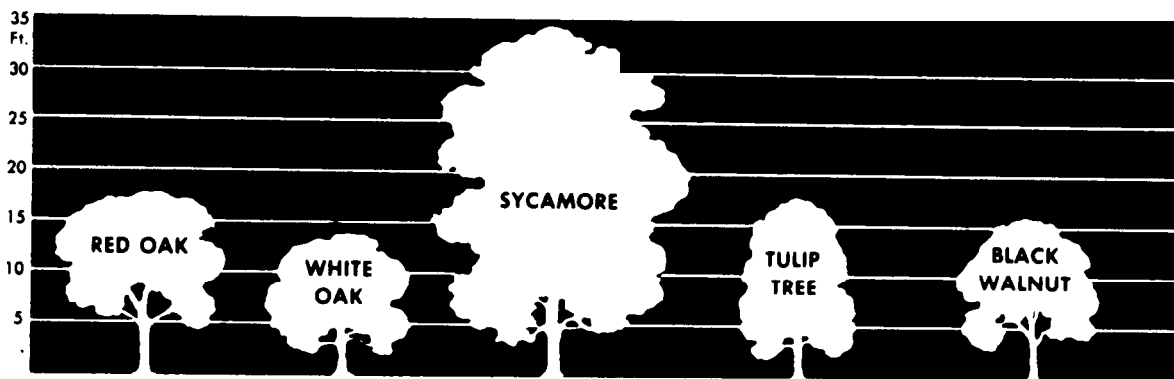
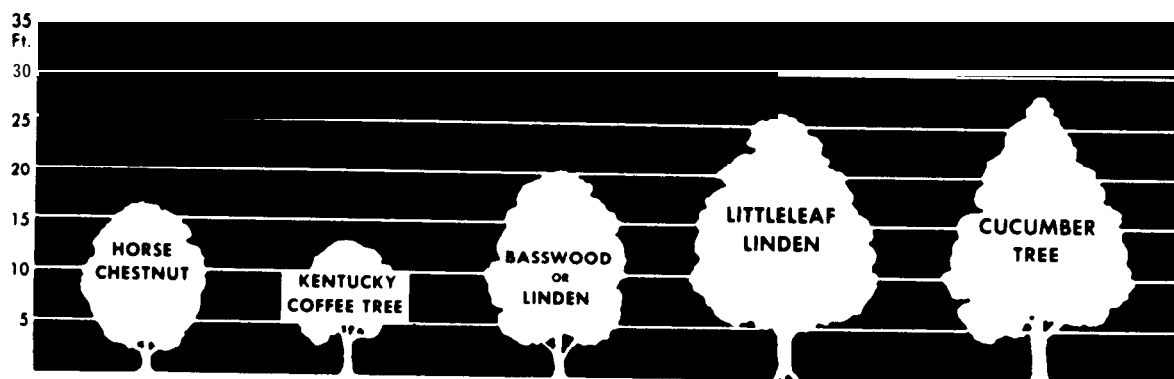
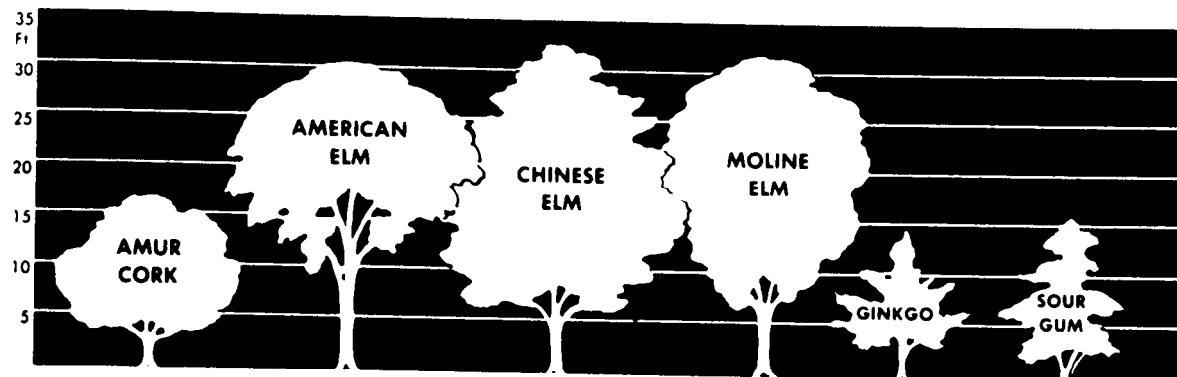


Table 1. Height growth of trees in the Morton Arboretum Tree Evaluation Plots based on 1989 survey.

TAXA	Height increase (ft/yr)	No. of trees	No. years planted
<i>Acer campestre</i>	0.75	3	28
A.c. leiocarpum	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
A.p. 'Cleveland'	0.50	4	24
A.p. 'Crimson King'	0.48	5	31
A.p. 'Emerald Queen'	0.70	5	25
A.p. 'Erectum'	0.84	3	29
A.p. 'Olmsted'	0.61	4	29
A.p. 'Schwedleri'	0.52	5	31
A.p. 'Summershade'	0.76	4	29
A.p. '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
Celtis occidentalis	0.74	4	31
Cladrastis lutea	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
F.p. '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

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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

