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FALTA, NANCY TURK. Selection and Maintenance of Natural Plants For Commercial Interiors. (1975) Directed by: Dr. Clara Ridder. Pp.

This study was designed to gain information from practicing plant authorities on methods of selection and maintenance of plants suitable for use in commercial interiors. Data were obtained by interviews with twelve nurserymen, landscape architects, and horticulturists practicing in the central Piedmont section of North Carolina and by seven questionnaires returned from selected plant authorities located outside the geographic limits of the study. Information gained from the nineteen plant authorities became the basis for the recommendations contained in this study.

Eleven species of plants were recommended by five or more of the plant authorities. In order of selection these are: (1) *Dracaena marginata*, (2) *Ficus benjamina* 'Exotica', (3) *Brassaia actinophylla*, (4) *Dracaena deremensis* 'Warneckeii', (5) *Dracaena fragrans* *massangeana*, (6) *Ficus elastica* 'Decora', (7) *Chrysalidocarpus lutescens*, (8) *Spathiphyllum* 'Mauna Loa', (9) *Chamaedorea erumpens*, (10) *Howeia forsteriana*, and (11) *Philodendron selloum*. In all, fifty-two species of plants were recommended by the survey group for use in commercial interiors. The majority of the plants are hardy and most can survive under the adverse environmental conditions commonly present in commercial interiors. A summary of the fifty-two plants and the recommended culture of each is incorporated into the findings of this study.

Adequate light was considered the foremost environmental factor in maintaining plants in commercial settings. The majority recommendation was to select plants that could survive for long periods of time with

lighting levels of 50 to 200 footcandles. This was considered preferable to installing supplemental lighting which might not add appreciably to the total footcandles of light reaching the plants. Correct watering of plants was rated as the second most important factor to consider in the maintenance of live plants in commercial interiors. Best results were obtained when trained professional nurserymen handled the regular watering of plants in commercial buildings. Only those plants capable of adapting to low lighting levels, low humidity, and moderate to warm temperatures should be selected for long-term use in commercial buildings.

in whose honor  
The University of North Carolina at Charlotte  
has named the  
Building as follows  
The name is  
The name is

1971

Approved by  
*[Signature]*  
DATE 1971

SELECTION AND MAINTENANCE OF NATURAL PLANTS  
" "  
FOR COMMERCIAL INTERIORS

This thesis has been approved by the following committee of  
the Faculty of the Graduate School at The University of North Carolina  
at Greensboro.

by

Nancy Turk Falta

A Thesis Submitted to  
the Faculty of the Graduate School at  
The University of North Carolina at Greensboro  
in Partial Fulfillment  
of the Requirements for the Degree  
Master of Science  
in Home Economics

Greensboro  
1975

*December 18, 1975*  
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ACKNOWLEDGEMENTS

The writer would like to express her appreciation to her thesis advisor, Dr. Clara Ridder, for her advice and guidance given so generously throughout this study.

Appreciation is extended also to Dr. Virginia Gangstad, Dr. George P. Grill, and Dr. Mary C. Miller for serving on this thesis committee and for their suggestions and guidance during this study.

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## CHAPTER I

## INTRODUCTION AND PURPOSE

Artificial or "permanent" plants of all types are currently being used extensively for decorative purposes in many commercial interiors. That artificial plants can add anything to our environment is questionable. According to Taloumis:

Man feels the need for green growing things about him. The ancient Egyptians, Greeks and Romans grew plants in containers outdoors and often brought them indoors . . . In the intervening centuries, the mode of living has changed, but the need for plants remains strong.<sup>1</sup>

In the past four or five years, the practice of using live plants in commercial buildings has grown appreciably. Both the large expanses of glass found in modern offices and the increased amounts of artificial lighting installed in commercial buildings in recent years have contributed to the rising popularity of live plantings in office buildings. The aesthetic importance of natural plants has also been discovered. Plants are now considered as structural forms with important design value. The stark, vertical lines of modern buildings provide an excellent foil for the irregular forms of plant life, which can relieve the harshness of geometric architecture.

Offices and lobbies of public buildings are usually display areas. Large planters, sunken garden areas, pools, and fountains have become elements of the initial design of such places.<sup>2</sup> Luxuriant foliage plants make clients and visitors feel welcome as they enter a commercial building.

Strategically placed plants can camouflage architectural problems and can create smaller intimate sanctuaries within expansive reception areas.<sup>3</sup>

At the Carborundum Company's new headquarters building in Niagara Falls, New York, most employees work in a thicket of tropical and subtropical plants. This building boasts a bold new concept of office design called office landscaping in which the walls and partitions of the offices have been largely replaced by plants. Indoor trees and plants are placed in individual planters in conjunction with a moderate use of screens. Although the company spends about \$700 a month for maintenance costs of the office vegetation, according to President William H. Wendel, "There's no going back to walls. This is a better way to communicate."<sup>4</sup> At the new World Trade Center in New York City, the sensation of a library-like calm has been achieved mainly by the lavish use of tree-size plants, which, in addition to sound absorptive qualities, produces a forest-like scent. Woodland sounds come from the trickling water of a plant-surrounded fountain.<sup>5</sup>

Everett Conklin, president of one of the country's leading interior landscaping firms, found that initial designs of office landscaping have shown an increase in the amount of desk space per area and a high increase in office worker efficiency and a decrease in absenteeism. According to Conklin,

We're no longer rural people. Today eighty to ninety percent of our time is spent indoors. Greenery seems to mean contented workers. Based upon this inborn urge to return to nature, is it not normal to assume that the addition of green leaves to the interior environment in which we perform our daily work will also mean the addition of new-found contentment?<sup>6</sup>

