

Eastern North American Plants in Cultivation

Many indigenous North American plants are in cultivation, but many equally worthy ones are seldom grown. It often appears that familiar native plants are taken for granted, while more exotic ones — those with the glamor of coming from somewhere else — are more commonly cultivated. Perhaps this is what happens everywhere, but perhaps this attitude is a hand-me-down from the time when immigrants to the New World brought with them plants that tied them to the Old. At any rate, in the eastern United States some of the most commonly cultivated plants are exotic species such as *Forsythia* species and hybrids, various species of *Ligustrum*, *Syringa vulgaris*, *Ilex crenata*, *Magnolia* × *soulangiana*, *Malus* species and hybrids, *Acer platanoides*, Asiatic rhododendrons (both evergreen and deciduous) and their hybrids, *Berberis thunbergii*, *Abelia* × *grandiflora*, *Vinca minor*, and *Pachysandra procumbens*, to mention only a few examples.

This is not to imply, however, that there are few indigenous plants that have “made the grade,” horticulturally speaking, for there are many obvious successes. Some plants, such as *Cornus florida*, have been adopted immediately and widely, but others, such as *Phlox stolonifera* ‘Blue Ridge’ have had to receive an award in Europe before drawing the attention they deserve here, much as American singers used to have to acquire a foreign reputation before being accepted as worthwhile artists. Examples among the widely grown eastern American trees are *Tsuga canadensis*; *Thuja occidentalis*; *Pinus strobus* (and other species); *Quercus rubra*, *Q. palustris*, and *Q. phellos* (the last primarily in the southeastern United States); *Acer rubrum*, *A. saccharinum*, *A. saccharum*, and *A. negundo*; *Gleditsia triacanthos* (particularly some of the thornless staminate cultivars); *Magnolia grandiflora*; and *Ulmus americana* (certainly one of the most widely planted trees in the northern United States, but one that is severely threatened by the “Dutch” elm disease). *Cornus florida* and *Cercis canadensis* are, with doubt, two of the most ornamental and widely planted of all eastern Ameri-

can small trees. Among other woody plants can be cited *Ilex opaca*, *Leucothoë fontanesiana*, *Pieris floribunda* (mainly in the North, for it is little planted in the southern Appalachians where it is indigenous), *Hydrangea arborescens*, *Kalmia latifolia*, and *Campsis radicans*. Herbaceous plants include *Phlox paniculata*, *P. subulata*, and the annual *P. drummondii* (all three in numerous color forms), *Phlox divaricata*, *Aquilegia* species and their hybrids, and various species of *Tradescantia*, *Oenothera*, *Coreopsis*, *Gaillardia*, and *Aster*. And, of course, some of the plants derived from Mexico, such as *Tagetes*, *Zinnia*, *Cosmos*, and *Dahlia*, are almost ubiquitous garden plants. But who in the United States would cultivate any of the goldenrods (*Solidago* species), which are colorful garden plants in England; or who would plant *Rhus typhina* as an ornamental shrub, as it is grown in Switzerland; and who would deliberately cultivate *Ipomoea* in the Southeast, where several species are among the most aggravating garden weeds? All of these are much too familiar.

Rehder's *Manual of Cultivated Trees and Shrubs* (ed. 2, 1940) includes some 2535 species of woody plants in 486 genera that are in cultivation in one way or another in northeastern North America. Of these, 1047 species in 228 genera are indigenous to the continental United States. Obviously, it is impossible with an allotted time and space to consider even these, much less the herbaceous ones, in any detail. It seems most practical here to deal primarily with plants of eastern North America (those with which I am most familiar), without meaning to slight the contributions of the western part of the United States and Canada, Meso-America, or the West Indies, all important sources of cultivated ornamental plants. I must also restrict these comments to eastern North American plants as cultivated in the United States without much consideration of those cultivated in other countries. Within this limitation I shall comment briefly on a few of the future potentials of botanical gardens and arboreta in connection with the cultivation of native plants as ornamentals. Some of these ideas are already familiar, but among them may be some that will suggest some directions that are open for work with native plants under cultivation.

