is accessible from a boardwalk. The pond is the late summer sensation of Kanapaha Botanical Garden and its offering climax with the appearance of the giant Brazilian *Victoria cruziana*. Shoreline emergents include papyrus, bamboos, irises, royal ferns, mallows, and more.

Palm hammock. This major collection includes most palm species known to be hardy in our climatic zone including several hybrids.

In addition to these major gardens, Kanapaha Botanical Gardens now hosts a series of smaller 'vestpocket' gardens including:
(1) an insectivorous plant garden that displays both native American species and several from abroad.
(2) an ornamental pepper garden.
(3) a wildlife food plant garden in which are displayed species whose berries attract birds and other wildlife.
(4) a woodland wildflower garden. This garden is being developed on a woodland hillside overlooking Lake Kanapaha. The Gainesville Garden Club sponsored a gazebo for this garden which should be transformed by time into a major attraction.
(5) a mallow garden subdivided into four areas to accommodate members of the four tribes of the family Malvaceae.

Of several horticultural features still to be developed, the most notable is the extensive arboretum which will consume most of the 29 acres that lie west of the developed portion and which were acquired for this purpose in March 1981. An irrigation system has been installed and extensive planting has been completed already. This area will further feature a series of water features (ponds, streams, and waterfalls) that are planned as a joint venture with the City of Gainesville's Regional Utilities Department. This will provide these features for Kanapaha Botanical Gardens while serving as an exemplary demonstration facility for recycling wastewater effluent from the nearby Kanapaha Wastewater Treatment Plant.

Kanapaha Botanical Gardens has set a goal of fiscal self-sufficiency and presently generates over 80% of its revenues from its operations. Kanapaha Botanical Gardens assesses a modest admission fee and operates both a gift shop and plant sales nursery that is stocked largely from an on-site propagation greenhouse and nursery. Additionally, the staff sponsors several specail fund-raising events including three moonlight walks annually and a winter bamboo sale. The facility's principal operational deficiency at this time is its lack of enclosed space to accommodate meetings, workshops, and to provide refuge for social events in case of inclement weather. Presently, Kanapaha's enclosed space is limited to a small building that serves as an admission building, gift shop, rest rooms, and office space. The Society's board of directors is presently planning an effort to raise the funding necessary for the construction of a more substantial facility.

Overall, the development of Kanapaha Botanical Gardens has proceeded quickly and auspiciously. It is the Society's belief that this has transpired because it has served as a catalyst to focus human energies that were here already. It now stands at the threshold of realizing its singular goal—to celebrate the immense beauty and diversity of the earth's flora.

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TREES THAT KNOW THEIR PLACE

D. G. BURCH
Horticultural Masterworks
4044 SW 4th Street
Plantation, FL 33317

A. A. WILL, JR.
Broward Community College
Biological Sciences Dept.
Fort Lauderdale, FL 33314

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Abstract. **Much of the work for arborists in all areas of the country consists of reducing the size of trees that have been planted in spots for which they grow to be too big. Street tree plantings have a number of constraints ranging from the need to stay clear of overhead wires and lights, to restrictions on root growth by the size of the planting area and the presence of underground utility structures. Smaller properties and town gardens also need trees in scale with the size of the lot.**

A selection of trees suitable for these conditions in south Florida is discussed.

Most arborists agree that the best pruning for the health and long life of a tree is no pruning at all—or at least no pruning whose only purpose is to reduce the size of a tree. "Trees that know their place" are trees that will not outgrow the site in which they are planted, and might better be called "trees that installers knew were right for their place." There are many sites in which a small tree is appropriate: the tiny yards that come with many townhouses, places where there are wires or other obstructions overhead, and spots where some tall, green, living relief is needed for a streetscape or garden, but where there is a very restricted rootrun due to underground conditions. Some situations may also require a columnar shape or a limited spread to the branches. These are not treated in detail in this paper since the main impetus for it has been the need to encourage the planting of trees to shade the ground around our living areas. Columnar trees and palms may shade and cool the sides of buildings if correctly placed, but do not contribute much to an overhead canopy cover.

For small gardens, the specifications for a suitable tree would probably include a single or multiple trunk that carries an open canopy, spreading high enough to allow walking, or at least sitting comfortably, in a light to medium shade. Dense shade may be a disadvantage in a small garden since it limits the smaller plants that can be grown to add color or other interesting features to the area. Not all

gardeners understand that the problems with growing plants under a tree come as much from root competition for water as from shade, but there is no doubt that heavy shade limits the range of flowering plants and of herbs and vegetables that will succeed even in pots. Another requirement might be for flowers, fruit, or fragrance, or all three, so that the tree is filling several roles in a site in which only a few plants can be grown. An interesting bark, or a striking leaf form or color are other positive features for this situation.