Most plant experts agree the ecology movement has given indoor plants a big boost. As wooded areas yield increasingly to concrete, nature lovers are scrambling to bring more greenery inside. Indoor plants are most popular among apartment dwellers in cities where the natural vegetation is sparse. "People have to have green in the city, otherwise they'll go crazy in all this concrete and glass" asserts Don Henley, Manager of King Exotic Plants in Manhattan.<sup>4</sup> Conklin suggests that "There is the desire for an oasis of living green as an escape from the pollution of the urban atmosphere and the sterility of glass, metal, and concrete."<sup>6</sup>

In discussing survival tips for decorator plants, Sprin mentioned that natural plants have become an important element of good interior design and provide that fresh "look-alive" feeling that nothing else can.<sup>7</sup> He reports that too often the designers who specify the live plants for given areas think only of the looks of the plant and not of the environmental requirements of the plant. Few people would question the beauty of healthy, natural plants over artificial plants, but the selection, cost, care, and installation problems connected with living plants have caused many in charge of the selection process to choose artificial plants. Perhaps the use of living plants would be encouraged if detailed, concise data on the selection and maintenance of natural plants for commercial interiors were readily available.

The purpose of this study was to determine those species of plants most adaptable for use in commercial interiors, and to determine the preferred methods of maintaining the selected plants in commercial settings. Maintenance includes the factors of plant environment that affect the adaptability of plants to commercial interiors.

Today there is a wide variety of foliage plants originally from dimly-lit jungles of the world at our disposal for use with the artificial lighting of commercial buildings. The only way to make an intelligent selection from among the many available varieties of plants is to determine the environmental conditions existing in a particular commercial interior and then to select plants that will not only look attractive in that setting, but plants that are also suited to that particular set of conditions.

Many recently published book and magazine articles have been devoted to the selection and care of natural plants for residential interiors. While much of the data published about house plants are applicable to plants used in commercial settings, plants chosen for commercial use must be able to endure extremes in humidity, light, and temperature. Limited information has been published comparing varieties of plants suitable for commercial interiors with regard to considerations such as hardiness, footcandle requirements, rate of growth and life expectancy.

#### Definitions of Terms Used

##### Commercial Interiors

The interiors of buildings used for commercial or public purposes, such as banks, office buildings, shopping malls, museums, hotels, and hospitals.

##### Conditioning

A period of time during which plants have a gradual transition from the conditions where they were grown to the conditions of the

interiors they will be entering. This is usually done in a heavily shaded greenhouse with plants receiving reduced water and fertilizer for one to three months.

#### Dormant

A period of natural inactivity when the plant growth is retarded or ceases altogether.

#### Footcandles

A quantitative unit for measuring illumination: ". . . the illumination on a surface one foot square on which there is a uniformly distributed flux of one lumen."<sup>8</sup>

#### Genus

A subdivision of a plant family, which is made up of other divisions known as species. The genus name begins with a capital letter; the species names, in lower case letters.

#### Maintenance Contract

A service contract with a professional nurseryman which includes watering, cleaning, fertilizing, pruning, and spraying plants for pests, and might cover the repotting and replacement of plants when needed.

#### Natural Plants

All living plants. The terms living plants and natural plants are used interchangeably in this thesis.

#### Peatmoss

The decomposed matter of sphagnum moss or other plants from bog areas.

### Perlite and/or Vermiculite

A light, gritty material used in place of or in addition to sand in potting mixtures to lighten and aerate the soil.

### Plant Environment

The sum total of all the external factors that affect the plant, such as light, air, temperature, humidity, soil, and water.

### Potting Soil

The various mixtures of loam, peatmoss, sand, perlite, pine bark, humus, and other materials in which potted plants are grown.

### Pot-Bound

The condition reached when the potted plant is so filled with roots that little or no area remains for their development.

## CHAPTER II

### REVIEW OF LITERATURE

#### Selection of Plants

Environment is the key to the survival of plants. The environmental factors affecting plants growing in commercial interiors include light, temperature, air, humidity, soil, and water. When all of these conditions are right, the plants will thrive. This review is divided according to the factors of plant environment and maintenance that affect the selection of natural plants for commercial interiors. In the search of literature, only two specific lists of recommended plants for commercial interiors were located. A copy of the plants recommended by these sources may be found in Appendix A.

#### Maintenance of Plants

##### Light

Sufficient light is a prime factor in the successful growth of indoor plants. Without ample light, photosynthetic processes are inadequate to produce sufficient food for plant growth. Photosynthesis is the process whereby plants use light energy to convert carbon dioxide and water to carbohydrates. In nature plants are subjected to constant changes in levels of illumination, spectral content and duration of light. Light quality refers to the wavelength of light being received by a plant. Natural sun light contains all visible wavelengths utilized



by plants and is the cheapest and most efficient source of light for plants. According to a photobiology paper by Dr. H. M. Cathey, the red region of the spectrum regulates the photoperiod responses of plants while the red and blue regions activate chlorophyll for photosynthesis.<sup>9</sup> Cathey reports that whenever a plant is taken away from natural sunlight where a wide band of continuous spectral emission is present and placed into an indoor environment with dim light, it must be supplied with light in the blue, red, and far-red regions of the spectrum for successful growth.