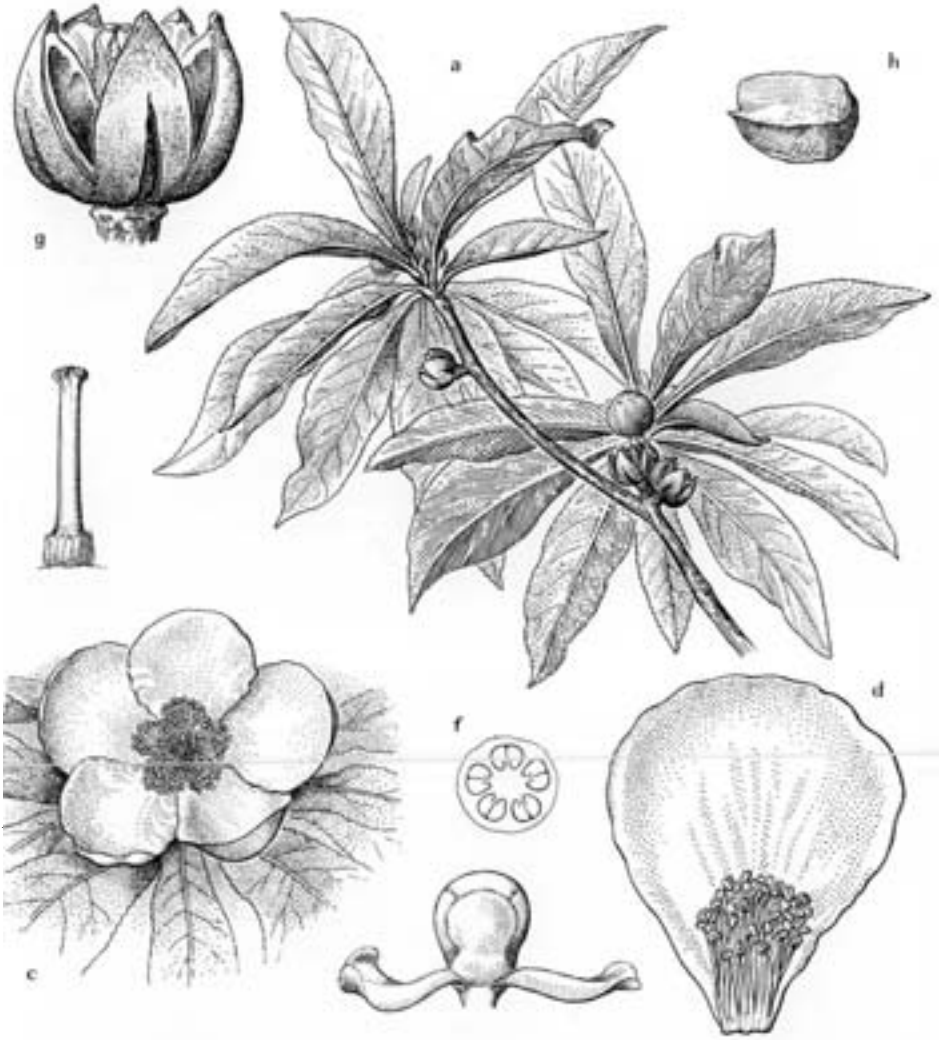
Conservation of Species. Certainly it is most desirable to preserve wild populations of each plant species in its own habitat through conservation of whole ecosystems in as many parts of the world as possible. Wild populations and their interactions

with other organisms are far better for study, research, and admiration than those in cultivation where only a few individuals can be preserved (and then largely under artificial conditions). It seems likely, however, that in view of the wholesale modification of large areas of the earth some species will survive only in botanical gardens or arboreta, in some instances far removed from the natural distribution of the species.

