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

Fig. 1. The sides of the box have been bolted together and strapped securely in place. The first bottom plank is in place.

Fig. 2. The bottom planks are being installed from two opposite sides leaving only a four foot wide section of soil in the middle to be removed. The soil has been removed in preparation for placing one plank on each side of the remaining soil.

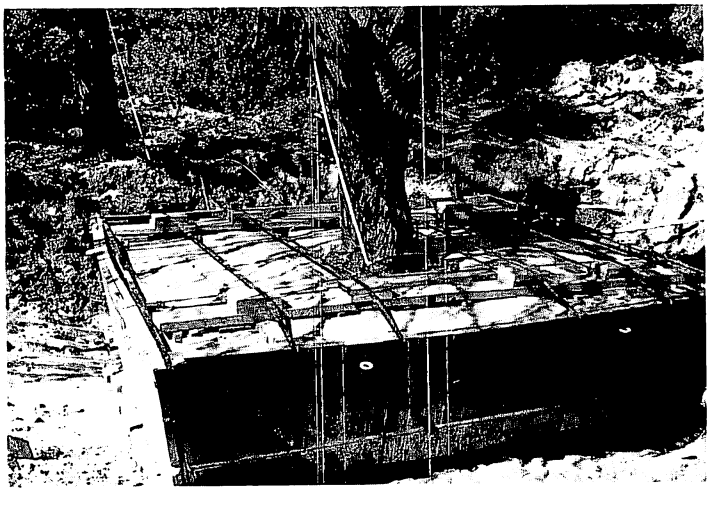

Fig. 3. All of the bottom and top planks have been placed into position and the entire box securely strapped with 1¼ inch steel strapping. The tree is now ready to lift and transport.

with 2" x 12" planks and the top, sides and bottom strapped together with 1 inch steel banding completely enclosing the roots and soil in a solid box as shown in Figure 3.

The tree can then be moved in an upright or horizontal position by lifting the box with slings as shown in Figure 4. The angled box sides hold the tree slightly above a horizontal position protecting the foliage during transport. A 14′ diameter box holding a 23 inch caliper Mesquite (*Prosopis* 'Reese Hybrid') weighed 25 tons and was lifted with two "I" beams under the box, Figure 5.

Once the specimen boxed tree is in its permanent site or in a storage area the mist nozzles are regulated to wet the foliage for five minutes every half hour from 11:00 AM to 4:00 PM. Misting continues for one month and longer, if the foliage wilts.

Fig. 4. The box has been lifted with two nylon slings and placed in a horizontal position in one lift. The tree may also be lifted in a vertical position with two slings under the box. Note that the tree is resting on a low bed trailer with the trunk and foliage above a horizontal position. Additional support will be needed under the trunk to prevent the trunk from moving during transport.

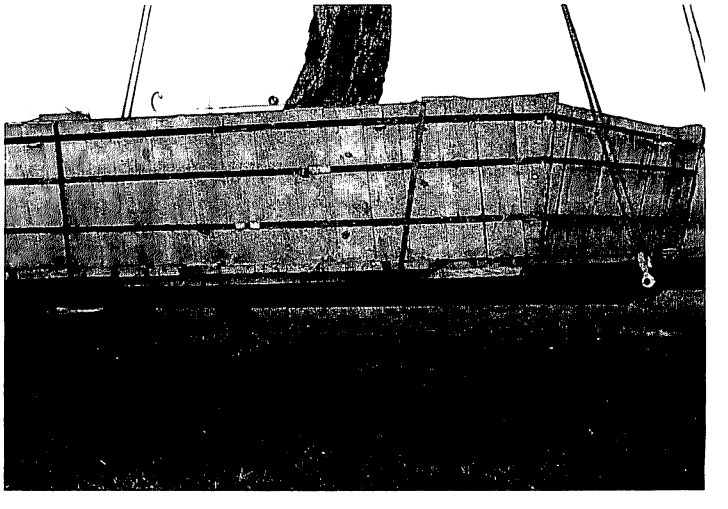

Fig. 5. This *Prosopis* 'Reese Hybrid' in a 12′ box weighed 25 tons and was lifted with two "I" beams under the box. The tree was transported in an upright position on a low bed trailer.

Results and Discussion

We have moved seventeen *Magnolia gradiflora* trees ranging from 7" to 16" caliper in 8' or 9' boxes, one 15" caliper *Pinus elliottii* in a 9' box, two 12" caliper *Liquidambar straciflua* in 9' boxes, two 20-23" caliper *Prosopis* 'Reese Hybrid' in 12' and 14' boxes, one 16" caliper *Cinnamomum camphora* in a 9' box, one 14" caliper *Schinus* spp., one multple weeping stem *Ilex vomitoria* and one multiple stem *Ilex opaca* 'East Palatka' all in 9' boxes during the past year.