Cathey states that we still have meager information on the light requirements of a wide range of plants despite the considerable amounts of research completed on artificial light sources. He feels that part of the problem in developing scientific studies of significant differences in plant response to artificial light sources is the greatly differing requirements that plants have for light and temperature. He suggests it is unlikely that any one standard light source will ever meet all of these different requirements and tolerances. Cathey reports that much money and effort has been devoted to develop special fluorescent lamps for plant growth. He states that in most tests these special growth lamps have been less effective than standard cool-white or warm-white fluorescent lamps. This may be due to a lower total radiation of the special lamps in the visible region than that of cool-white fluorescent lamps and inadequate amounts of far-red radiation in comparison with incandescent filament lamps.<sup>9</sup>

In his pamphlet, "Using Florida Grown Foliage Plants", Dr. Charles Conover states that when artificial light is the sole light source for

indoor plants, both incandescent and fluorescent light should be provided so the plants will receive the red and blue bands necessary for proper growth.<sup>10</sup> He suggests that the "Gro-Lux" and other specialty fluorescent lamps designed to produce the light quality necessary for plants can be used in place of incandescent and fluorescent combinations. When growing plants under all artificial lights, Crockett recommends the combination of one warm-white fluorescent lamp for each cool-white fluorescent or combining cool-white fluorescent lamps with incandescent lamps in a ratio of two watts fluorescent to one watt incandescent.<sup>3</sup> Cathey recommends mixing equal numbers of cool-white fluorescent lamps with special plant growth fluorescent lamps or mixing equal numbers of cool-white fluorescent lamps with warm-white fluorescent lamps.<sup>9</sup> In his paper "Indoor Landscaping with Live Foliage Plants", Dr. A. F. DeWerth recommends that when artificial light is the sole light source of indoor plants, the fluorescent lamp appears to be the most suitable light source.<sup>11</sup> Fluorescent lamps can be placed extremely close to the plants for they give a fairly high light intensity with minimum heat. He suggests that in some locations a mixture of incandescent and fluorescent light sources might be desirable and recommends providing incandescent light through the use of spotlights. These spotlights produce high light intensity without affecting room or plant temperature and they accent the particular planting.

Both DeWerth and Conover recommend that for plants to remain in good condition over long periods of time, the total amount of light reaching the plants should be greater than 200 footcandles for a duration of 12 to 14 hours during each 24-hour period.<sup>11, 10</sup> This light can be a

combination of natural and artificial light or all artificial light if the required intensity and duration are provided. Conover states that lower light levels of 50 footcandles or less can be used to maintain some varieties of plants for periods of up to 12 months if the duration of lighting is 12 to 15 hours during each 24-hour cycle.<sup>10</sup> The total number of footcandles of light received by the plant is a product of intensity and duration. When plants are grown in low light areas they should be lighted for longer periods to compensate for the low light intensity. Generally, the brighter the light, the shorter the period of illumination needed. DeWerth states that 30 footcandles of light for 10 hours will maintain some plants as well as 20 footcandles for 15 hours daily.<sup>11</sup>

Graf recommends that footcandle readings should be measured with a direct-reading light meter in the exact spot plants will be placed since there can be great fluctuations of available light only a few feet away from the measured spot.<sup>12</sup> He reports that a light meter reading of daylight in winter one foot distant from a north window could measure approximately 500 footcandles but only 150 footcandles three feet away from the window. Conover and Conklin both recommend the use of General Electric Light Meter, Model 213.<sup>10, 13</sup>

### Temperature

The rate at which most plant processes occur depends on temperature, but most foliage plants can be grown indoors successfully within a fairly wide range of temperature. Conover and DeWerth recommend the range of 70 - 75 degrees for day temperature and the range of 65 - 70 degrees

for night temperature as optimum for indoor plants.<sup>10, 11</sup> Plants do best at a slightly lower temperature than what is generally considered comfortable for people. A temperature of 68 degrees days and from 58 - 61 degrees at night was considered ideal according to a Grounds Maintenance article.<sup>14</sup> This article recommended that 70 degrees with air conditioning was good for indoor plants. DeWerth advises that air conditioning is beneficial to plant growth.<sup>11</sup> Uniform temperatures seem to be more favorable to plants than the hot and cold extremes of temperatures common in summer months.

The temperature of a commercial building should be checked to learn if it is kept constant day or night or if the thermostat is turned very low at nights and on weekends. Conklin reports that in most commercial buildings the interior day temperatures average 70 to 72 degrees all year round, while night temperatures are slightly less.<sup>13</sup> This almost constant daily temperature in commercial buildings does not give plants the nightly drop in temperature they would receive in their natural environment. The lowering of temperature of 5 to 10 degrees at night reduces the rate of metabolic activity in plants. During the daylight, plants manufacture their own food and at night consume it in order to grow. Without the lower night temperature, plants are less able to function properly.<sup>12</sup>

Graf reports that plants which are native to the tropics need warmth and high humidity and are usually extremely adaptable.<sup>12</sup> These plants do well in commercial interiors where there is no marked daily change in temperature, although these are not ideal conditions for the plants. Typical of these plants would be dieffenbachia, philodendron,

dracaena and bromeliads. Plants from sub-tropical areas usually prefer temperatures that are fairly cool. These plants survive longer indoors with day temperatures of 60 - 70 degrees, while the night temperature may go as low as 45 degrees. These plants would be suitable only in cooler locations within commercial interiors and include such plants as Norfolk Island Pine, fatsia, podocarpus, ivies and the jade plant. Graf suggest checking various locations within a room with a thermometer to locate the cooler positions.<sup>12</sup> Locations near the floor are usually cooler than those on top of filing cabinets. Positions close to radiators or hot air vents are often hot, dry and distressing to plants. Air blowing from air conditioning ducts directly on plants can be harmful. Plants cannot tolerate jolting variations in temperature. A rapid change of 30 to 40 degrees in either direction can kill plants.<sup>15</sup> Some plants expire when left in chilly buildings over long weekends and holidays.<sup>14</sup>

Sunlight coming through a window warms the interior space near the window. Direct sun heats any surface it falls on and can scorch plants. Delicate shade-loving foliage plants are most susceptible, but almost all indoor foliage plants need some protection from full mid-day sun during the summer months.<sup>15</sup> Since cool night temperatures outside tend to make the air near the windows cooler than interior locations, plants that require warm temperatures could become overly chilled near a window when the outside temperature is 40 degrees or less.