In North America, the most conspicuous and well-known example is *Franklinia alatamaha*, which was known from a single colony near what was Fort Barrington, in McIntosh County, Georgia. It was last seen in the wild in 1803; nurserymen attempting to fill orders for the plant may have played a crucial role in its disappearance. No other colony has ever been found, and *Franklinia* now survives only in cultivation. Other rare plants that may meet a similar fate are the handsome red-flowered mint *Conradina verticillata*; the rare *Gentiana pennelliana*, of western Florida; *Lilium iridollae*, of the same region; and *Lindera melissifolia*, and *Kalmia cuneata*, two of our rarest shrubs.

Other plants endangered by man through his careless introduction of disease-producing organisms include *Castanea dentata*, formerly one of the dominant trees of the eastern deciduous forest. The chestnut still survives but hardly ever fruits in its native habitat, for the sucker shoots which spring from the roots are usually attacked by the blight organism, *Endothia parasitica*, before they are large enough to flower. Outside its original eastern American distribution and beyond the reach of the blight, the tree still flourishes, flowers, and fruits under cultivation, as, for example, in northern Michigan and in Portland, Oregon. It seems likely that a similar or even more serious fate may be in store for *Ulmus americana*, since, as yet, no individuals truly resistant to the disease caused by *Ceratocystis ulmi* have been found, in contrast to the European elm, *Ulmus procera* (also affected by the fungus but not so severely), which apparently is making a comeback in Europe. It seems likely that both *Castanea dentata* and *Ulmus americana* will survive primarily in botanical gardens and arboreta well removed from the sources of infection.

Promotion of Desirable but Seldom Cultivated Plants. In spite of Rehder's inclusion of over a thousand species of trees, shrubs, and woody vines in his *Manual*, it is evident that many of these are seldom encountered in cultivation outside botanical gardens and arboreta. Botanical and horticultural institutions



Franklinia alatamaha. a, branch before flowering, bearing fruit of two preceding years, $\times \frac{1}{4}$; b, bud showing outermost sepal and two bractlets, $\times 1$; c, flower, $\times \frac{1}{2}$; d, petal with group of stamens attached, $\times 1$; e, gynoecium (pistil), $\times \frac{2}{3}$; f, diagrammatic cross section of ovary, showing two rows of ovules in each locule, $\times 5$; g, capsule from which seeds have been shed — note loculicidal dehiscence above, septicidal dehiscence below, $\times \frac{2}{3}$; h, seed, the hilum to upper left. (Drawn by the late Dorothy H. Marsh from specimens cultivated at the Henry Foundation for Botanical Research and the Arnold Arboretum. Illustration prepared for a Generic Flora of the Southeastern United States, a project made possible through the support of the National Science Foundation [currently through Grant GB-6459X, C. E. Wood, Jr., principal investigator].)

