Metasequoia glyptostroboides: Fifty Years of Growth in North America

John E. Kuser

Now, half a century after *Metasequoia glyptostroboides* was introduced into the West from China, the dawn redwoods produced from these seeds rank among the temperate zone's finest trees. Some of them have grown to remarkable size in the relatively short time of fifty years. Perhaps the largest overall is a tree at Bailey Arboretum, in Locust Valley, New York, which in late August 1998 measured 104 feet in height, 17 feet 8 inches in breast-high girth, and 60 feet in crownspread. Several trees in a grove alongside a small stream in Broadmeade Park, Princeton, New Jersey, are now over 125 feet tall, although not as large in circumference or crown as the Bailey tree. In favorable areas, many others are over 100 feet in height and 12 feet in girth.

Two beautifully buttressed trunks. Above, the Sarah P. Duke Gardens' dawn redwood has been growing in this wet spot since 1949. Below, a specimen that stands with its feet in Lake Auburn in Mount Auburn Cemetery, Cambridge, Massachusetts. Both trees derive from the original distribution

In 1952 a visiting scholar from China, Dr. Hui-Lin Li, planted dawn redwoods from a later seed shipment along Wissahickon Creek in the University of Pennsylvania's Morris Arboretum in Philadelphia. Li knew the conditions under which *Metasequoia* did best in its native range: in full sunshine on streamside sites, preferably sloping south, with water available all summer and seasonable variations in temperature like those found on our East Coast—warm summers and cold winters. Today, Li's grove beside the Wissahickon inspires awe; its trees reach as high as 113 feet and measure up to 12 feet 6 inches in girth.

Large dawn redwoods now occur as far north as Boston, Massachusetts, and Syracuse, New York, and as far south as Atlanta, Georgia, and Huntsville, Alabama, and are found in all the states between. Many of the best specimens grow along the fall line between the Piedmont and the Coastal Plain, usually close enough to a constant supply of water to justify the Chinese name *shui-sha* (water fir). Smaller specimens grow as far north as Maine, across temperate sites in the

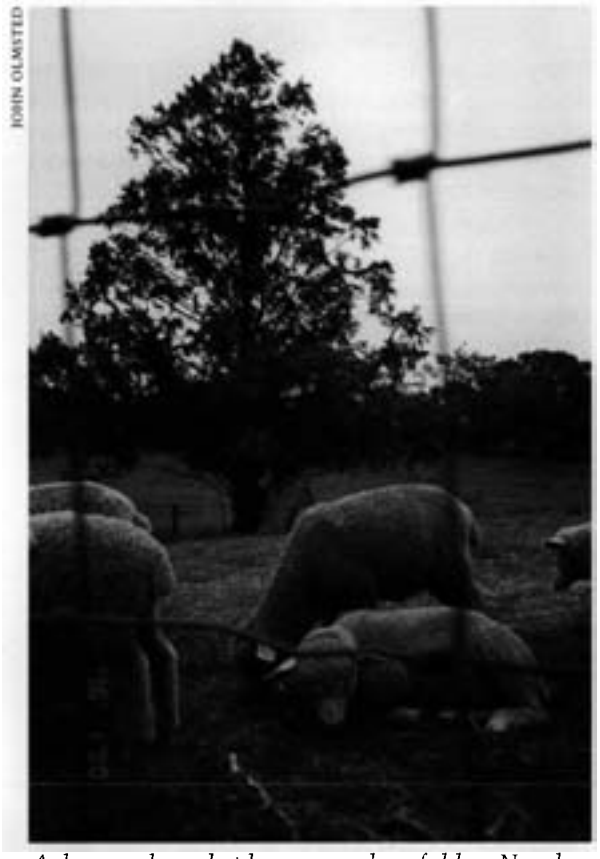
Metasequoia glyptostroboides *at Bailey Arboretum, Locust Grove, New York, photographed in September 1998. At 104 feet high and 17 8 feet around, it may be the largest individual outside China*

Midwest, and along the West Coast from Los Angeles to Vancouver. In the West, they must be watered during the growing season; a tree at Los Angeles' Huntington Gardens that had remained small for years began to grow rapidly when moved next to a stream and is now a large tree.

Warm summer temperatures as well as moisture appear to be needed for the species' best growth. When planted where summers are cool, as at Strybing Arboretum in San Francisco, Pacific Lumber in Scotia, California, and Butchart Gardens in Victoria, British Columbia, trees remain small and twiggy compared to those growing in areas with warmer summers. Even within its favored climate range, however, *Metasequoia* is somewhat site-selective: it does not thrive in dry or windswept locations and, like yew and hemlock, needs good drainage in addition to moisture. At present, *Metasequoia* in the United States remains free of serious disease and insect pests. It is sometimes disfigured by heavy populations of Japanese beetles, but refoliates quickly because it is an "indeterminate grower," that is, it continues to grow all summer as long as sufficient warmth, moisture, and daylight are available.

