WHAT CAN WE DO WITH SWEET BAY MAGNOLIA?

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Magnolia virginiana L. is probably the most numerous species of the genus in the wild in America today, and there are many things we can do with it. I'll list several categories, then give some details of botanical and horticultural work possible with the Sweet Bay.

I. We can use it effectively in the landscape.
II. We can better define and classify its natural variations.
III. We can make fertile hybrids between northern and southern varieties.
IV. We can select distinctive cultivars for propagation, both in varieties and in hybrids.
V. We can get decorative F_1 hybrids between Sweet Bay and several other species.
VI. By introgressive hybridization we can introduce Sweet Bay genes to other species, particularly *M. grandiflora*.

I. Landscape use. On our tour later this afternoon, look at the smaller leaved evergreen magnolia at the Joe Kirkpatrick place, east of his main house. It may be the largest Sweet Bay tree some of our members have ever seen, who are familiar only with the northern variety of the species *M. virginiana* var. *virginiana*. Kirkpatrick's is one of the finest specimens of the southern variety, *M. virginiana* var. *australis* Sarg. in cultivation around Memphis. This variety was described botanically only 49 years ago.

Though some cultivated trees of it have proved hardy up in Illinois and northern Pennsylvania, the most northern wild trees of var. *australis* I have located are in two Tennessee counties and one in western North Carolina. Primarily a native of the Southern Atlantic and Gulf Coastal Plains, south to the Florida Everglades and west into east Texas, it co-occupies a small part of the range of the northern *M. virginiana* var. *virginiana*. Both are found, sometimes side by side, in wet woodlands of eastern Georgia. But from southern

South Carolina up the coast to New York's Staten Island, and discontinuously in Massachusetts, only the northern variety appears to be native, by my observation.

I differ somewhat in my description and delimitation of the varieties, both from Sargent and from his Harvard colleague M. F. Fernald, who in 1950 included southeast Virginia in the var. *australis* range. I think Sargent had already listed it farther north than it actually ranges when he placed some specimens in the Cape Fear region around Wilmington, North Carolina. I surveyed that area in June 1966 and around Wilmington I could find only a form of the northern variety. While it had pubescent young branchlets and flower pedicels and peduncles, its flowers had the odor, the yellow pollen color, the early season and hour of flowering, and the loss of last year's leaves by flowering time, which to my mind put them in var. *virginiana*.

II. A better definition of the natural varieties. Sargent, unfortunately, chose no type specimen for his var. *australis*, and about the only distinctions he gave were to describe it as a larger tree, retaining green leaves until spring and with pubescence remaining during the first season on its branchlets, pedicels, etc. A tree it often or usually is, but not always. Pubescence is found also on branchlets, pedicels and peduncles of many cultivated var. *virginiana* plants, and on those wild in much of the eastern Carolinas, while it is relatively scarce on var. *australis* plants from central to southern Florida while they are in the juvenile condition. (Seedlings of the latter population do become pubescent on the internodes below their flowers.) As to evergreen leaves, that character too is variable. Young plants or suckers of the northern variety, or very sheltered older plants, can hold some green leaves until spring. But out in Texas and western Louisiana, many or most of the southern Sweet Bays native there are largely defoliated by Christmas. (I found some exceptions.) Through Mississippi, Alabama and Georgia to northern Florida, "semi-evergreen" would better describe the majority of wild Sweet Bays. But go to the flowers of living specimens, and you can nearly always separate the northern and southern varieties. I have observed many clones flowering in habitat, or collected in the wild, from North Carolina to Florida and Texas, and find the following invariable or consistent differences:

1. Flowers of the southern variety open later in the day, and usually later in the season.

2. Flowers of the southern variety usually open more abruptly.
3. The fragrance of the southern variety is more intense, and more citrus-like.
4. Flowers of the southern variety have paler anthers, and pale, almost white pollen, compared with butter-yellow in the northern.
5. The southern variety is highly self-sterile (within a clone) if not absolutely so. Northern variety plants are generally self-fruitful.
6. The stigmas generally abscis more quickly on the southern variety flowers.
7. Fruits usually take longer to mature on the southern variety (80-90 days, versus about 60 days on the northern), but there are some exceptionally early-maturing var. *australis* trees in west Tennessee (wild at Bethel Springs and cultivated in Jackson at Riverside Cemetery and the Parkview Baptist Church).
8. Outer seed coats on the southern variety have a more pungent odor suggestive of bay rum.

These consistent differences, it appears to me, are practically enough to give the *australis* variety (by my delimitations) the status of subspecies. As Savage has indicated in his recent American Magnolia Newsletter article ["Magnolias in Michigan Part III," Vol IV, No 2 (Issue 5)], if the Sweet Bay variants had been brought over from Asia, they would no doubt have been classified as two or more species. W. W. Ashe, known as a great species splitter among American botanists of the early third of this century indeed did propose *australis* for specific rank in 1931, without, however, citing the phenotypic differences I have observed and listed above. Excepting chemical difference which might be discerned by chromatography of dried specimens these contrasts between northern and southern populations would disappear in the herbarium material, leaving only the pubescence contrast, which I have found not valid for separating the varieties. When living, flowering plants, rather than herbarium sheets are studied, the valid contrasting characters are more than enough to justify varietal separation. Perhaps we should not go further than that, as the next heading shows the separation not complete, in the genetic or biological sense.