Where the site has size limitations which include the need to stay under overhead wires, the major consideration must obviously be an ultimate height that does not exceed the height of the lowest wire, or a growth habit which allows a discreet pruning that gives the wires a free run without the tree having to be carved into some of the extreme forms of windows or tunnels that some utility companies cut into large trees. In a public site, the favored trees would also be free of serious litter-producing characteristics—the carpet of fallen flowers, that to some gardeners is a bonus from a flowering tree, is a nuisance and a potential liability in public and commercial situations. And fruit! This is seen as an invitation to small children to climb the trees, a problem in creating potential falls, a threat to the paintwork of passing cars, and a mess that can only add to the landscape budget. The trees alongside streets and in parking lots, must, of course, also be able to stand the additional stresses that come from these sites—fluctuating temperatures and higher extremes due to the surrounding blacktop, poor soil aeration, flooding and drying out of the small volumes around the roots, air pollution and so on.

Where root space is restricted, even a tree that would normally grow large will be held to a smaller size, but a tree that is naturally small would have a smaller root mass, and would be stressed less by the constriction. Whatever the reason that root space is limited, whether the tree is in a planter or in a planting space left in paving, it is important to make sure that drainage is good, that the soil has some capacity to hold water and nutrients, and that exchange of gases can occur. Cultural practices must be as close to ideal as possible. Plants are relatively forgiving, but the experienced horticulturist knows that each stress placed on a plant reduces the leeway in all other factors acting on it.

The lists that follow place the trees in the slot in which they fit best, but many of the street trees can easily be held to small garden size, and some of the small garden trees and tree shrubs serve very well in streets and parking lots. Native plants are marked with an asterisk *.

TREES FOR SMALL GARDENS

Trees easily shaped to form the "roof" of an outdoor room at a maximum height of about 12 feet.

5 BEST (reasonably available, trouble free, and good)

Bucida spinosa (Northr.) Jennings Ming tree. Great shape, light shade, leaves "disappear" as they fall into vegetation but can stain masonry.

Caesalpinia mexicana Gray Yellow flowers, shapely tree.

Citrus spp. Quadruple whammy trees—shade, flowers, fruit, fragrance, and can be shaped into lovely form.

Olea europea L. Olive. Shapely trees, resistant to everything.

Tabebuia impetiginosa (DC.) Standl. Incredible show of pink flowers if the plants dry out well in the winter.

OTHER CANDIDATES (may be less available, shorter lived, etc.)

Annona squamosa L. Sugar-apple and *Annona* hybrid. Delicious fruit.

Averrhoa carambola L. Carambola. Pink flowers, popular fruit. Will need frequent light pruning to stay to size.

Callistemon viminalis (Gaertn.) Cheel Weeping bottlebrush. Red flowers several times a year.

Cassia surattensis Burm. f. Yellow flowers, butterfly food source. Life expectancy only 10-15 years.

**Conocarpus erectus* L. Buttonwood and var. *sericeus* Silver B.

Milletia ovalifolia Kurz Blue flowers.

Pittosporum ferrugineum Ait. 'Floyd L. Wray' is a good form.

SHRUB TREES

Strong growing shrubs that are reliable and long-lived when formed into small single or multi-trunked trees with a spreading canopy.

Cocculus laurifolius (Roxb.) DC. Snail Seed.

**Chrysobalanus icaco* L. Cocoplum.

Cordia boissieri A.DC. Texas wild olive. White flowers.

**Eugenia* and *Syzygium* spp. Stoppers and Cherries.

**Forestiera segregata* (Jacq.) Krug & Urban. Florida privet.

Hibiscus cultivars.

Jatropha integerrima Jacq. Red flowers all year long.

Lagerstroemia Crape myrtle. The newer hybrids.

Ligustrum japonicum Thunb., *L. quihoui* Carr., *L. sinense* Lour.

Malpighia glabra L. Barbados-cherry.

Murreya paniculata (L.) Jacq. Orange-jessamine.

Myrciaria cauliflora (DC.) O. Berg in Mart. Jaboticaba.

**Myrsine guianensis* (Aubl.) Kuntze Rapanea.

Nerium oleander L.

Thevetia peruviana (Pers.) K. Schum.

Tibouchina granulosa (Desr.) Cogn. Glory bush.

Viburnum odoratissimum Ker.-Gawl. also var. *awabuki*.

**Xanthoxylum fagara* (L.) Sarg. Wild-lime.

STREET TREES

Trees with a spreading canopy high enough to clear traffic but low enough to be under wires. (Some may need light pruning.)

Caesalpinia granadillo Pittier Bridal veil.

**Clusia rosea* Jacq. Pitch-apple.

**Coccoloba diversifolia* Jacq. Pigeon-plum.

**Coccoloba uvifera* (L.) L. Seagrape.

Cupaniopsis anacardioides (A. Rich.) Radlk. Carrotwood.

Erythrina variegata var. *orientalis*.

Ficus perforata L. (*F. jacquinaefolia*).

Ficus rubiginosa Vent. Rustyback fig.

**Lysiloma* spp. False tamarind.

Terminalia muelleri Benth. Black-olive.

If flowers and/or fruit are acceptable, the following are good choices:

Manilkara roxburghiana (Wight) Dubard.

