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PARADISE UNDER GLASS

The Opryland Hotel complex is a greenhouse away from home, with enough plant varieties to rival Heinz.

by Terry McIver, associate editor



The lush surroundings of the Conservatory feature 15 different palm varieties.

How's this for a service contract: daily care of approximately 18,000 plants—some very rare and temperamental—covering four acres, in a controlled environment. To be tended amidst annual tourist traffic of about 500,000 people.

Such a regimen does exist, but you

won't find it on any street. It belongs to the landscaping crew of the Opryland Hotel in Nashville, Tenn. The crew is charged with the care and feeding of the plant life in the hotel's two massive indoor gardens, The Conservatory and The Cascades.

The two lush garden environments

were installed as part of the hotel's Phase II and Phase III expansion projects, by Earl Swensson & Associates, architects for the entire Opryland Hotel complex. The Conservatory phase was completed in 1983; the Cascades project was finalized in 1988.

The Conservatory was designed by a team of architectural experts inspired by conservatories in England, Scotland, Italy and Canada.

"All of your senses are affected here," says Swensson. "There are places to sit quietly and think. There are paths to walk, and there are places to eat and drink.

"The magic is that it's all indoors. For someone attending a business meeting or a pleasure traveller, the Conservatory is more than a figurative breath of fresh air."

Landscape manager and horticulturist Hollis Malone spent months selecting The Conservatory's 10,000 tropical ornamental plants which represent 37 families and more than 215 varieties. It took Malone, assistant landscape manager Don Voorhees and a crew of 10 many months to finalize the landscape.

The Conservatory is meant to recall the lush solitude of a Victorian garden. It includes six kinds of ficus trees, four kinds of banana trees, 15 types of palms and a sampling of orange trees.

"We went to Florida and bought most of the Conservatory plants a year in advance," says Malone. "In some cases we actually took cuttings and had a Florida nursery grow the plants especially for us."

Temperature in the Conservatory is maintained at 71 degrees with humidity of 50 percent. A retractable window shade controls the amount of light that streams in through the 110-foot-high roof.

Soil for the Conservatory is a mix of 60 percent pinebark fines, 20 percent peat and 20 percent sand. "We tried to balance pH during mixing process by adding lime nutrients," says Voorhees, "now we find the soil is settling. We've started a regular process of adding soil as needed to raise the plants. In some areas, soil depth reaches three feet."

Cascading beauty

The Cascades is a two-acre water-oriented interior space that features 8,200 tropical and ornamental plants of 449 different species, and a lake that covers 12,500 square feet.

The challenge to Malone when selecting plants for the Cascades was to complement the Conservatory while highlighting the Cascade's own features, and to install plants that were as well developed as those in the Conservatory.

"We went a step further than we did with the Conservatory design by selecting a larger variety of flowering bushes and trees as well as a number of rate plants," says Malone.

Plant varieties in the Cascades collection range from a 40-foot high Alexandria palm tree to six-foot-tall ginger bushes and jasminum vines.

The Cascades is truly a landscaping wonder. Light streams in through a glass skylight, and water flows down and around man-made yet realistic rocks and mountains. Nighttime entertainment features the laser light-accompanied "Dancing Waters." Fountains erupt to the rhythms of recorded music or melodies plucked by the house harpist.

A day's work

While the amount of care required by the complex would indeed make any landscape managers take leave of his senses, Malone and company are supported by automatic watering systems which can also be used to pump nutrients and fertilizers to roots.

Peters fertilizers are used for the two gardens, along with an Aqua-Gro wetting agent. When necessary, Subdue and Banrot fungicides are applied.

"We've had great success with the Peters product," says Malone. "We use their 248-16 tropical foliage food with a 3-2-1 ratio.

"Dispensing fertilizers and fungicides through the grid system prevents spotting, and is much neater and safer," says Malone. But he ad-

mits watering is his most important concern. "Primarily because we have both sun and shade. The sunnier areas need water every two or three days, while a shaded area needs less."

Most watering in the Cascades is done by a drip irrigation grid system. Emitters are placed every square foot in 18 watering stations, and dispense one gallon of well water per hour according to specific schedules. Using well water results in a considerable savings for the hotel, considering an average weekly rate of 20,000 gallons.

To avoid traffic jams caused by

massive crowds that descend upon the complex, most spot watering is done in early morning.

