

been a mentor of mine. Hugh is an Eastern Region past-President and this summer was elected as Director for Region IV of the AAN. Hugh will now discuss, "Seed Source and Selection".

SEEDLING PROPAGATION — SOLVING THE SEED SOURCE PROBLEM

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One aspect of particular and growing concern to the seedling propagator is the matter of seed provenance and selection. As a background to this topic I should mention that at Forrest Keeling Nursery we grow a range of hardy deciduous trees and shrubs from seed — almost 100 species. These are grown in open field beds without shade but otherwise under intensive culture as regards irrigation, nutrition, disease, insect and weed control. A considerable portion of these seedlings are used by other nurseries as understocks. A somewhat larger proportion are used as liners for growing on into finished plants, either in the field or container. Still others (particularly our so-called "top-of-the-crop") are purchased for re-sale to customers who plant them in their permanent or ultimate location. Mail-order firms, highway departments, conservation agencies and others are avid consumers of these larger seedlings.

Regardless of outlet or usage, we are ever more impressed with the importance of seed source in producing acceptable planting stock. Not that there is anything new to this concept. For many years foresters have been keenly aware of the vital factor of seed provenance. They have conducted exhaustive tree selection and breeding programs and have followed up with the establishment of seed orchards to produce superior forest trees and ones adapted to specific sites.

In arboriculture, ornamental horticulture or "amenity horticulture" as our English friends prefer, the problem is somewhat different. Foresters find that they must often select parent stock, or ecotypes, for narrowly-defined specific areas. For example, a selection of pine adapted to one side of a mountain may fail when planted on the other side. In our industry, selections must have wide adaptability to be of practical usage. Thus the danger of buying seed "out of the barrel" where parentage is unknown. This is not to disparage the commercial seed houses. We find they will cooperate in defining seed origin and parent characteristics where they have this information. The establishment of a seed row or seed orchard of your own from a proven selection is

ideal, or collection from known and acceptable parent trees is similarly advantageous.

Most commercial species have broad native distribution. For example, red maple [*Acer rubrum*] is native from south Florida to Nova Scotia. Sugar maple [*A. saccharum*] is found from Louisiana to Newfoundland. Silver maple [*A. saccharinum*] grows natively from the Gulf to northern Maine. Pecan [*Carya illinoensis*] is native from the Rio Grande to Wisconsin. Hackberry [*Celtis occidentalis*] is found from the Florida Keys to North Dakota. Redbud [*Cercis canadensis*] occurs from Florida to Minnesota; flowering dogwood [*Cornus florida*] from central Florida to Wisconsin; tulip tree [*Liriodendron tulipifera*] from Michigan to Mobile; honeylocust [*Gleditsia triacanthos*] from Texas to New York; northern red oak [*Quercus rubra* (*Q. borealis maxima*)] from Mississippi to Quebec. As the great bulk of usage of these trees is in USDA Zones 5 and 6 it is obviously important, if not vital, that seeds come from parent trees in these more northern latitudes.

Here are some critical examples in selecting parent seed plants:

Red maple [*Acer rubrum*] — as Dr Alden Townsend of the USDA Delaware Ohio Plant Laboratory has pointed out there is a tremendous variability of this species as to growth rate, fall coloration, seed dormancy and other characteristics according to location within its natural range We regularly had difficulty growing this species until we found a suitable Illinois type

Silver maple [*Acer saccharinum*] — northern nurserymen have found that seedlings from native trees south of Zone 6 will winterkill. On the other hand, we were forced this year to collect seed from S E South Dakota, the extreme northwest range of the species Resulting seedlings are much slower in growth than those from Zone 6 parent trees

Pecan [*Carya illinoensis*] — we ran into all sorts of problems with northern cultivars supposedly grafted onto northern understock We suspect that the supplier in this case had actually used southern understock Now that we have changed sources and are using northern cultivars grafted on certified northern understock, we believe our problems are behind us

Chinese chestnut [*Castanea mollissima*] — there are forest and orchard types of this tree Horticultural users want the orchard type

Redbud [*Cercis canadensis*] — trees produced from southern seed will winterkill in northern nurseries These nurseries insist on seedlings grown from native northern seed

Hazel [*Corylus americana*] — we find a wide variability in nut size of the native hazel Obviously the planter wants a type producing good crops of the larger nut

Crataegus spp. — Over the years we have planted many or most of the commonly used and offered clones and types of hawthorns The native species, particularly *C. phaenopyrum*, *C. crus-galli* and *C. viridis*, the parent of 'Winter King', have proven so much more satisfactory under our conditions that we have dropped production of the exotic types

Eleagnus umbellata 'Cardinal', a USDA introduction, does not even resemble the species grown from imported Japanese seed 'Cardinal' is incomparably superior.

Carpathian or English walnut [*Juglans regia*] — last year we secured seeds of supposedly Carpathian walnuts from four different sources. They varied greatly in growth and obvious hardiness. We have settled on the outstanding source that has regularly been a good nut producer in an area where temperatures dip to 34°F.