According to T. H. Everett, excessive temperatures produced artificially are more harmful to plants than the same temperature coming from sun heat.<sup>16</sup> Artificial heating lowers the relative humidity of the

air, and during the period of the year when artificial heating is needed, days are shorter and light intensities are lower than during the warmer season. Everett reports that excessive heat, especially if accompanied by too much shade, makes plants spindly and weak with elongated stems. A temperature too low checks plant growth and often causes a yellowing of the foliage which is followed by the dropping of the lowermost leaves on the stems.<sup>16</sup>

### Air

Air is another important element of the plant's environment. Plants need air to live, but it is not necessary that the air be changed frequently. The air must be of moderate temperature, free from noxious fumes, and relatively fresh. Damage to plants may be caused by the presence of small amounts of sulphur dioxide, hydrogen chloride, chlorine, mercury vapor and other gases.<sup>16</sup> The normal opening of doors plus the leaks around doors and windows usually provide enough air change. However, DeWerth suggests the occasional opening of doors and windows when artificial heating and cooling are used the year around.<sup>11</sup> Cold drafts blowing directly on plants should be avoided. Plants deteriorate and may eventually die if exposed long to drafts.<sup>16</sup> The plants should never be exposed to direct gusts of air from air conditioning or heating ducts. The air around plants should move gently and be reasonably humidified.

### Humidity

The relative humidity of the air is of great importance in the successful maintenance of indoor plants. The humidity of the air in

commercial buildings should be kept as high as possible, for the benefit of people as well as plants. Conover and DeWerth recommend that the relative humidity should never be below 25 percent at any time, while 35 to 45 percent relative humidity is optimal.<sup>10, 11</sup> Working directly with the building maintenance engineer can sometimes solve this problem. Proper care in watering, temperature control, and maintenance of correct light levels will do much to overcome the adverse effects of low humidity common to most building interiors, particularly during the winter months.<sup>10</sup> The most beneficial method of supplying extra moisture in the air comes from misting the plants at regular intervals with tepid water. This practice is useful in shopping malls or other large plantings but is impossible to do inside most offices. The misting of plants also washes away dust and lint that has accumulated on the leaves, and allows the plant to receive more light.

The air around plants grown together in groups is usually more moist than the air around a single specimen plant. The foliage, damp soil and clay pots all give off moisture. Another method of adding to the moisture content of the air near plants is to stand them on broad, shallow, water-tight trays, filled with gravel, pebbles, moss or sand that is always kept wet. The higher the humidity can be maintained, the more beneficial it will be for the plants.<sup>16</sup>

### Soil

DeWerth, from his experiences working with plants in the interiors of campus buildings, states that the soil used for growing plants must act as a reservoir for mineral nutrients; serve as a sponge from which

the roots draw water; and provide a source of oxygen for the roots.<sup>11</sup>  
 The soil for plants growing in commercial interiors should be loose and friable with good fertility. It should crumble readily between fingers when handled and should not become compacted, even after extended use. The following soil mixture was developed at the Texas A & M experiment station:<sup>11</sup>

$\frac{1}{2}$  bushel sphagnum peat moss,  $\frac{1}{2}$  bushel horticultural grade perlite, 2 oz. 20% superphosphate, 4 oz. 5-10-5 fertilizer.

Similar to this potting mixture is one developed at Cornell:<sup>17</sup>

$\frac{1}{2}$  damp shredded sphagnum peat moss,  $\frac{1}{2}$  perlite or vermiculite. To each two gallons of mix add 1 tablespoon 5-10-5 fertilizer, 1 tablespoon limestone (dolomite).

These two mixtures are about 50 percent lighter than mixtures containing garden loam. These soil mixtures do not shrink or compact and they drain well. Also, soil diseases are lessened with these mixtures.

Conover reports that foliage plants used in commercial interiors are easier to care for if planted in soils containing high levels of peat moss. These soils retain water and fertilizer and provide good aeration if peat moss is mixed with coarse sand or perlite. He recommended the following soil combinations:<sup>10</sup>

1. Two parts peat, one part perlite, one part coarse sand.
2. One part peat, one part vermiculite, one part coarse sand.
3. Two parts peat, one part coarse sand.

Another potting mix frequently recommended by horticulturists is:<sup>13</sup>

$\frac{1}{3}$  garden loam,  $\frac{1}{3}$  peat moss,  $\frac{1}{3}$  coarse builder's sand.  
 To each gallon of mix add: 1 tablespoon limestone, 2 teaspoons 5-10-5 fertilizer, and  $1\frac{1}{2}$  teaspoons superphosphate.

According to Graf, Eastern experiment stations recommend a basic mix of one part loam, one part peat moss and one part perlite or sand.<sup>12</sup> In



sandier regions of the South, more organic matter is added to offset the lack of clay and more fertilizer is required to sustain growth. A recommended California soil mixture is one part sand, one part peat moss and one part fine ground bark or redwood sawdust.<sup>12</sup>

Although a wide variety of soil mixtures have been recommended by horticultural experts for plants used in commercial interiors, they all have in common the quality of being friable and providing good aeration for the roots of the plant.