Daily care includes check-ups of plant material, leaf cleaning, and spot checks for overly dry soil.

One problem that the larger plants have since outgrown is that of weaker root systems. "Being indoors," Malone explains, "the plants don't have to contend with wind, which results in weaker root systems, and, at the outset, some falling plants." Malone will install supports to secure the weaker plants, unless the supports are aesthetically unattractive.

Disease and pest control at Opryland centers on root diseases due to overwatering. "Some are brought in already carrying a disease such as pythium or rhizoctonia," says Malone, "but insect control is our biggest challenge."

An insect problem is to be expected, with thousands of people coming in from the great outdoors carrying a bug or two on their clothing. "Spider mites are most common, and we see an occasional white fly or aphid," Malone says. "If we see a problem, we spray the infected plant, rather than expose a wider area to chemical control. But if we have a troublesome plant, we'd rather throw it away rather than risk too much treatment."

LM



Traffic in the Cascades is compounded by a restaurant and gazebo-style bar.



Hollis Malone, left, and Don Voorhees lead the Opryland crew.

WHERE THE TREES COME FROM

The introduction of several biological concepts have allowed researchers to fine tune the art of tree propagation.

by Douglas Chapman, Dow Gardens



The number of shade trees successfully propagated by cuttage or tissue culture will continue to grow.

By providing interest and color, trees, shrubs and bedding plants are often the difference between an average and an exciting golf course. To better develop a course, a superintendent should be aware of new biological concepts that affect the quality, amount and type of trees, shrubs and herbaceous plants that can be grown on the course.

One current technology is propagation of trees by cuttage and/or tissue culture.

Shade and ornamental plant production has been moving more toward unique cultivars, or clonal plants, for specific goals. These goals should include disease resistance, environmental tolerance or crown uniformity.

Early problems

Many trees were produced by budding and grafting during the 1960s and 1970s. By the mid-'70s however, symptoms of incompatibility were appearing with the descendants of many red maples breaking off at the root-stock union. This incompatibility even occurred on trees with a diameter of up to 2 to 4 inches. Further, many trees were suckering excessively, increasing maintenance costs, and producing trees that were not remaining vigorous or healthy over the long run. In short, new propagation techniques had to be found.

TREES PROPAGATED BY CUTTINGS

<i>Acer buergerianum</i> ⁽¹⁾	late June	<i>A. saccharum</i>		<i>M. 'Profusion'</i> ⁽⁶⁾	late June - mid July
<i>A. campestre</i> ⁽⁴⁾	June - July	<i>subspecies Nigra</i> ⁽⁵⁾	mid June - mid July	<i>M. 'Red Jewel'</i> ⁽⁶⁾	mid June - mid July
<i>A. carpiniifolium</i> ⁽¹⁶⁾	late June	<i>A. tegmentosum</i> ⁽²⁾	July	<i>M. sargentii</i> ⁽⁶⁾	late June
<i>A. ginnala</i> ⁽⁴⁾	mid June	<i>Aesculus</i>		<i>M. 'Selkirk'</i> ⁽³⁾	May - June
<i>A. griseum</i> ⁽¹²⁾	late June	<i>hippocastanum</i> ⁽⁵⁾	late May - mid June	<i>M. 'Snowdrift'</i> ⁽⁵⁾	mid June - July
<i>A. palmatum</i> ⁽¹²⁾	June	<i>cornus florida</i> ⁽¹⁾	mid June - July	<i>Ostrya virginiana</i> ⁽⁶⁾	late June - mid July
<i>A. platanoides</i> ⁽⁵⁾	mid June - mid July	<i>Malus 'Donald Wyman'</i> ⁽⁶⁾	mid June - mid July	<i>Quercus palustris</i> ⁽⁵⁾	mid - late July
<i>A. rubrum</i> ⁽⁴⁾	mid June - mid July	<i>M. hupehensis</i> ⁽³⁾	mid May - June	<i>Tilia cordata</i>	
<i>A. saccharum</i> ⁽¹⁹⁾	June	<i>M. 'Mary Potter'</i> ⁽⁵⁾	mid June - July	<i>'Greenspire'</i> ⁽⁶⁾	mid June - early July

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Researchers at Rutgers first reported propagation of Norway maples, red maples and *Acer ginnala* by cuttage. In 1981 this list was expanded to include crab apple, which was shown to be propagable by cuttage.