should make special efforts to bring knowledge of such neglected plants to the horticultural public and to promote their cultivation, for there are many worthwhile ornamental plants that fall into this category. Among these are the witch-hazels, *Hamamelis virginiana* (fall flowering) and *H. vernalis* (winter or spring flowering and in shades of deep red to yellow); *Cladrastis lutea*, yellow-wood, notable for its *Wisteria*-like clusters of white flowers in early summer; our only ericaceous tree, *Oxydendrum arboreum*, sourwood, outstanding in its panicles of small white flowers in summer and brilliant coloration in autumn; *Ilex longipes* and *I. decidua*, two handsome deciduous hollies; *Neviusia alabamensis*, a rare rosaceous shrub with flowers lacking petals but with showy white stamens; *Fothergilla major*, an apetalous relative of *Hamamelis* with conspicuous stamens and leaves with brilliant red and yellow autumn color; the brilliantly colored *Rhododendron speciosum*, *R. cumberlandense*, *R. prunifolium*, and *R. bakeri*; the white- or pink-flowered *R. atlanticum* and *R. canescens*; *R. minus*, the Piedmont counterpart of the more frequently grown *R. carolinianum*; the pink-shell azalea, *R. vaseyi*; the deciduous magnolias, such as *M. macrophylla*, *M. ashei*, *M. cordata* (particularly the yellow-flowered forms), and the pair of close relatives, *M. fraseri* and *M. pyramidalis*; the red-flowered *Aesculus pavia* and the shrubby *Ae. parviflora* with its candle-like racemes of white flowers; the silver-bell trees, *Halesia diptera* (particularly the showy var. *magniflora*), *H. parviflora*, and the very variable *H. carolina* (including *H. monticola*); *Lonicera flava* and the more frequently cultivated coral honeysuckle, *L. sempervirens*; the shadblows or shad-bushes, *Amelanchier arborea*, *A. canadensis*, the dwarf *A. stolonifera* and *A. obovata*, and other species; *Yucca glauca*, some forms of which are hardy far beyond its natural distribution; *Ungnadia speciosa*, of the Sapindaceae, a pink-flowered shrub known as Texas buckeye that has proved to be hardy as far north as Gladwyne, Pennsylvania; *Pinckneya bracteata*, notable for the one or two pink enlarged sepals of each flower; *Cyrilla racemiflora*, mentioned below; *Leucothoë racemosa* and *L. recurvata* and *Clethra alnifolia* and *C. acuminata*, of the Ericaceae, two vicarious Coastal Plain-montane species pairs; *Elliottia racemosa* with its racemes of white flowers; *Zenobia pulverulenta*, with its bell-shaped white flowers and leaves either whitened or green below; *Stewartia ovata* and the equally showy but much less hardy *S. malacodendron*; *Styrax americana* and *S. grandifolia*; various species of *Vaccinium* and *Gaylussacia*; and a host of herbaceous species, among which are *Amsonia*



Hamamelis vernalis. Photo: J. Henry.



Top left: *Rhododendron speciosum*
right: *Halesia monticola*

Bottom left: *Zenobia pulverulenta*
right: *Ilex longipes*

Photos: J. Henry

species, *Baptisia sphaerocarpa*, *Ipomopsis rubra*, *Phlox bifida*, *Camassia scilloides*, *Zephyranthes atamasco*, *Hymenocallis* species, *Hesperaloe parviflora* (the red-flowered yucca, from central Texas but perfectly hardy at Gladwyne), various species of *Clematis*, and the gray-leaved *Senecio antenariifolius* and the showy yellow-flowered *Eriogonum allenii*, both endemics of the Virginia and West Virginia shale barrens that flourish in open, dry situations as long as they are not shaded out by surrounding plants. The list could go on and on.

Selection of Unusual Forms from Wild Populations. A reservoir that still has an enormous horticultural potential is the natural variability of wild populations. The late Mrs. J. Norman Henry brought together over a period of years a remarkable collection of native plants, especially from the southern and southwestern United States. These she grew (most far to the north of their native habitats) at Gladwyne (near Philadelphia), Pennsylvania, where they and others are maintained for study and distribution by the Henry Foundation for Botanical Research, which she established. In the course of her extensive field work she brought into cultivation most of the species mentioned in the preceding paragraph and also made many interesting selections that deserve to be known better. These include intense color forms of *Rhododendron speciosum*, *R. cumberlandense*, *R. bakeri*, and *R. austrinum*; a hose-in-hose form of *R. alabamense*; a yellow-fruited form of *Ilex decidua*; a form of *I. glabra* that has maroon fruits until winter when they become black, as in the kind usually seen; *Phlox nivalis* 'Gladwyne' and 'Azure', *P. carolina* 'Chattahoochee', *P. stolonifera* 'Blue Ridge'; handsome natural hybrids of *Aesculus pavia* with *Ae. sylvatica* and with *Ae. glabra*; a red-flowered form of the cross-vine, *Bignonia* (*Anisostichus*) *capreolata*; a number of color variants of *Lilium superbum* and *L. canadense*; a beautiful late-flowering *Robinia*, a small tree with densely gray-pubescent leaves and compact drooping racemes of pink flowers, distinctive enough to be given specific rank, except that it appears to be a natural sterile hybrid of unknown parentage; a pale orange-flowered *Campsis radicans*; a startling number of puzzling variants of eastern American *Yucca*; and several variants of *Calycanthus floridus*, including a green-flowered one — all valuable additions to horticulture.

