ARBORICULTURE: WORLD GLIMPSES AND IDEAS[1]

by Richard W. Harris

Abstract. An overview of the regard with which trees are held by people around the world. Special uses of trees and their cultural practices are informative. The severe storms in England emphasize the importance of proper training and pruning of large-growing deciduous trees.

Trees are important in the landscapes and the cultures of the world. It is interesting to see how they are used and cared for by individuals and governments. Trees and their care tell much about a people.

The use of and the esteem with which trees are held in some countries will be presented followed by information about several arboricultural problems, practices, or ideas that may be of interest.

Tree Use and Care

On some main boulevards in the large cities of China, pedestrians, bicycles, and vehicles in each direction are separated by a row or more of well-kept trees. Such an avenue would be almost one-third of a block wide. In the center-city streets of Tokyo, trees two and three stories tall are groomed upright and lashed securely to stakes for protection against typhoons. In none of my inspections did I see ties constricting a trunk (Fig. 1); the ties must be adjusted several times during a growing season.

Many country roads in France are shaded by rows of tall trees, reputedly planted upon orders of Napoleon so his troops would not have to march in the sun. Canberra is indeed a capitol city within a park conforming to the 1912 plans of American landscape architect Walter Burley Griffin. Many trees are now mature and a master reforestation program is underway. Capability Jones, an early English landscape architect, accentuated vista perspectives by planting large-growing trees in the foreground and trees of smaller mature size in the distance.

In many countries, especially the orient, the elderly are held in high regard, be they human or plant. Trees that we would have replaced long ago are nurtured with braces, cavity work, pruning and love.

Plant Sculpturing

Horticulturists in almost every country have fashioned the size and shape of plants to their liking for aesthetic and cultural reasons. *Bonsai* plants of Japan and *espaliers* of Europe come quickly to mind. The Chinese, however, like to point out that their *pingjin* is "a landscape in a vase" while *bonsai* is just "a plant in a pot". In any case, the miniaturized plants and landscapes are exquisite.

The *sheared* forty-foot-tall beech trees at the Palace of Schonbrunn in Vienna and other gardens of Europe are most impressive. *Pleached* alders and laburnums in England, Australia, and elsewhere provide shaded tunnels of foliage to escape the summer sun. *Espaliered* pear and apple trees adorn the south and west walls of homes and gardens to capture the warmth of the spring and fall European sun. Supposedly begun in France, *pollarding* is reported to have begun in order to produce long, straight, flexible shoots for making baskets, fences, and the like. It has been carried over to give uniform small-sized trees to formal gardens and drives (Fig. 2). The practice is not to be confused with *lopping, topping* or other terms given to severely stubbing back large branches in a tree.

The Asians are particularly skilled at framing garden views from buildings and through walls and gates.

Tree Shelters

In England *treeshelters* have given increased growth rates for young trees of most tree species (4). *Treeshelters* are vertical, light-colored, translucent or transparent plastic tubes about 10 cm (4 in) in diameter and 0.6 to 2.0 m (2 to 6 ft) tall; 1.2 m is the most common height used (Fig. 3). Preformed shelters slide over the tree and

1. Presented at the annual conference of the International Society of Arboriculture in Vancouver, B.C. in August of 1988.

fasten to a stake with wire or staples. More than six million were put into use in Britain between 1979 and the end of 1986.

They are recommended for broadleaved trees 15 to 40 cm (6 to 16 in) tall with a good terminal bud. It is interesting that much smaller trees are commonly planted in English and Australian than American landscapes. In America these may be appropriate primarily in landscapes that have limited access, i.e. highway rights-of-way, private gardens, and developing parks.

Treeshelters enhance tree growth, protect against animal damage, and permit safer application of herbicides. In three years, Sessile Oak, *Quercus petraea,* in shelters made 4 times the height growth of those not in shelters, 141 compared to 27 cm (42.7 vs 10.5 in) (Fig. 4). After another three years, during which all trees were not in shelters, the originally sheltered trees were still 58%, 70 cm (26 in), taller than those that had not been sheltered.