#### Fertilization

When foliage plants are used for commercial interiors, little fertilization is required, since it is desirable to keep plants from growing excessively. An overabundance of new growth can cause plants to soon outgrow their locations, and the new growth may be unattractive in appearance if grown under less than ideal light conditions. For commercial installations Conover suggests that applications of fertilizers more often than once a month is unnecessary, and usually four applications a year will be sufficient unless considerable new growth is desired.<sup>10</sup>

Plants grown under artificial lights require only about 30 percent as much fertilizer as those grown in natural light. DeWerth recommends a light feeding of liquid fertilizer applied every six months when growing plants solely under artificial lights.<sup>11</sup> Conover felt that slow-release fertilizers, such as Osmocote, were quite satisfactory, or liquid feeding could be used, but if the light intensity was very low, the feeding program should be cut accordingly.<sup>18</sup> Everett states that fertilizers help only when the plant is in condition to use additional

nutrients to good advantage, which generally means during the growing season rather than when the plant is dormant, and at times when its pot is filled with healthy roots.<sup>16</sup> Graf recommends that under the limited light conditions usually found indoors, a slow-growing plant should receive just enough fertilizer to keep it from starving, perhaps only once or twice a year.<sup>12</sup> Each expert cautioned against the over-feeding of plants and advised using fertilizers at or weaker than the recommended strength of dilution.

### Watering

In indoor landscaping, soil fertility is closely related to soil moisture, and moderation should be used in both. Plants should be watered enough so that the soil never becomes completely dry between waterings, and enough water should be applied each watering to thoroughly wet the entire soil ball. Pots should not be allowed to stand in water for any length of time. Plants growing in clay pots require more moisture than those planted directly in planters because of greater evaporation through the porous clay. Graf reports that plants need more water when actively growing than when they are semi-dormant.<sup>12</sup> However, although plants may use less water for growth while they are semi-dormant, the dryer winter atmosphere may actually increase water losses from their leaves and increase their demand for water.<sup>15</sup> The larger the size of the plant and its pot, the less often it will need to be watered. Those plants growing in direct sunlight will require more frequent watering than those plants in positions away from windows.<sup>12</sup>

A deficiency of water for extended periods will cause the plants to wilt and slow down the growth processes. Severe moisture deficiency in the soil can cause death to some plant cells and later browning and drying of leaf margins. When moisture in the soil is excessive, the water fills the air spaces and chokes off the oxygen required for the roots.<sup>11</sup> How often the plant needs water depends on its variety and growth, as well as on temperature, light and humidity.<sup>15</sup> Conover recommends the use of automatic water systems in large plantings.<sup>10</sup> However, this is expensive to install and could result in the under or over watering of some varieties of plants.

Tepid water, above 60 degrees should be used for watering plants. Cold water can shock many plants and cause them to wilt. Heavily chlorinated water should stand in uncovered containers for 24 hours before use. Water from a water softener should be avoided unless it is equipped with a de-ionizing unit to remove the sodium. Neither chlorine nor sodium is beneficial to plants.<sup>3</sup> Fluorides can also be harmful to some foliage plants, such as dracaena, cordyline and chlorophytum, and fluoridated water should be avoided if possible.<sup>15</sup>

Probably more problems connected with watering can be traced to improper drainage than to any other source. Plants can be grown in almost any container as long as excess water is not allowed to collect in it. The bottom of the pot should contain several drainage holes, and the plant should be grown in its own individual pot with drainage holes and then placed into a decorative container or planter, rather than being planted directly into a container without drainage holes. Extreme care must be taken in watering any plant growing in a container without drainage holes.

### Pests

Plants grown in commercial interiors should be inspected often for signs of insects, disease, over or under watering, and to see if the plant is fitted to its environment. Pests caught early are more easily eradicated by washing or insecticides than those allowed to establish a large population build-up on the plant. Graf recommends that when plants are few in number, it is good practice to wipe the foliage often with a damp cloth to remove possible pests.<sup>12</sup> He also advises spot-spraying for specific problems as soon as they arise. Heavy misting or forceful syringing of each plant weekly with water can discourage general pest infestations. Washing with water alone is not satisfactory if pests are well entrenched in the leaf axils and dense foliage of the plant.<sup>12</sup>

Graf recommends the following insecticides for the listed pests:

Scale, aphids, mealybugs. Heavy infestations can be eradicated with a total immersion of the plant for 30 seconds in a warm soapy solution containing one teaspoon of nicotine sulphate to each gallon of water and rinsed several hours later with water. Malathion is also recommended for these pests plus white flies, red spider, thrips and ants.<sup>12</sup>

Malathion is not considered safe for delicate ferns. It should be used according to the manufacturer's recommended strength of solution, and extreme care must be used when handling this or any other insecticide. Red spider mite is best controlled by Kelthane.<sup>12, 16, 19</sup>

Graf states that injury and disfiguration by insects, caused by their feeding on parts of the plants and its juices, is one of the problems encountered in plant maintenance. He suggests that with periodic preventative spraying with combinations of a contact poison such as malathion, a stomatic poison such as Rotenone or Seven, and a miticide such as Kelthane every three to four weeks, insect invasions can be avoided altogether.

### Plant Acclimation

Plant acclimation is the conditioning of the plant so that it will live longer when it is moved from its original growing location and placed into interior locations in offices or homes.<sup>18</sup> According to Conklin, "All interior plants should last at least twice as long as they do now -- it is time for growers to refine their operations. Many poor results in indoor plantings are due to plants improperly conditioned at the time of installation."<sup>6</sup>

Most of the foliage plants and trees used for commercial interiors on the East Coast are grown in Florida. The goal of most wholesale growers is to produce a plant of a given size in the shortest possible time to maximize profits. These plants are grown in the full outdoor sunlight of up to 10,000 footcandles and are then frequently moved directly to offices and homes where the amount of footcandles received might not exceed 50 to 75. The plant cannot stand such a violent change in light intensity and slowly dies.<sup>18</sup>

In their original growing locations, the plants might have had rainfall and supplemental irrigation of 150 inches of water per year and are then placed into an interior environment where they are watered once every week or ten days. The plants are grown originally in a relative humidity of 80 to 90 percent and are then placed directly into interior locations with perhaps 15 to 20 percent relative humidity. These Florida grown plants have been given liquid fertilizer every few days, whereas in their new locations they are fed no more than two to four times a year. All these practices lead to poor results. Leaves turn yellow and drop, while foliage die-back is common.<sup>6</sup>

The solution to these problems is the proper conditioning or acclimating of the plants before they enter commercial interiors. Conover recommends the following steps for proper acclimation of Florida grown foliage plants:

1. The Florida grower must grow the plant under reduced light. For most species this would entail a 60 to 80 percent light reduction. The midday light intensity should range from 2,000 to 3,000 footcandles, rather than levels up to 10,000 footcandles normally encountered. This shading of the plants will be more costly, but is considered vital for customer satisfaction.