By 1984 researchers had extended the list of crab apples that could be propagated by cuttage to include Snowdrift, Candied Apple, Sugar Tyme, Silver Moon, *Malus sargentii*, Sentinel, Mary Potter, and Red Jewel. Researchers had thus introduced and confirmed several important factors:

1. Propagation of trees by cuttage is

possible, but one cannot make a generalization that all sugar maples can be propagated by cuttage. Individual trees must be tried until successful, then propagate that individual as a clone.

2. Plants to be propagated by softwood cuttage must reach a certain stage of physiological maturity. *Malus* cuttings taken after rapid elongation (new growth) is completed is an example. Sugar maple, when leaves reach full growth and petioles become slightly red, is another.

These identifiable morphological

characteristics indicate that there is a specific physiological state of maturing for each plant at which propagation by cuttage is optimal.

Clonal, or cultivar selection, is often made for some desirable phenotypic characteristic, like disease resistance, environmental tolerance, habit, flower color, foliar color and/or fruit size and color. Some suggest that another criterion when selecting trees for clonal production is its ability to be propagated by cuttage in commercially acceptable percentages.

The list grows

Many plants have now been reported propagatable by cuttage (see table). Much of this research has been done in the Northeast and Midwest; therefore, the optimal period would change as one moves south, but the physiological stage remains the same.

When developing new cultivars, a frequent problem is being able to propagate a large enough number of individuals quickly from the mother plant to make it profitable. Tissue culture is the preferred propagation technique used for rapidly developing a large number of individuals from a single mother plant. It has been reported that that one can propagate cultivars of red maple by tissue culture.

The advantages of propagating trees by cuttage includes: little or no suckering, no incompatibility and a rapid growth rate compared to other propagation techniques.

A large number of shade trees are propagated by cuttage as evidenced by G.M. Moller's 1985 report that *Acer ginnala*, *A. rudrum*, *Amelanchier*, *Cercidiphyllum*, *Cornus kousa*, *Platanus*, *Prunus*, *Malus*, cv. and *Tilia* were propagated by cuttage. Others reported trees propagated by cuttage include some of the more outstanding cultivars of crab apple, Donald Wyman, Mary Potter, Profusion, Red Jewel, Sugar Tyme, Snowdrift and Selkirk, and *Tilia cordata* clones. In addition, the reported propagation of *Cornus florida* by softwood cuttage has become significant in the nursery industry.

During the next several years, it appears that there will be a great increase in the number of shade trees propagated by cuttage and/or tissue culture. This is not to indicate that the other techniques, such as seedage or budding, will not be continued. But where possible, propagation by cuttage requires a less-skilled propagator, eliminates incompatibility and reduces suckering. It also results in trees available for sale that are economical and of high quality. **LM**

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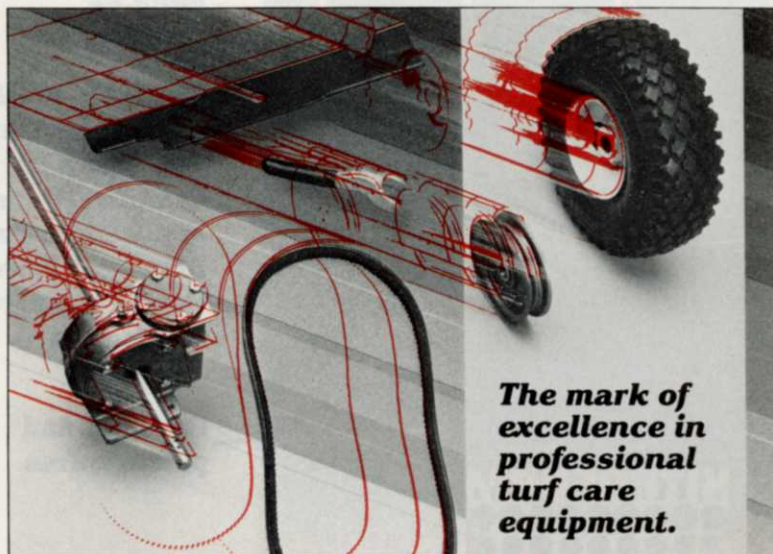
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