Even though the oaks in the shelters were kept

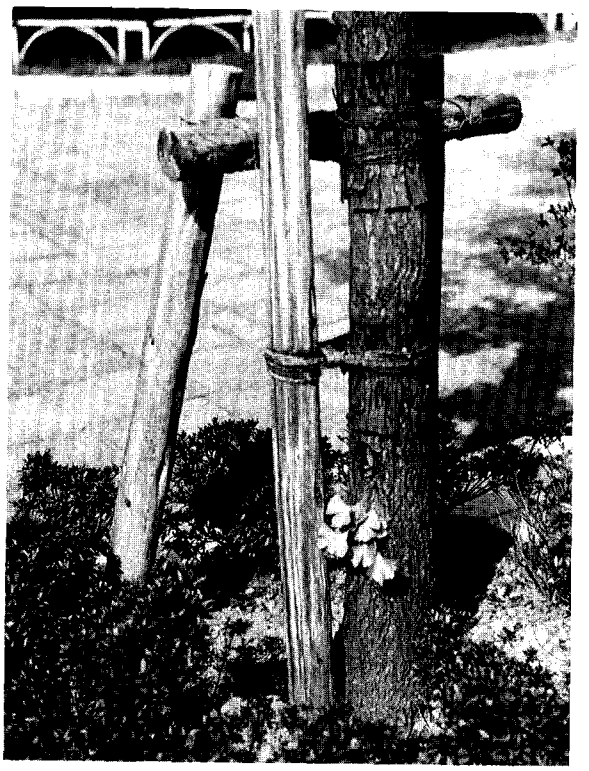


Figure 1. Tall Ginkgo biloba street tree in Tokyo is securely lashed to well-anchored short stakes to withstand strong winds. No tie girdling was evident.

Figure 2. A pollarded Platanus x acerifolia develops a dense head. Enlarged knobs form at the branch ends to which the shoots are cut back every year or two.

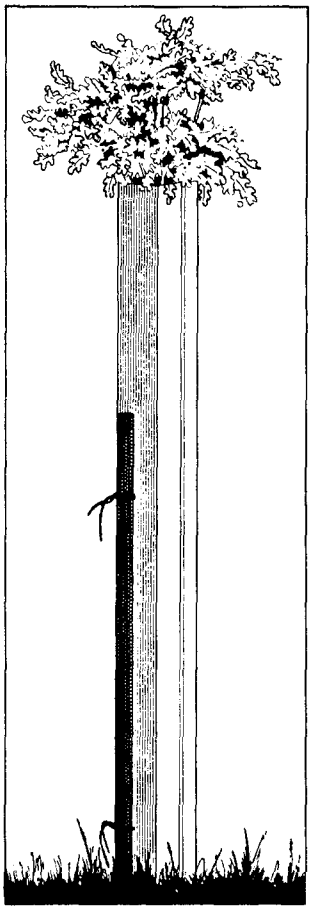


Figure 3. A treeshelter in place supported by a stake reaching about two-thirds the shelter height.

relatively immobile, they were 45% greater in stem diameter and 300% greater in stem volume than those in the open. Even though the sheltered trees had greater diameter for three years, they had to be staked for the next two years. The authors state "Ideally a *treeshelter* should provide a greenhouse effect for the first two or three years and then continue to give support and protection for another two or three years while the stem thickens."

Temperatures up to 48°C (118°F) have been recorded in the shelters but had not caused visible damage except for browning of leaves pressed flat against a sun-exposed shelter surface. During the growing season the relative humidity was high, at 100% for much of the time. The only influence on pest and disease problems was a reduction in oak mildew damage. High temperature may be a problem for shelter-grown trees in areas with more intense sunlight than in Britain. The shelters used had no vent holes to provide air circulation and thereby lower temperatures.

In 1987, Shanks (8) estimated the cost of planting a tree and using a shelter to be $1.20 to $2.55 US ($1.70/pound). This includes the cost of the plant, planting, shelter and installing the shelter; in quantities of 100, a 1.2 m (4 ft) shelter costs about $1.00.

Diagnosing Problems

In 1982, I had the privilege of visiting A. Bernatzky, the park superintendent who replanted the streets and parks of Frankfurt/M after World War II (retired, and the author of *Tree Ecology and Preservation* (1). Among the interesting things we discussed and he demonstrated was the use of metal *dousing* (devining) rods to identify trees that had trunk or root cavities or decay. Neither I nor his protege' were able to duplicate his feats. Water wells are still "witched" today, and I had a city engineer locate a longlost sewer pipe with a metal clothes hanger.

The Arboricultural Association News (3) reported that Swedish scientists are convinced that dogs can detect rot in trees and twenty dogs are being trained to do this including rot in telegraph poles, notwithstanding those impregnated with preservative.