Still other examples are seen in the numerous cultivars that have been selected from wild populations of *Ilex opaca*. Currently Mr. and Mrs. Don Smith, of the Watnong Nursery, New

Jersey, have been bringing into cultivation a number of excellent forms of *Gaylussacia brachycera* and of *Leiophyllum buxifolium*. Further examples are among the cultivars recently registered at the Arnold Arboretum (Arnoldia 30: 251. 1970): *Cercis canadensis* 'Royal White' (larger white flowers than usual in form *alba*) and 'Silver Cloud' (variegated leaves), *Cornus stolonifera* 'Isanti' (dense, compact growth), *Liriodendron tulipifera* 'Ardis' (miniature in leaf and growth), and *Tsuga canadensis* 'Watnong Star' (dwarf, the new growth very pale at first).

Acer rubrum, with its great variability in intensity of flower and fruit color, as well as in autumn coloration; *Robinia*, which hybridizes extensively in the southern Appalachians producing a wide variety of attractive clones that vary in height of plant and size and color of flower; the polymorphic *Vaccinium stamineum* and its relatives, a taxonomic nightmare, but with much variation that can be of horticultural interest; and *Magnolia grandiflora*, with its variable flower size, color of new foliage, pubescence of the underside of the leaves, and stature (including dwarf forms), are all taxa that could yield desirable cultivars.

A slightly different sort of selection that can be tried with other plants is seen in Burpee's 'Gloriosa Daisy', which is an artificial tetraploid derived from color forms of the common and widespread black-eyed susan. By selecting forms that are "double-flowered" or have the inner half of each ray floret brown instead of orange-yellow and then doubling the chromosome number by treatment with colchicine, Burpee's plant breeders produced a much more vigorous, much larger flowered plant that is more showy than and far superior to the wild *Rudbeckia serotina*. One wonders how other members of the Aster Family, e.g., *Gaillardia*, with its polymorphic corolla forms and colors, or members of several other families might respond to similar treatment.

Still another type of selection is going on at the Arnold Arboretum, where Mr. A. J. Fordham is growing seedlings from cones on "witches' brooms" from various conifers. Each witches' broom represents a genetic mutation that has occurred on a growing branch of a tree, the resulting growth having a compact, bushy, stunted, or dwarfed appearance. Seedlings from cones produced on branches of this type yield about half "normal" individuals and half variously dwarfed ones. Selections from the latter group provide slow-growing genetically dwarf plants that are useful for bonsai, or in rock gardens or other



Magnolia ashei. Photo: J. Henry.

places where a low, slow-growing plant is desirable. (See *Bonsai Bull.* 6: 6-11. Fall 1968; 6: 9-14. Winter 1968-69.)

Selection of Ecotypes. Still another type of selection from wild populations that botanical gardens and arboreta should continue is the search for physiological variants or ecotypes suited to various climatic extremes, e.g., for hardiness in northern areas, or to various soil types. In this connection, it is always necessary to remember that one can be quite mistaken in prejudging the physiological potentials of any plant. Thus, although *Franklinia alatamaha* came from the warm climate of the Coastal Plain of Georgia, it is hardy as far north as Boston; and there has been for many years on Bussey Hill in the Arnold Arboretum a plant of *Cyrilla racemiflora*, a species that is not found in the wild north of southeastern Virginia. One can surmise, however, from what is already known of the ecotypic variation in plant species, that, in any wide-ranging species, the

individuals comprising populations in various parts of its range will be genetically (hence, physiologically) adapted to various climatic extremes, as well as to various soil types, and selections can be made accordingly.