2. The northern grower must acclimate the plant still further by exposure to low light intensities for one or two months or more in the northern greenhouse. The plant could also go from the Florida grower into a well insulated building without windows, such as a warehouse. Artificial light should be supplied in a scientific manner so that it will gradually approximate the new growing conditions.

3. Feeding is a very vital part of acclimation. The plant fed heavily by the Florida grower, then suddenly moved to dark interior locations will suffer a drastic reduction in its growth rate. The plant must be fed far less if it is to survive the drastic change from outdoor light to the 50 to 100 footcandles available in many commercial interiors. Therefore, the Florida grower must minimize feeding all during the growing process. The northern grower must also sharply reduce the amount of water the plant receives. He must leach the plant heavily and repeatedly during acclimation. Leaching may be accomplished by flooding the pots of the plants with water, either by hosing or by immersion, until all

the old fertilizer is washed out and the water draining out of the soil and pot looks clean.<sup>18</sup>

The whole process of growing and acclimating foliage plants must be geared to delivering a plant to the home or commercial building which is so slowed down by reduced light, water and fertilizer that it can stand its new, very low-light environment. It should then keep growing for months or years in interior locations.

#### Maintenance Services

Among the large firms that specialize in commercial contract plantings, maintenance is an extremely important part of the contract that follows the planning, acclimatizing and actual planting of the plants. Everette Conklin's hard-cover catalog recommends that

All installations of live indoor trees and plants should be maintained by professional horticulturists. Service contracts are now written which relieve the customer of all responsibility. The interior planting specialist professionally feeds, waters, cleans, prunes and sprays for insect and disease control at regular intervals. He guarantees to keep all plants in good condition and to quickly replace any that are not healthy.<sup>13</sup>

The maintenance contract is usually made for a year's minimum and may cover three, four, five or more years. For smaller jobs, some firms will train the company's own personnel to take care of the plants.

"Small installations have the problem of everyone watering and the consequent drowning of plants which are more easily killed by kindness than neglect."<sup>5</sup> The Greenhouse in New York City solved this problem by urging the appointment of only one person, preferably someone fortified with a short horticulture course. One horticulturist suggested that plants be labeled as to origin and carry information regarding the soil,

light, humidity and water they had previously received. Other problems peculiar to commercial installations are the theft of small plants and the hazards of cigarette butts and alcohol being dumped into the potted plants. Alcohol is particularly deadly and can kill a plant overnight.<sup>5</sup>

A number of companies, particularly those in large cities, include plant rentals as a part of their total operation. These rentals are for photography, television and motion picture studios, as well as for social and business activities. Conklin's catalog points out the advantage to the customer of plant rentals is the absence of capital expenditure.<sup>13</sup>



### CHAPTER III

#### PROCEDURE

This study was designed to gain information regarding the views of practicing plant professionals on their individual methods of selection and care of plants suitable for use in commercial interiors. Data were obtained by interviews with nurserymen, landscape architects and horticulturists practicing in the central Piedmont section of North Carolina and by questionnaires mailed to selected plant experts located outside the geographic limits of the study.

#### Selection of Plant Authorities

In order to compile a complete list of the plant professionals in the geographic area of the study, the following sources were used: (1) the classified advertisement section of the Greensboro, North Carolina, telephone directory; (2) university personnel in the field; (3) and word of mouth. All individuals and business firms on the original list were contacted by mail or telephone to determine both their previous experience in interior landscaping, and their willingness to participate in the study. The final list was limited only to those persons with actual experience in the field of interior landscaping. Although the final list of plant authorities selected for inclusion in this study was limited to twelve individuals, all twelve plant authorities agreed to participate in the study. To gain additional information from plant

authorities located outside the geographic limits of the study, a questionnaire was mailed to eleven plant professionals suggested by the literature or by referrals.

#### Development of Interview Schedule and Questionnaire

An interview schedule was developed from suggested topics in the review of literature. The interview schedule was designed in two parts so that interviews could be concluded within an hour with business firms but could be expanded in interviews with horticultural experts who might have additional time available to explain specific plant environmental requirements. A sample of this two-part interview schedule may be found in Appendix B and Appendix C. Appendix D lists the names and addresses of the twelve plant authorities who agreed to be personally interviewed for this study.

The researcher sent a letter of introduction explaining the scope of the study to each of the eleven persons or business firms on the list of plant authorities located outside the geographic limits of the study. A sample of this cover letter may be found in Appendix E. The first part of the interview schedule, Appendix B, was treated as a questionnaire and mailed with the cover letter. The names and addresses of the seven plant authorities who completed and returned the mailed questionnaire may be found in Appendix F.

#### Data Collection

Brief notes were made during the personal interviews and complete data were recorded immediately following each interview. Data from

the interviews and from the questionnaires were analyzed descriptively. When possible, the data were presented in table form. Findings are compiled into a concise summary of fifty-two recommended plants and their culture that were found best suited for commercial interiors by the nineteen plant authorities participating in the study. Additional information given the researcher during the interviews was incorporated into the findings whenever appropriate.