Following renewed exploratory research by Dr. Gregory Moore at the Victorian College near Melbourne, Australia, Kevin Blaze' designed and is building what is called a PIRM, Plant Impedance Ratio Meter. It appears to be the next generation Shigometer (9), at least for estimating the relative vigor of plants. It uses low voltage alternating current at a low (1kHz) and a high (10kHz) frequency and is thereby able to minimize or eliminate the influences of probing depth, moisture content, and temperature. For two months Tippett, Crombie, and Hill (10) were able to fairly accurately follow the upward development of *Phytophora*-injured tissue in inoculated trunks of eucalyptus.

Moore (personal communication, 1988) found the PIRM to be successful and reliable in assessing the condition of twenty elm trees. It is being used in other studies on fruit ripening, effects of

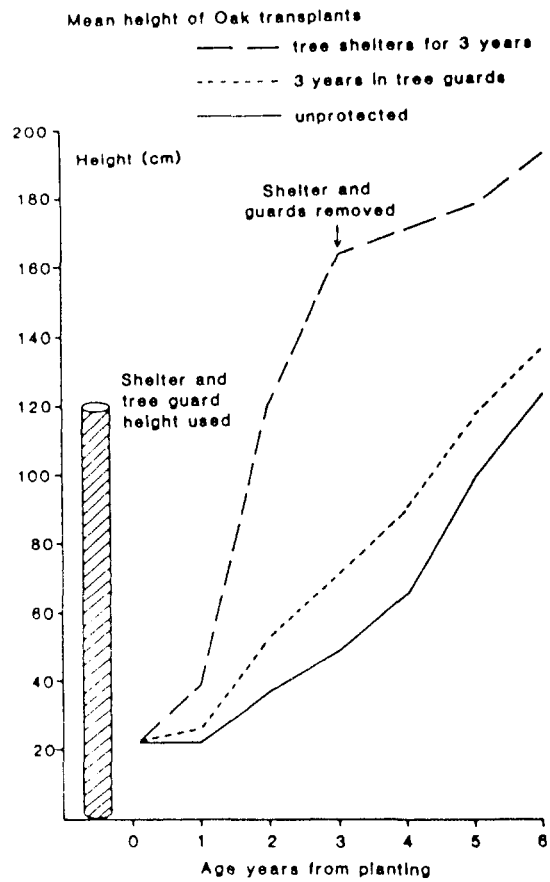


Figure 4. Height growth of Quercus petraea transplants grown for three years in treeshelters, within wire tree guards, or left unprotected and then all grown without protection for an additional three years (3).

salt on fruit tree growth, and on irrigation and tree growth. It will be interesting to learn more about the versatility, accuracy, and reliability of the PIRM.

The PIRM with attachments for vigor and decay assessments cost $795 in 1987. Due to the value of the dollar, the cost in 1988 would be at least $200 more.

The 1987 British Hurricane

Southern Britain was hit with hurricane force winds, with gusts to 110 kph (68 mph), in the early morning of October 16, 1987 following a week of heavy rain (5). The majority of deciduous trees were still in full leaf. The Royal Botanic Gardens, Kew, lost close to 500 trees with a further 500 damaged, out of a tree population of about 11,000. In some areas of Wakehurst Place, further south, losses were estimated at 80%.

The damage was not spread evenly across genera or within genera. Species with big, domed-shaped crowns were more seriously affected than smaller trees. The deciduous oaks were more heavily damaged than the evergreen ones. Except for the larches, conifers in the Pinetum were relatively unscathed even though they took the brunt of the storm.

Several reports since the British hurricane are similar to that of W.E. Matthews (6) in which he wrote that trees that had been thinned, both in streets and in the open, stood while unthinned ones around them fell. He also noted that "isolated trees accustomed to standing strong and exposed came out of the storm very well."

