

with *M. acuminata* and *M. kobus* being the recommended rootstocks in our area (USDA Zone 5 and colder).

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Pot-In-Pot Tree Production for Municipal Use

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INTRODUCTION

The City of Columbus, Ohio comprises 135,000 acres: 2050 miles of streets and 202 parks (7000 acres). In 1996, an independent consulting firm accomplished a street tree inventory, concluding that the City had 85,000 trees and slots for 45,000 additional trees.

At that time, the City of Columbus made a commitment, and in my opinion, undertook the most aggressive approach to planting street trees in the United States. In the fall of 1999, the Columbus Ohio Municipal Nursery will be in full production planting 4000 container-grown and 1000 bareroot trees along the streets and in the parks each year.

PRODUCTION

The pot-in-pot system optimizes the growing environment of a tree through highly controlled germination, propagation, and root control methods. The process combines several different production methods that have been developed over the years. The unique combination of these methods and critical timing at different stages during the growth period results in a superior tree.

In the fall, seed is collected locally, specifically from mature trees exhibiting exceptional form, foliage, and resistance to insect/disease/air pollution. Table 1 represents a list of trees that I consistently produce from seed.

After collection, seed is given the proper stratification/scarification treatment and stored in the cooler. Once dormancy requirements have been satisfied, the seed is germinated. By the end of the greenhouse phase, the trees usually produce three flushes of growth and are approximately 18 to 24 inches tall.

Trees are then acclimated under shade and transplanted into 3-gal containers for one growing season. During the 1st year of growth, trees are monitored closely to insure central leaders are maintained and to accomplish selective pruning.

In the fall, some trees will be transplanted into 10-gal containers, while others will remain in the 3-gal containers and overwintered in the polyhouse. Transplanting is dependent upon the size of the tree as well as the species. In the spring, the remaining trees are transplanted into 10-gal containers and will remain there for 2 years. During each phase of production, containers treated with Spin-Out™ are utilized to prevent root girdling.

Table 1. Trees that are consistently produced from seed.

| | |
|---|-------------------------|
| <i>Acer buergerianum</i> | trident maple |
| <i>A. campestre</i> | hedge maple |
| <i>A. tataricum</i> subsp. <i>ginnala</i> | Amur maple |
| <i>A. palmatum</i> | Japanese maple |
| <i>A. truncatum</i> | purpleblow maple |
| <i>Aesculus glabra</i> | Ohio buckeye |
| <i>A. parviflora</i> | bottlebrush buckeye |
| <i>Carya cordiformis</i> | bitternut hickory |
| <i>Celtis laevigata</i> | sugarberry |
| <i>C. reticulata</i> | nettedleaf hackberry |
| <i>Cercis canadensis</i> | eastern redbud |
| <i>Cladrastis lutea</i> | yellowwood |
| <i>Diospyros virginiana</i> | persimmon |
| <i>Eucommia ulmoides</i> | hardy rubber tree |
| <i>Fagus grandifolia</i> | American beech |
| <i>Fraxinus ornus</i> | flowering ash |
| <i>Gymnocladus dioica</i> | Kentucky coffeetree |
| <i>Koelreuteria paniculata</i> | panicked goldenraintree |
| <i>Magnolia acuminata</i> | cucumbertree magnolia |
| <i>M. virginiana</i> | sweetbay magnolia |
| <i>Nyssa sylvatica</i> | black tupelo |
| <i>Ostrya virginiana</i> | American hophornbeam |
| <i>Phellodendron amurense</i> | Amur corktree |
| <i>Pterocarya fraxinifolia</i> | Caucasian wingnut |
| <i>Pyrus fauriei</i> | Korean pear |
| <i>Quercus acutissima</i> | sawtooth oak |
| <i>Q. bicolor</i> | swamp white oak |
| <i>Q. imbricaria</i> | shingle oak |
| <i>Q. macrocarpa</i> | bur oak |
| <i>Q. muhlenbergii</i> | chinkapin oak |
| <i>Q. palustris</i> | pin oak |
| <i>Q. robur</i> | English oak |
| <i>Q. rubra</i> | red oak |
| <i>Q. stellata</i> | post oak |
| <i>Sophora japonica</i> | Japanese pagodatree |
| <i>Tetradium danielli</i> (syn. <i>Evodia daniellii</i>) | Korean evodia |

At the end of the 3rd growing season, trees are adequately branched with central leaders, will stand 6 to 7 ft in height, and will average 1 to 1½ inches in caliper.

Although these elements seem to be rudimentary, desired growth will not be achieved if the schedule is not strictly adhered to. In addition to the timing of certain activities, monitoring the trees and correcting any deficiencies is just as vital.

Successful Production of Difficult-to-Transplant Native Woody Trees

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For almost 10 years our nursery in southern Ohio has been working on developing a system to produce difficult-to-transplant or taprooted trees so they can be successfully moved to their final destination. The production system we are using today is allowing us to grow and successfully transplant many of the more beautiful natives in a short period of time which here-to-for were nearly impossible to field transplant successfully or at least at any successful ratio that made it a profitable venture. This system has allowed us to go from a seed, to a containerized liner, to a 2-inch caliper tree in 42 months and only 24 to 26 months are spent in the ground.

The demand for trees and shrubs and, in particular indigenous natives, has been extremely high the last couple of years. Our tiny nursery is receiving orders and request in the numbers of thousands. The last 50 to 75 years showed a marked decline in the use of native trees I suspect because of their notorious reputation for transplant difficulty or they may have been considered too "ordinary" for most people to seek them out.

The late Dr. Phillip Kozel of Ohio State University infected me in the early 1970s with a great appreciation and love for the native species. As a young landscape designer fresh out of school, I couldn't wait to start designing landscapes using beech (*Fagus*), nyssa (*Nyssa*), sassafras (*Sassafras*), white oak (*Quercus alba*), etc. Needless to say, I was extremely frustrated when I found that absolutely no one grew these plants. Now 25 years later, I realize what a lot of these reasons were, but we have come a long way to resolving many of these problems with transplant difficulty. There is great interest in the buying public, and I think we know now how to put a good root system on them.

Our nursery has developed a system of growing a containerized liner which when planted in a fertile nursery field in the fall, can produce a 2-inch caliper tree, with a multiple-branched root system that will transplant readily in 2 years. Growing trees in containers is nothing new but before the development of Spin-Out™ and Whitcomb's special 'Roomaker' pots most of the root system was wrapped around the sides and bottom of the container dictating an eventual death sentence for the plant.

Two of the most important factors in this system we developed that help to insure success is by starting with the right plant, (or liner) and fall planting. (Remember, we are talking about native species.) The right plant should be an indigenous native, which means you have to have an idea of the seed source of your liners. Buying seeds or seedlings from an unknown source or from outside your climatic zone is like a crapshoot. The seed of most of our natives is either collected by myself personally or