III. Fertile hybrids are obtainable between varieties. I already have flowered a number of intervarietal hybrids, and have secured viable seeds both by intercrossing the F_1's and by back-crossing them to var. *australis*. The first cross, in contrast to some interspecific magnolia crosses, can be made reciprocally, and the F_1 hybrids seem fully

cross-fertile. (Whether they inherit the self-fertility of var. *virginiana*, I shall investigate this year.) Although my own crossing experience, along with that of both Doris Stone and David Leach, indicates that some Sweet Bays can produce numerous apomictic seedlings (by parthenogenesis, my results indicate) when pollinated either by *M. grandiflora* or by more distantly related species, the intervarietal crosses give what appear nearly always to be true hybrids. They show intermediate conditions between the respective parents in such things as pubescence, leaf shape, leaf texture, evergreen tendency, hour of flowering and fragrance of flowers and seeds.

I have, like Ashe before me, found no wild Sweet Bays that could not be separated into one or the other of the taxa by my flower and fruit criteria. There are some cultivated trees (in Springfield, Illinois and Webster Groves, Missouri) however, which may possibly be the result of an isolated, self-sterile *australis* tree which had only var. *virginiana* to cross with it. Such a situation exists in Mt. Pulaski, Illinois, where the lone tree of var. *australis* gives only occasional fruits to open pollination, and produces intermediate seedlings. At Sesser, Illinois, a lone *australis* appears to get its open cross-pollination only from nearby *grandiflora*, and its seedlings come sometimes hybrids with *grandiflora* and sometimes *australis*, apparently by facultative apomixis. Another explanation could be that the Sesser tree is exceptionally self-fertile for *australis*.

Since the two varieties, *virginiana* and *australis*, do overlap at present in Georgia, it is possible that past introgression of *australis* genes into the eastern Carolina population of var. *virginiana* could have been the source of the pubescence seen on the deciduous sweet bays in the wild around Wilmington, North Carolina, and on many plants cultivated farther north.

IV. We can select distinctive cultivars. With cuttings rooting readily under mist following hormone treatment, a quite varied list of cultivar forms is possible from clones already under observation. By further breeding, it should be possible to combine some of the extreme features in a single clone. Here are some things we can look for.

a. Precocity. Seedlings from some lines of var. *virginiana* begin flowering in their third year of growth. I even had four seedlings flowering by the time they were two years old, in a cross between a shrubby var. *virginiana* and the recently named *australis* cultivar 'Henry Hicks,' whose original tree is in the Arthur Hoyt Scott Horticultural Foundation's planting at Swarthmore College. One of these is as fully evergreen as its pollen parent, under cool greenhouse

conditions.

b. Dwarf Stature. In some lines of var. *virginiana,* comparative dwarfness is associated with precocity and abundant flowering. I am also working with some dwarfs in var. *australis*. One stoloniferous clone found by Tom Dodd, Jr. in Mobile County, Alabama has already been crossed with 'Henry Hicks.'

c. Glossy Leaves. A clone propagated from the largest *australis* tree in the outpost near Turtletown, Tennessee (1600 ft. elevation) and some crosses with it are as glossy as a good *M. grandiflora*. At the other extreme, the least gloss is found on many Texas and western Louisiana seedlings, with considerable pubescence persisting on their upper leaf surfaces.

d. Extremes in Leaf Size and Shape. Texas and western Louisiana sources of var. *australis* give the largest leaves, in breadth as well as length. For contrast, the relatively narrow leaf of a seedling from near Turtletown, Tennessee, and another from near Florida City, south of Miami. In var. *virginiana,* [we have] the narrow leaves of a shrubby line cultivated at Champaign, Illinois, which also carries this shape into crosses with *australis*. Another clone of *australis* believed to be from southern Alabama or Mississippi has leaves among the smallest, over-all. In both botanical varieties, there are shrubs or trees with many blunt-tipped to emarginate leaves, and two *australis* seedlings from a source near Segno, Texas add a twisted blade to this shape. Crosses have been made with clones in both varieties that showed an unusual proportion of broad based, ovate leaves.

c. Flower Size. Size of the flower varies between clones and lines in both varieties. The reports appear to be true that flowers, as well as leaves, tend to be larger on the *australis* population west of the Mississippi, particularly in Texas and western Louisiana. There is a fair range of variation in the southeast, too, where Ashe distinguished a forma or var. *parva*, that still needs more investigation. In var. *virginiana,* there is a form with larger than usual, multitepaled flowers and a pinkish tinge, which Mr. Philip Savage, Jr. mentioned in his recent newsletter discussion. Mrs. T. D. Havener in Mt. Pulaski, Illinois has an old tree of this form, which I am crossing with var. *australis* and with *M. macrophylla*. (Seedlings from the latter cross are now germinating.)