With the exception of the two Mesquites (*Prosopes* 'Reese Hybrid' which lost 60-80% of their foliage during the first two or three days of boxing, (they have since recovered), we have been able to maintain all of the trees in full leaf regardless of the season they were moved with no apparent transplanting shock.

Boxing and misting foliage after transplanting have proven to be our most effective way to move large specimen trees without transplanting shock. This is of particular advantage in landscaped sites where subsequent construction would make it impossible to replace large trees that did not survive transplanting. Specimen trees may also be removed from a construction site and held for a number of years in healthy condition before being moved into a new landscape site with excellent chances for survival.

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FERTILIZER TYPE AND NITROGEN RATE AFFECTS FIELD-GROWN LAUREL OAK AND JAPANESE LIGUSTRUM

EDWARD F. GILMAN AND THOMAS H. YEAGER
Environmental Horticulture Department, IFAS
University of Florida, Gainesville, FL 32611

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Abstract. **Laurel oak (*Quercus hemisphaerica*) and Japanese ligustrum (*Ligustrum japonicum*) grown in fine sand in the field received 3 or 6 lbs. N/1000 ft²/yr as controlled release (Nutricote 40, 180 and 360, Plantco Inc., Bramalea, Ontario Canada) or water soluble granular carriers (ammonium and calcium nitrate). Seventeen months after planting there were no differences in oak height or trunk caliper among fertilizer carriers. Increasing the N rate from 3 to 6 lb N/1000ft²/yr resulted in a slight increase in height but not caliper. *Ligustrum* receiving soluble granular fertilizer were larger than unfertilized checks. There were no growth differences due to fertilizer types. *Ligustrum* receiving 6 lb N/1000ft²/yr were larger than those receiving the 3 lb rate.**

Recent work indicates that the carrier of nitrogen may not be as important to landscape plant response as the method of application (8) and presence of competing turf (6). In support of this, hibiscus shrubs grew similarly in a fine sand when fertilized with a variety of slow-release and water-soluble nitrogen carriers (3). The best response resulted from surface broadcast application (5).

Moderate growth and acceptable leaf color of hibiscus were maintained by applying 5 lbs. N/1000 ft²/yr divided into 5 equal applications (4). Wright and Hale (9) stated that 3.5 lbs. N/1000 ft²/yr was adequate for shade tree growth with no growth increase at the 7 lb rate. Ponder et al. (7) reported N from 0-8 lbs N/1000 ft²/yr had no effect on tree growth. Citrus does not respond to applications of N in excess of 4-5 lbs N/1000 ft²/yr (2). The objective of this study was to compare growth of field-grown oaks and *Ligustrum* fertilized with controlled release fertilizer with that from soluble granular fertilizer at two N rates.

Materials and Methods

Laurel oaks (*Quercus hemisphaerica*) were planted on 5 ft centers in rows spaced 12 ft apart as bare root liners in Feb. 1985. *Ligustrum japonicum* were planted on 5 ft centers in rows spaced 12 ft apart from 1 gallon containers in Jan., 1987. Both species were planted in a fine sand (sandy, siliceous, hyperthermic, Hapladault). Overhead irrigation was applied several times only during the first several months following planting. Oaks were occasionally pruned to promote development of a central leader and dominant lateral branches. The *Ligustrum* were not pruned. Glyphosate was periodically applied for weed control. Millet was grown as a cover-crop between plant rows. A 3" thick layer of cypress wood chips was applied to a 9 ft² square centered around each plant in August 1987.

Oaks were fertilized once with a soluble granular fertilizer (16N-4.4P-8.3K) in 1986 about 1 year before initiation of treatments. Oaks (beginning on 19 Aug. 1987) and *Ligustrum* (beginning on 8 Sept. 1987) received 16N-4.4P-8.3K Nutricote 180 twice each year, Nutricote 180 + Nutricote 40 (5:1 ratio) twice each year, Nutricote 360 once each year or soluble granular fertilizer twice or five times per year for a total of 5 treatments (Table 1). The granular fertilizer was formulated with ammonium nitrate, calcium nitrate, triple superphosphate and potassium chloride as a 16-10-10. Each fertilizer was surface applied to the mulch (9 ft²) at a rate of 3 or 6 lb N/1000ft² of applied area per year. Ten treatments and a non-fertilized check were arranged in a randomized complete block design, with 20 blocks (replications) totaling 220 plants for each species.

Initial height and caliper of the oaks, and height and crown spread of the *Ligustrum* were recorded in August 1987. Caliper and height was measured by averaging the greatest spread and the perpendicular spread. *Ligustrum*

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