Metasequoia is usually propagated by cuttings, either hardwood or softwood; the latter works well between mid-August and mid-September if the cuttings are treated with hormone and rooted under mist. In general, juvenile trees root more easily than large ones although there are exceptions. Like many other species from eastern Asia, however, *Metasequoia* is also capable of reproducing naturally in eastern North America; self-reproducing trees have been reported in Tennessee and New Jersey. Seedlings come up regularly in my lawn and garden, but since they cannot compete with grass and weeds, there is little danger the species will become another *Ailanthus* or *Paulownia*.

Shortly after the introduction of *Metasequoia*, hopes were high that it would serve as a new source of commercial softwood. Danish forestry professor Syrach Larsen made "timber" selections from trees he had grown near Copenhagen from Arnold Arboretum seeds; these lacked the basal fluting usually present in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A dawn redwood at home in a sheepfold on Naushan Island, Massachusetts

the species and thus produced better logs. (The fluting of the lower trunk can be reduced, if desired, by pruning the tree up to eight or ten feet or by growing trees closely spaced to cause natural pruning.) We now know that by Western standards *Metasequoia* is too intolerant of shade to be grown commercially: it cannot be as closely spaced in plantations as its cousin *Sequoia*, and because so much light passes through its crown, plantations require constant, expensive weeding. Moreover, its wood is rather brittle, although the light, purplish, aromatic heartwood is highly resistant to decay. Houses built of *Metasequoia* wood have been known to survive as many as seven generations of Chinese farmers.

When used as a street tree, *Metasequoia* should be planted at least ten feet from sidewalks to allow room for its wide, shallow, aggressive root system. As a park or lawn tree, dawn redwood grows to majestic proportions when soil, sun, and moisture are to its liking; and when used in an allée, it could well rival in effect the splendid *Taxodium* allée at Longwood Gardens in Pennsylvania. No one knows how tall it will finally grow outside its native range, but one 450-year-old tree in China's Hubei Province is 154 feet high.


ALBERT BURNEY HUFF

Dawn redwoods planted at the Secrest Arboretum in Wooster, Ohio, in 1948 or shortly thereafter.

Genetic Diversity

For a species whose native range is now very restricted, *Metasequoia* possesses a surprising amount of genetic variation. In 1991 a group of researchers at Rutgers University compared the allozyme diversity and growth rates of seedlings grown from seeds of fifty-two parent trees in Hubei, Hunan, and Sichuan Provinces with those of forty trees derived from the Arnold Arboretum's 1948 seedlot. The 1991 Chinese seedlings had more allozyme variation and produced a few unusually fast-growing individuals, several dwarfs, corkscrews, and a "featherleaf." A

The roots of a dawn redwood planted too close to a sidewalk thirty-five years ago in Paramus, New Jersey.

Clone 27A dwarfs its fellow clones grown from seeds from Hubei, China, at Rutgers Test Plantation

This dwarf weeping form also derives from one of the 1991 seeds from Hubei.

comparison made of the genetic variations within the *Metasequoia* seedlings and those of other conifer species showed *Metasequoia* to be about average in this respect—neither as diverse as lodgepole pine *(Pinus contorta)* nor as monomorphic as red pine *(P. resinosa)*.

Professor Li Minghe of Huazhong University in Wuhan, who was responsible for the 1991 seed shipment, reported that the species' range had been much more extensive until quite recently; indeed, 11,000-year-old *Metasequoia* logs have been found buried under the city of Wuhan, about five-hundred kilometers (three hundred miles) from Modaoqi, the center of the species' present range. This may help to explain the amount of genetic variation that still exists.

Fifty years after its introduction to North America, *Metasequoia* continues to grow. The 125-foot-tall trees in Broadmeade Park continue to add two feet of height each year. Fast-growing, essentially disease-free, both beautiful and interesting, *Metasequoia* also continues to grow in popularity.