## CHAPTER IV

## FINDINGS AND DISCUSSION

The data for this study were collected from personal interviews with twelve individuals in the interior landscaping field in central Piedmont North Carolina and from mailed questionnaires completed and returned from seven plant experts located outside the geographic limits of the study. The interviews were conducted between February 1, 1975, and October 14, 1975. The researcher is indebted to those plant experts whose suggestions and information made this thesis possible.

The final list of plant authorities selected to be contacted for an interview for this study was very limited, but fortunately each person on the list agreed to participate in the survey. Each interview lasted approximately one hour, although three interviews extended over two hours in length. Each person included in this study did not respond to every question in the interview schedule since some individuals did not have specific information or experience on certain questions asked by the researcher. Therefore, some of the topics discussed in this chapter will have fewer responses than others.

Selection of Plants

The list of plants chosen by those interviewed and the list of plants chosen by the mailed questionnaires were quite similar. Members of the dracaena, ficus and palm family were rated highly by both groups.

These same plants appeared on recommended plant lists located through the search of literature (see Appendix A). The frequency of selection of all plants recommended for use in commercial interiors during personal interviews was carefully recorded and tabulated (see Table I). The twelve plant authorities recommended a total of forty-eight species of plants suitable for commercial use. *Ficus benjamina* 'Exotica' and *Brassaia actinophylla* led the list in order of frequency of selection and were chosen by seven of the twelve plant authorities, while *Dracaena marginata* and *Dracaena deremensis* 'Warneckeii' were selected six times. Also popular were *Chrysalidocarpus lutescens*, *Dieffenbachia amoena*, *Dracaena fragrans massangeana*, *Howeia forsteriana*, and *Nephrolepis exaltata bostoniensis*.

TABLE I

PLANTS RECOMMENDED FOR COMMERCIAL INTERIORS BY  
THE TWELVE PLANT AUTHORITIES INTERVIEWED

	<u>Botanical Name</u>	<u>Common Name</u>	<u>Frequency Of Selection</u>
1	<i>Ficus benjamina</i> 'Exotica'	Java fig	7
2	<i>Brassaia actinophylla</i>	schefflera	7
3	<i>Dracaena marginata</i>	dragon tree	6
4	<i>Dracaena deremensis</i> 'Warneckeii'	striped dracaena	6
5	<i>Chrysalidocarpus lutescens</i>	areca palm	3
6	<i>Dieffenbachia amoena</i>	giant dumbcane	3
7	<i>Dracaena fragrans massangeana</i>	corn plant	3
8	<i>Howeia forsteriana</i>	kentia palm	3
9	<i>Nephrolepis exaltata</i> <i>bostoniensis</i>	Boston fern	3
10	<i>Araucaria excelsa</i>	Norfolk Island pine	2
11	<i>Cissus rhombifolia</i>	grape ivy	2
12	<i>Dizygotheca elegantissima</i>	false aralia	2
13	<i>Dracaena deremensis</i> 'Janet Craig'	green dracaena	2

TABLE I  
(CONTINUED)

	Botanical Name	Common Name	Frequency Of Selection
14	<i>Ficus elastica</i> 'Decora'	rubber plant	2
15	<i>Ficus lyrata</i>	fiddleleaf fig	2
16	<i>Philodendron selloum</i>	philodendron	2
17	<i>Pleomele reflexa</i>	pleomele	2
18	<i>Sansevieria trifasciata</i> <i>laurentii</i>	snake plant	2
19	<i>Scindapsus aureus</i>	pothos	2
20	<i>Spathiphyllum</i> 'Mauna Loa'	spathiphyllum	2
21	<i>Aglaonema commutatum</i> 'Pseudo- <i>bracteatum</i> '	'White Rajah'	1
22	<i>Aglaonema modestum</i>	Chinese evergreen	1
23	<i>Asparagus densiflorus</i> ' <i>Sprengeri</i> '	Sprengeri fern	1
24	<i>Aspidistra elatior</i>	cast iron plant	1
25	<i>Asplenium nidus</i>	birdsnest fern	1
26	<i>Chamaedorea elegans</i> 'bella'	neanthe bella palm	1
27	<i>Chamaedorea erumpens</i>	bamboo palm	1
28	<i>Chamaedorea seifrizii</i>	reed palm	1
29	<i>Chlorophytum comosum</i> 'Vittatum'	spider plant	1
30	<i>Citrus mitis</i>	calamondin orange	1
31	<i>Dieffenbachia</i> 'Exotica'	exotica	1
32	<i>Dieffenbachia picta</i>	spotted dumbcane	1
33	<i>Dracaena godseffiana</i>	gold-dust dracaena	1
34	<i>Ficus retusa nitida</i>	Indian laurel	1
35	<i>Monstera deliciosa</i>	Mexican bread fruit	1
36	<i>Pandanus veitchii</i>	variegated screw pine	1
37	<i>Peperomia caperata</i>	emerald ripple	1
38	<i>Philodendron</i> 'Burgundy'	burgundy	1
39	<i>Philodendron</i> 'Emerald Queen'	emerald queen	1
40	<i>Philodendron hastatum</i>	elephant's ear	1
41	<i>Philodendron cordatum</i>	heart leaf philodendron	1
42	<i>Phoenix roebelenii</i>	pigmy date palm	1
43	<i>Plectranthus australis</i>	Swedish ivy	1
44	<i>Podocarpus macrophyllus</i> 'Maki'	Southern yew	1
45	<i>Rhapis excelsa</i>	lady palm	1
46	<i>Veitchia merrillii</i>	Adonidia palm	1
47	<i>Yucca elephantipes</i>	Joshua tree	1
48	<i>Zebrina pendula</i>	silvery wandering jew	1

Likewise, the frequency with which plants were recommended on the returned questionnaires was recorded and tabulated (see Table II). The seven plant authorities selected a total of twenty-eight species of plants suitable for use in commercial interiors. *Dracaena fragrans* *massangeana* and *Dracaena marginata* were chosen by all seven of the plant authorities. *Ficus elastica* 'Decora' was selected six times, while *Chamaedorea erumpens* and *Ficus benjamina* 'Exotica' were selected five times by the seven plant authorities who returned a mailed questionnaire. In addition, popular species were: *Brassaia actinophylla*, *Chrysalidocarpus lutescens*, *Dracaena deremensis* 'Warneckei', *Spathiphyllum* 'Mauna Loa', and *Spathiphyllum* 'Clevelandii'.