f. Vigor. This apparently will be increased in many of the cross-combinations, at least in comparison with self-pollinated var. *virginiana*. My seedlings of *australis* from a Dade County, Florida source have been the fastest growing of all lots, so far, and one which is about to flower at two years old will be crossed with clones of more

northern ancestry.

g. Fruit Size. Relatively large fruits have been seen from Texas sources of *australis*. The largest fruited *virginiana* I know, at Princeton, Illinois, has given hybrids from a 1966 cross with one of the most northern sources of *australis*, collected near Columbia, North Carolina by Oliver M. Freeman.

h. Hardiness. So far as possible, I am using *australis* from northern sources, or trees which have done well when planted north of their natural range, in crossing, to increase the likelihood of hardiness in their offspring. On the other extreme, the south Florida sources may give seedlings worth testing in Hawaii, Puerto Rico, and other tropical to subtropical areas.

i. Recurrent Flowering. My Dade County *australis* seedlings came from January-ripening seeds, which must have been produced by October flowering, after a hurricane. In that vicinity, flowers and new growth on trees occur early as February. Where climate permits, we may use their character of photoperiodic indifference to get extended or recurrent flowering in the species, and perhaps in some interspecific hybrids.

V. Interspecific Hybrids. The oldest recognized hybrid *Magnolia* is *M.* x *thompsoniana* C. de Vos, dating to an accidental cross in London in 1808. (I have repeated it in Urbana, Illinois in the 1960's with the putative parents, *M. virginiana* var. *virginiana* x *M. tripetala*, and got similar hybrids. I have not obtained hybrids with *M. tripetala* as the seed parent, nor with its pollen on *M. virginiana* var. *australis*.

Though Mr. J. E. Dandy is apparently justified in putting *M. virginiana* in a section by itself, it is now known to be capable of crossing with at least three species in Section Rytidiosperum and two in Section Theorhodon, but the F_1's so far flowered are sterile or only partially fertile. With Rytidiosperum, the species crossed include, besides *M. tripetala*, the American *M. macrophylla* (crossed by me on var. *virginiana,* and in 1967 by Dr. Frank B. Galyon on var. *australis*) and *M. obovata* [*hypoleuca*] from Japan. Mr. W. F. Kosar at the U. S. National Arboretum has flowered several *M. obovata* x *M. virginiana* var. *virginiana* hybrids he made, but finds them sterile to further crossing, which also is the general report with *M.* x *thompsoniana*, both the original English clone and my hybrids at Urbana.

With Section Theorhodon, the two species crossed with *M. virginiana* both gave F_1 hybrids. Most recent (1965) was Kosar's cross, using var. *virginiana* pollen on a clone of the diploid *M. guatemalensis* collected in 1964 at the type locality (Tactic, Guate-

mala) by Mrs. McDaniel and me. It gave several vigorous hybrids.

The inter-sectional hybrid of *M. virginiana* with *M. grandiflora*, a hexaploid in Section Theorhodon, is sometimes productive of plants which can be used in breeding beyond the F_1. Specifically, I have crosses back to both *M. virginiana* var. *virginiana* and *M. grandiflora*, from pollen of the 'Freeman' cultivar, selected among the hybrids of this combination made by Oliver M. Freeman in the early 1930's. Apparently only some of the 'Freeman' flowers have fertile pollen, and some the its sister hybrids seem to have none. My back-crosses of var. *virginiana* x 'Freeman' that have flowered to date appear both male- and female-sterile, and are smaller flowered than 'Freeman.'

VI. Introgression. The experience with 'Freeman' at least proves that some hybrids of *M. grandiflora* can back-cross to that species. When that happens often enough, as we can theorize it well may have in the many thousand years that *grandiflora* has co-existed with *M. virginiana* (especially with var. *australis*) in the Gulf States and Georgia, introgression may by now have carried many genes of *M. virginiana* var. *australis* into some lines of *M. grandiflora*. I believe that it has, and that some of the most fragrant, most lanceolate foliaged, and most vigorous clones of *M. grandiflora* owe part of these qualities to their partially *australis* ancestry. Among several I suspect of hybridity, the fertility now seems quite normal, as is the case with the *M. grandiflora* cultivar 'Madison,' from the Alabama town of that name (near Huntsville). It is a distinctive, lanceolate-leaved and long-flowering clone, easily cutting-propagated. In a recent trial at the Tom Dodd Nurseries, 'Madison' open-pollinated seedlings were the tallest, at one and two year old, of any of grandiflora yet tested there. Some seedlings have leaves of extremely lanceolate shape.

Other clones of *grandiflora* that I suspect to be introgressed include *M. grandiflora* lanceolata ('Exoniensis') and 'Alabama Ever-blooming' among the named ones, and a number of seedlings cultivated across the Southeast. Usually their cones are small for *grandiflora*.

Whether *M. virginiana* can introgress into other species, will depend upon how well it can make back-crosses beyond the F_1. Even if it doesn't, there are still enough breeding and selection possibilities with it to keep several plant scientists, nurserymen and serious hobbyists quite active for a long time. I hope that this summary of work already done by breeders and botanists with Sweet Bay will stimulate others to turn their eyes and hand to it. ❧