Many of the woodland plants of eastern North America have very broad distributions: a very commonly encountered one extends roughly from Quebec, west to Minnesota or southern Saskatchewan, and south to eastern Texas and to Florida. Among the populations of a species distributed so broadly, it is likely that there is a considerable amount of ecotypic differentiation and that the more northern populations consist of individuals more tolerant of cold than those of the more southern ones. Search for various ecotypes suited to special environments should produce some interesting results. Wright, for instance, almost thirty years ago (*Jour. Forestry* 42: 489-495, 591-597. 1944) demonstrated differences in resistance to cold in white and in red ash, *Fraxinus americana* and *F. pennsylvanica*; and ecotypic variation in response to day-length has been found in species of *Populus*, *Pinus*, and *Alnus*, among others. Certainly the northern populations of white pine, *Pinus strobus*, should prove to be physiologically, if not morphologically, quite different from those in southern Mexico, and the arborvitae, *Thuja occidentalis*, of northern bogs must be physiologically different from the plants of this species that grow on dry limestone cliffs in Virginia. Indeed, J. R. Habeck (*Ecology* 39: 457-468. 1958) has found evidence of ecotypic differentiation between populations of *Thuja* that grow in poorly drained swamps and those on well-drained upland sites in Wisconsin.

As noted previously, *Cornus florida* is very widely cultivated, but its western counterpart, *C. nuttallii*, with six pointed bracts instead of four notched ones, has repeatedly proved to be too tender to survive the winter of the eastern United States. However, at Boyd's Nurseries, McMinnville, Tennessee, after twenty years of trials, a single seedling that has withstood -19° F., was found and this plant has now been propagated and is available commercially. Within the range of *C. nuttallii*, from southwestern British Columbia, to western Washington and Oregon, and southward in the Sierra Nevada and in the Coast Ranges of California, there must be other climatic ecotypes that would be suitable in the East. Disjunct populations of this species in central western Idaho offer particularly intriguing possibilities.

As a result of many attempts to grow southern plants at Gladwyne, Pennsylvania, Mrs. Henry evolved the general principle that the hardiest forms of species that grow on the Atlantic

and Gulf Coastal plains and in the Mississippi Embayment of the Coastal Plain are to be found in the Embayment area, where the climate is more continental (hence more rigorous) and plants are subjected to more sudden changes in temperature than on the Coastal Plain of the southeastern United States. This principle leads to the suspicion (expectation?) that hardier forms of a plant such as *Styrax americana*, which at Boston is killed back each winter, can be found in the northernmost part of its range in the Mississippi Embayment, in the case of the *Styrax* the part that lies in southeastern Missouri, western Kentucky, southern Illinois, Indiana, and Ohio.

Edaphic or soil ecotypes are also to be sought. Five very striking examples are found in shrubby races of *Quercus chrysolepis*, *Quercus garryana*, *Lithocarpus densiflora*, *Chrysolepis* (*Castanopsis*) *chrysophylla*, and *Umbellularia californica* that were reported from the Siskyou Mountains of southern Oregon and northern California by Whitaker (Ecol. Monogr. 30: 299. 1960). These forms are genetically dwarf and are adapted to growth in soils derived from serpentine, a mineral high in magnesium, while their arborescent counterparts are not. If these dwarfed races are like other plants adapted to serpentine soils, they will grow even better in richer soils, while retaining their dwarf character, and all five have interesting horticultural potentials as shrubs and even as bonsai subjects.

Search should also be made for species and ecotypes that are resistant to air pollution in cities, although, hopefully, steps are being taken to reduce this. Some plants are known to be very sensitive, others are more resistant, but I do not know whether a real search has been made for especially smog-resistant plants.