References

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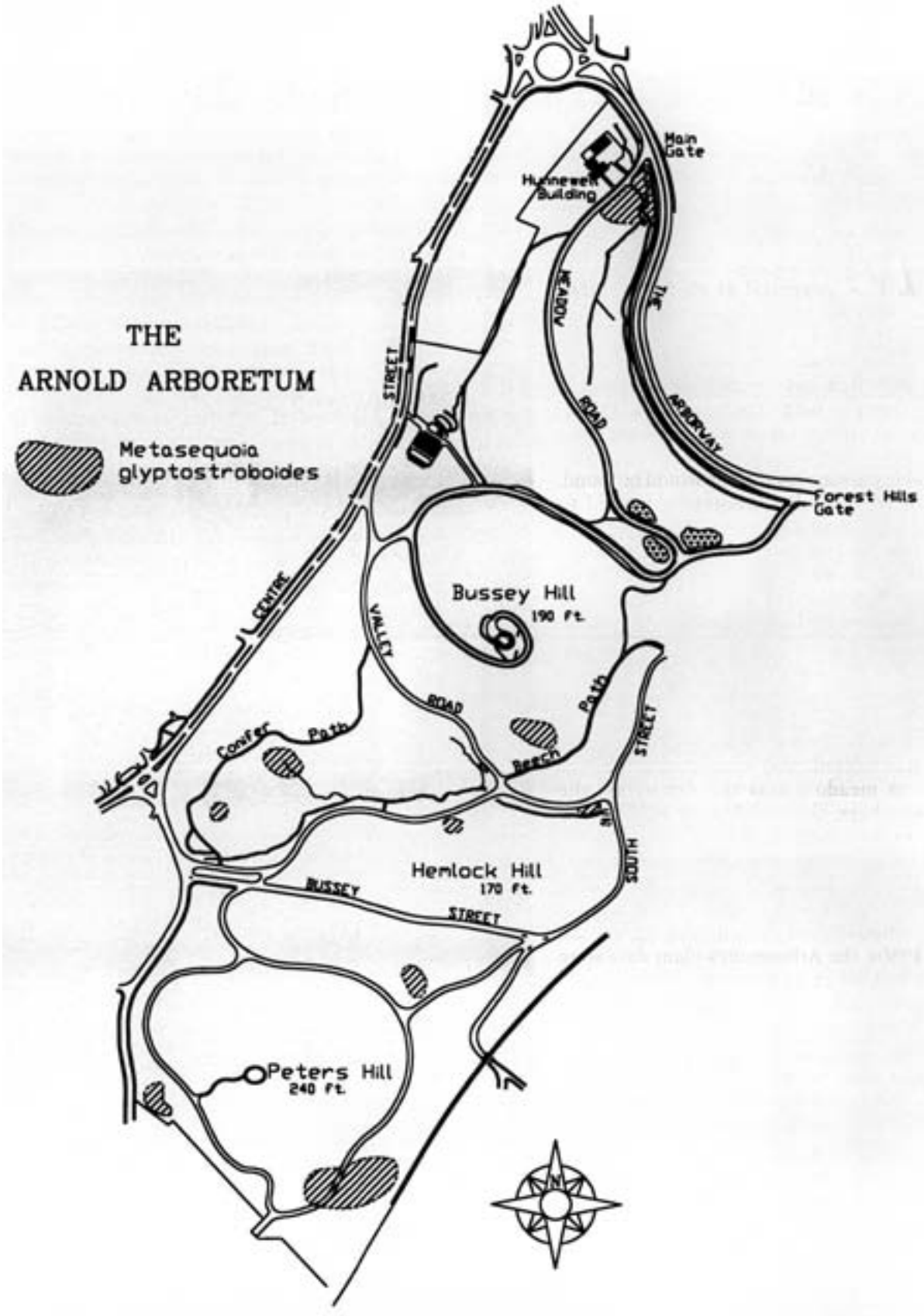
John Kuser teaches dendrology, forest ecology and silvics, urban forestry, and forest genetics at Cook College, Rutgers University. He has written extensively on *Metasequoia* and several other conifers as well as *Paulownia tomentosa* A textbook, *Urban and Community Forestry in the Northeast*, will be published by Plenum Press later this year. During next year's sabbatical he will work on a rangewide study of the genetic architecture of *Chamaecyparis thyoides* and will expand and update the 1992 leaflet, *Exotic Trees in New Jersey*.


THE
ARNOLD ARBORETUM
Metasequoia glyptostroboides
Main Gate
Hunnewell Building
MEADOW
DRIVE
ROAD
ARBORWAY
Forest Hills Gate
STREET
CENTRE
VALLEY
ROAD
Bussey Hill
190 Ft.
Conifer
Path
Beech
Path
STREET
SOUTH
Hemlock Hill
170 Ft.
BUSSEY
STREET
Peters Hill
240 Ft.