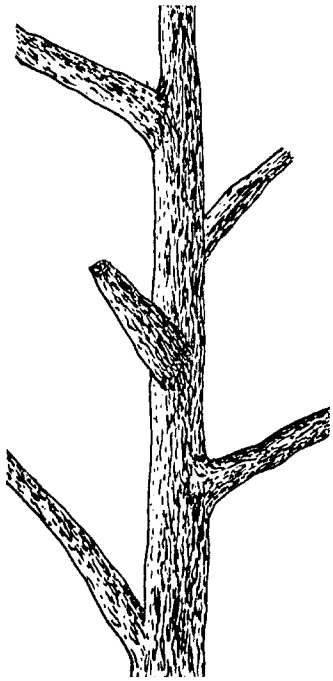
A researcher in Scotland studying the loss of forest trees in winds that they should normally withstand has described the cause as *wind waggle.* Wind waggle is the effect of a wind gust coinciding with the tree's natural swaying frequency so that if a gust hits a tree when it is towards the maximum extent of its sway, then it is subjected to enough force to uproot it or break its stem" (3). Mayer (7) in Germany reports that breaking of the trunk of a tree, particularly those in frozen or dry soil or with an ice or snow load, is usually caused by a single but very strong gust of wind lasting only a few seconds. On the other hand, wind-induced tree sways frequently cause *windthrow,* root breaking or roots pulling out of the soil. Mayer states that "according to information in the literature, no tree species can survive violent storms (those with mean wind speeds over a period of ten minutes higher than 30 m/s [70 mph]) without damage. This threshold value for wind speed is related to the height near the top of a forest stand."

Information being gathered about the trees that were lost and damaged at Kew and elsewhere should be of interest and practical value to arborists everywhere.

Topping Mature Trees

By whatever name—*topping, lopping, stubbing,* or *dehorning*—cutting branches back to stubs is all too common. It is thought by many as the proper way to prune because they see those whom they believe to be knowledgeable aborists doing

5. Main branches of a mature street tree severely headed. Such stubbing is commonly done every three or four years in Europe to keep the trees within bounds.



6. On large-growing trees, the main scaffold branches should be well spaced vertically and radially. The diameter of any branch should be less than 75% of that of the trunk immediately above the branch attachment.

so, and the results are obvious. Proper thinning, however, usually goes unnoticed because a pruned tree does not look much different to the average person than it did before it was pruned.

Topping is particularly common with public street trees in many cities in France and Germany (Fig. 5). The trees are cut back essentially to hatracks every few years so that regrowth, should it fail, is thought not to be particularly hazardous. The species used seem to survive this brutal treatment even though decay may become a problem. Topping should not be confused with *pollarding* (Fig. 2).

Training Young Trees

The proper training of young trees is the most cost effective aspect of arboriculture in order to obtain structurally strong and safe mature landscape trees. Commercial arborists seldom are involved with training young trees because it usually is not cost effective for them, and few homeowners are aware of the importance of early training.

The essence of training young large-growing trees involves primarily four concepts (Fig. 6): 1) The diameter of a main branch should not be larger than 75% of the diameter of the trunk immediately above the branch attachment. 2) Branches with narrow-angles of attachment that have included bark should be removed. 3) Branches that are more than 33% of the diameter of the trunk should be spaced along the trunk at least 45 cm (18 in) apart. Each of the three above-mentioned practices will favor trunk tissue growing around the branch and holding it securely. 4) Do not have one main branch over another.

These and other pruning practices have been brought together in a set of *pruning standards* (2) by the Western Chapter. They are being reviewed by a recently appointed committee chaired by John Britton to develop pruning standards that hopefully will be adopted by ISA as well as the National Arborist Association.

Literature Cited

1. Bernatzky, A. 1978. Tree Ecology and Preservation. New York: Elsevier Publishing.
2. Britton, J.C. 1988. Pruning Standards. Western Chapter of the International Society of Arboriculture.
3. Davis, M.M. 1987-88. *The greenhouse and wind waggle factors in fallen trees.* Arb. Assoc. News. Winter 1987-88:3.
4. Evans, J. and C.W. Shanks. 1987. Treeshelters. Arb. Res. Note 63/87/SILS:1-4.
5. Flanagan, M. 1988. *The damage caused by the hurricane force winds to the trees at the Royal Botanic Gardens, Kew.* Arboric. J. 12:181-188.
6. Matthews, W.E. 1987-88. *After the hurricane.* Arb. Assoc. News. Winter 1987-88:1.
7. Mayer, H. 1987. Wind-induced tree sways. Trees (Springer-Verlag) 1:195-206.
8. Shanks, C.W. 1987. Treeshelters—A guide to their use and information on suppliers. Arb. Advisory and Information Service (England).
9. Tippett, J.T., and J.L. Barclay. 1987. *Detection of bark lesions caused by Phytophthora cinnamomi in Eucalyptus marginata with the plant impedance ratio meter and the Shigometer.* Can. J. For. Res. 17:1228-1233.
10. Tippett, J.T., D.S. Crombie, and T.C. Hill. 1987. *Effect of phloem water relations on the growth of Phytophtora cinnamomi in Eucalytus marginata.* Phytopathology 77:246-250.

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