Hybridization. Both spontaneous and controlled crosses of native American plants in arboreta are far from new, but there are still enormous untouched potentials, as in the genus *Rhododendron*. The 'Ghent' and 'Exbury' azaleas are spectacular examples of complex hybrids that involve eastern American species of *Rhododendron*, but there are many other possibilities among the dozen or so species of section *Pentanthera* that occur in eastern North America. At Gladwyne, Mrs. Henry saw the desirability of extending the flowering period of azaleas into midsummer or later, and in 1953 described *R. × gladwynense*, the hybrid (made in 1944) between the two latest flowering species, *R. prunifolium*, with large, brilliant red flowers, and *R. serrulatum*, with small white flowers. At Gladwyne, the hybrids bloom from mid-July to mid-August, or later, and have proved to



be quite hardy. Mrs. Henry later crossed *R. × gladwynense* with the earlier-flowering *R. arborescens* and made a number of other beautiful hybrids. Fred C. Galle, at the Ida Cason Calloway Gardens, Pine Mountain, Georgia, and Henry T. Skinner, of the U.S. National Arboretum, are currently producing a series of hybrids involving these and other American azaleas.

The use of American species as a source of hardiness in hybrids is well known, as with *Rhododendron catawbiense*, which has provided the hardy genetic background of many red-flowered hybrid rhododendrons, or as with the white-flowered *Nymphaea odorata* in crosses with tenderer species of *Nymphaea* with colorful flowers. Such work could well be extended to other genera. Crosses between *Hydrangea arborescens* and its closest relative, the less hardy blue-flowered *H. aspera*, of Japan, might produce interesting results, as might the hybridization of *Aesculus pavia* with *Ae. turbinata*, of Japan, or other species, such as *Ae. parviflora*, which is placed in a section of its own. (The handsome pink-flowered *Ae. carnea* is a tetraploid that originated through hybridization of *Ae. pavia* and *Ae. hippocastanum*, which belong to different sections.) It would also be interesting to see what results could be obtained in crosses between *Ceanothus americanus* or *C. sanguineus* and some of the blue-flowered western American species that are not adapted to the climate of the eastern United States.

Problems in the Cultivation of Native Plants. Finally, there is much to be learned about many aspects of the cultivation of native ornamental plants. The seed-germination requirements of many of the tree species are well known, but those of many shrubs and of the majority of herbaceous plants have received relatively little attention. There are also numerous problems in connection with the vegetative propagation of native plants. Difficulties in rooting cuttings of American azaleas (*Rhododendron* sect. *Pentanthera*) worked against the propagation and wide horticultural use of these beautiful plants until the discoveries that cuttings should be taken early in the growing season when the new shoots are just beginning to become woody and that root-suckers can also be taken made the rooting of cuttings a routine matter (see A. J. Fordham, Quart. Bull. Amer. Rhododendron Soc. 23: 162-165. 1969). The further discovery that *Elliottia racemosa* will produce root-suckers that can easily be rooted has eased the difficulty of propagating that beautiful ericaceous endemic of Georgia (see Fordham, Arnoldia 29(3): 17-20. 1969). Yet, plants such as *Nyssa sylvatica* and *Sassafras*



Elliottia racemosa. Photo: J. Henry.

albidum, each of which suckers from the roots but is difficult to propagate vegetatively or to transplant, offer further problems.

These examples suggest some of the possibilities that workers at botanical gardens and arboreta can find in native eastern American plants, both in and out of cultivation. Aside from these considerations, however, but basic to all that has been said, is the question of why anyone should bother to cultivate non-food plants at all. I think that the answer lies in the satisfy-

ing connection that plants make with the natural world around us, for there is every indication that man needs to keep in contact with the living world in which he evolved. With ever-increasing urbanization and with the profound changes man is bringing to his environment, cultivated plants are more important than ever in bringing a sense of appreciation for and a sense of the value of the remarkable organisms that inhabit the earth. Man removed to an artificial world would be a sorry animal indeed. Botanical gardens and arboreta have a critical role to play in maintaining and developing a real appreciation for the natural world and our proper place in it.

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