Golden rain tree [*Koelreuteria paniculata*] — some 50 years ago someone planted the streets of Clarksville, in north-east Missouri, with golden rain. These have developed into handsome specimens that we see commonly pictured in nursery catalogues. Though the species is supposed to withstand only -10°F these trees have been unimpaired at -25°F when trees raised from imported seed have failed.

“Borderline” trees — there is a considerable group of highly-desirable tree species of borderline hardiness with us and throughout the important USDA 5 and 6 zones. These include sweet gum [*Liquidambar styraciflua*], tulip tree [*Liriodendron tulipifera*], southern magnolia [*Magnolia grandiflora*] and flowering dogwood [*Cornus florida*]. Southern seed sources of these species are wholly unsuited to the northern latitudes. We have had disastrous results with clones of sweet gum where original parentage was unknown but likely from a southern source. Likewise seedlings grown from seed purchased abroad (the original parents had to be from some point in the U.S.) proved tender. Our most satisfactory trees have been grown from native Illinois parents at the northern natural limit of distribution.

Likewise, we believe it is vital to secure seed of these other “borderline” species from native trees growing toward the northern extension of their distribution.

‘Rem Red’ honeysuckle [*Lonicera maackii* ‘Rem Red’] — a USDA discovery that produces large quantities of bright red fruit and comes true from seed. Distinctly superior to the species *L. Maackii* f. *podocarpa*.

Nanking cherry [*Prunus tomentosa*] — seedlings produced from northern plains windbreak plantings are incomparably more vigorous than seedlings grown from imported Japanese seed. Some fruit tree growers had thought that the dwarfish Japanese seedlings might be better as a dwarfing understock for peach. Apparently the results were not encouraging.

English oak [*Quercus robur*] — as is wellknown a high percentage (most) of the seedlings grown from the fastigate form of English oak will come true. As is also wellknown, the species is unusually susceptible to mildew. About 20 years ago we secured a quantity of fastigate seedlings from Robert Simpson of Vincennes, Indiana, who had produced them from fastigate parent trees growing, I believe, in the Vincennes courtyard.

These seedling trees, in turn, came into fruiting for us after about 6 years. From progeny produced from these trees we were able to select individuals that not only exhibited the typical fastigate form but also had a much heavier, leathery leaf free from mildew. These third generation individuals are just now beginning to fruit and we soon hope to have markedly superior fourth generation seedlings.

Rugosa rose [*Rosa rugosa*] — about 15 years ago we planted a seed-row from an Oregon fence-type selection of rugosa rose. We have produced our seedlings from this row since it came into bearing. The seedlings are not only vigorous with rich, dark foliage, but are also precocious, flowering and fruiting in the one-year seedbed. Last year we gathered some 600 lbs. of hips from these beds, enough for our current production. This fall, flowering and fruiting in the resulting one-year beds is even more pronounced. By regularly gathering hips from first-year seedlings, we assume this precocious character will be enhanced.

Wentworth cranberrybush [*Viburnum trilobum* ‘Wentworth’] — years ago we established a seed-row of 100 plants of ‘Wentworth’ cranberrybush secured from the Siebenthaler Co. This is a selection made specifically for fruits that can be used for preserves, however, it is also a compact, upright grower with distinctive

foliage Seedling progeny appear identical to the parent, at least as to foliage and growth habit

Yuccas — Here is one item that has been unreliable from the seed houses. When ordering *Yucca filamentosa* we have obtained Lord knows what. The logical and easy solution is to gather your own seed

Little-leaf linden [*Tilia cordata*] — seedlings grown from imported seed appear to be entirely satisfactory as an understock. However, they are not satisfactory to grow on. They want to make a bush rather than a tree and no amount of pruning and staking seems to bring them around to an arborescent form. I suspect the seed is gathered from bushy forms where it can be readily collected.

On the other hand, seedlings produced from *Tilia cordata* parents growing in this country grow into respectable trees. Other than for understock, I believe it would be highly desirable to collect seed from 'Greenspire' or similar superior clones. One cannot reproduce a clone by seedage, but the resulting tree should be better than the typical species.

MODERATOR SHUGERT: Excellent paper, Hugh; and we are indebted to you! Our fifth speaker, Hans Hess, is well known to all of us. This gentleman is an outstanding grower and shall share with us his experiences on the seeding of difficult species.

SEEDLING PROPAGATION OF DIFFICULT SPECIES

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This topic is somewhat evasive in that we have no definition of what is a "difficult" species; what is difficult for one person may be very simple for another. I believe that it all terminates with enough experience to arrive at a successful conclusion — in this case a good stand of healthy seedlings. As an example, one of our members inquired some months back about the proper handling of *Myrica pensylvanica* seed. He explained that he had purchased seed, planted it the same fall he received it and had no success; this happened for several years. I inquired as to his handling of the seed and he explained that it was planted immediately upon receipt from the supplier. This will not do when planting bayberry seed. Bayberry seed has a waxy gray coating which is used in the manufacture of bayberry candles. This waxy covering must be removed prior to planting in order to obtain germination the spring after planting.

Some very popular species at present are the amelanchiers — known as June berry, shadblow, sarvis tree and other common names. These plants flower early in the spring and the fruit ripens, depending on the area, sometime during June. It must be