Noronhia emarginata (Lam.) Hook.

Psidium littorale Raddi Cattley guava.

Tabebuia spp. Trumpet Trees *T. caraiba* (Mart.) Bur., *T. chrysotricha* (DC.) Standl., *T. heterophylla* (DC.) Britt.
Tamarindus indica L. Tamarind.

TREES FOR NARROW SPACES

Sometimes the only space for planting is close to a building. These trees have branches that do not spread much.

**Ilex cassine* L. Dahoon holly.
**Ilex vomitoria* Ait. (Weeping forms).
**Krugiodendron ferreum* (Vahl) Urban Black ironwood
Podocarpus spp.

A few palms, all with palmate leaves, have small heads of foliage. *Thrinax* and *Coccothrinax* species are good choices.

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MOVING LARGE SPECIMEN TREES WITH MINIMAL SHOCK

ROY A. MECKLENBURG
Walt Disney World Co.
P. O. Box 10,000
Lake Buena Vista, FL 32830

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Abstract **Transplanting shock for large specimen trees (above 6" caliper) in Central Florida was minimized by using the "California" boxing system and foliar misting techniques. These techniques were successful with *Pinus elliottii, Liquidambar styraciflua, Prosopis* " Reese Hybrid", *Cinnamomum camphora, Schinus* spp., *Ilex vomitoria,* and *Ilex opaca* 'East Palatka'.**

Moving large trees with a ball of soil (B & B) minimizes transplanting shock and maintains a portion of the original root system (40% or less) intact and undisturbed in the soil. When the roots are pulled loose from the soil or the soil ball is disturbed, the fine root system is injured and will lose much of its ability to absorb water. Without at least part of the fine root system intact and undisturbed in soil, most large specimen evergreen trees will rapidly wilt and not survive transplanting, particularly if transplanted while in a flush of growth.

Large specimen trees (6" caliper and up) growing in sandy soil at WALT DISNEY WORLD Resort are dug with a ball of soil approximately nine inches in diameter for each inch of trunk caliper (diameter).

The ball diameter specifications from the 1990 American Standard for Nursery Stock (1) for 6" or larger caliper trees is 10" of ball diameter per inch of caliper. We have reduced that ratio in our sandy soils to facilitate lifting the tree without breaking the ball of soil. Our primary goal is an undisturbed ball of soil and intact roots. A small undisturbed ball of soil and roots has been more effective in reducing transplanting shock than a large disturbed ball of soil and roots. In very sandy soil, a ratio larger than 1 to 9 will produce unstable soil balls that break when moved, particularly if the tree must be transported in a horizontal position. If we can move the tree upright on a low bed trailer the soil ball will, in most cases, remain intact and undisturbed, substantially reducing subsequent transplanting shock.

Transplanting shock can be further reduced by allowing the balled and burlapped tree to remain in its original hole for 1 to 3 months before moving it to the landscape site. The excavation is immediately backfilled with soil around the ball and a 6" water ring created at the outer edge of the top of the ball. The ring is filled with water daily for 2-3 weeks in addition to the normal overhead irrigation or rainfall. After 1-3 months and presumably after partial replacement of the severed root system, the balled and burlapped tree can be removed and transplanted with minimal transplanting shock.

The difficulty of maintaining a ball of soil undisturbed during lifting and transport led us to evaluate the boxing of trees as an alternative procedure for moving large trees.

Methods and Materials

Boxing large specimen trees has been a common practice in southern California and we have found it more effective in Central Florida than other methods in maintaining an undisturbed soil ball. We boxed our first specimen tree, a 13" caliper *Magnolia grandiflora*, this past spring, under the guidance of Mr. Gil Hernandez of Hecker Pass Nursery. Before beginning to dig, we install a 365° fine spray irrigation nozzle with 1/2 inch PVC pipe in the tree canopy just beneath the highest branches. A wide spreading tree such as a mature camphor (*Cinnamomum camphora*) may require 2-3 nozzles for good coverage. The purpose of the spray nozzles is to wet and cool the foliage by evaporation and to thereby reduce leaf transpiration and prevent wilting. A square section of roots and soil 30" deep is dug so as to be just slightly smaller than the desired inside dimension of the box.

The double-planked (2" x 8" cypress planks) box sides are one foot wider at the top than at the bottom. Two eye bolts are installed at the top for lifting the side into place. The inner planks are vertical and the outer planks are horizontal on the sides. The sides are 32 inches high from 8' to 12' wide depending on tree size and are bolted together as can be seen in Figure 1. The sides are placed around the soil cube and strapped with 1¼" steel banding. The bottom is then undercut by hand starting from two opposite sides placing one 2" x 8" plank in place at a time as shown in Figure 2. The plank is lifted into place with a hydraulic jack and shored with 2" x 12" x 12" wooden shims. It is very important that the box sides be installed horizontally and that the wooden shims supporting the box are placed level to prevent the box from shifting. Soil is then removed from beneath the box until a second plank can be put into place. This continues until the last plank is in place at the middle of the tree. The top is then planked