TABLE II

PLANTS RECOMMENDED FOR COMMERCIAL INTERIORS BY THE SEVEN PLANT  
AUTHORITIES WHO RETURNED A MAILED QUESTIONNAIRE

<u>Botanical Name</u>	<u>Common Name</u>	<u>Frequency Of Selection</u>
1 <i>Dracaena fragrans massangeana</i>	corn plant	7
2 <i>Dracaena marginata</i>	dragon tree (Madagascar)	7
3 <i>Ficus elastica</i> 'Decora'	rubber plant	6
4 <i>Chamaedorea erumpens</i>	bamboo palm	5
5 <i>Ficus benjamina</i> 'Exotica'	Java fig	5
6 <i>Brassaia actinophylla</i>	schefflera	4
7 <i>Chrysalidocarpus lutescens</i>	areca palm	4
8 <i>Dracaena deremensis</i> 'Warneckei'	striped dracaena	4
9 <i>Spathiphyllum</i> 'Mauna Loa'	spathiphyllum or white anthurium	4
10 <i>Spathiphyllum</i> 'Clevelandii'	white flag	4
11 <i>Aglaonema</i> 'Pseudo-bracteatum'	white rajah	3
12 <i>Aglaonema modestum</i>	Chinese evergreen	3
13 <i>Chamaedorea seifrizii</i>	reed palm	3
14 <i>Ficus retusa nitida</i>	Indian laurel	3
15 <i>Philodendron selloum</i>	philodendron	3
16 <i>Cissus rhombifolia</i>	grape ivy	2

TABLE II  
(CONTINUED)

	<u>Botanical Name</u>	<u>Common Name</u>	<u>Frequency Of Selection</u>
17	<i>Ficus lyrata</i>	fiddleleaf fig	2
18	<i>Howeia forsteriana</i>	kentia palm	2
19	<i>Phoenix roebelenii</i>	pigmy date palm	2
20	<i>Scindapsus aureus</i>	pothos	2
21	<i>Asparagus densiflorus</i> 'Sprengeri'	Sprengeri fern	1
22	<i>Chamaedorea elegans</i>	parlor palm	1
23	<i>Chamaedorea elegans</i> 'bella'	neanthe bella palm	1
24	<i>Dracaena draco</i>	dragon tree	1
25	<i>Dracaena</i> 'Janet Craig'	Janet Craig	1
26	<i>Pleomele reflexa</i>	pleomele	1
27	<i>Rhapis excelsa</i>	lady palm	1
28	<i>Zebrina pendula</i>	silvery wandering jew	1

Plant recommendations made by the twelve authorities interviewed and the seven who returned questionnaires were combined (see Table III). Eleven plants were selected by at least five of the nineteen authorities. Most popular was *Dracaena marginata*, which was chosen by thirteen of the nineteen participants of the study. *Ficus benjamina* 'Exotica' was chosen twelve times, while *Brassaia actinophylla* was selected by eleven of the authorities. Also popular were *Dracaena deremensis* 'Warneckei', and *Dracaena fragrans massangeana*, both recommended ten times.



TABLE III

PLANTS RECOMMENDED FOR COMMERCIAL INTERIORS BY THE NINETEEN PARTICIPANTS OF THE STUDY, WITH A MINIMUM SELECTION OF FIVE

	<u>Botanical Name</u>	<u>Common Name</u>	<u>Frequency Of Selection</u>
1	<i>Dracaena marginata</i>	Madagascar dragon tree	13
2	<i>Ficus benjamina</i> 'Exotica'	Java fig	12
3	<i>Brassaia actinophylla</i>	schefflera	11
4	<i>Dracaena deremensis</i> 'Warneckei'	striped dracaena	10
5	<i>Dracaena fragrans</i> massangeana	corn plant	10
6	<i>Ficus elastica</i> 'Decora'	rubber plant	8
7	<i>Chrysalidocarpus lutescens</i>	areca palm	7
8	<i>Spathiphyllum</i> 'Clevelandii'	white flag	6
	<i>Spathiphyllum</i> 'Mauna Loa'	white anthurium	6
9	<i>Chamaedorea erumpens</i>	bamboo palm	5
10	<i>Howeia forsteriana</i>	kentia palm	5
11	<i>Philodendron selloum</i>	philodendron	5

#### Maintenance of Plants

The first sheet of the interview schedule, Appendix B, was used as the basis for the organization of this chapter, and the arrangement of topics generally follows that of the interview schedule. The final section of findings consists of a summary of the fifty-two plants and their culture chosen by the nineteen participants of the study for use in commercial interiors.

#### Light

While the plant authorities contacted for this survey reported considering a variety of elements about a commercial site prior to starting the actual planning of an interior landscaping job, they agreed that light was the prime consideration. Each plant expert mentioned

checking the available light from both natural and artificial sources. Four persons mentioned checking both light intensity and light duration and explained they used a direct reading light meter to check the available footcandles in the exact location plants would be placed. However, one landscaper stated that from years of experience, he could usually "eye-ball it" and rarely needed to check the light with a light meter.<sup>20</sup>

On October 14, 1975, the researcher met with LeRoy Brown, head of interior landscaping for the Rouse Company which owns and operates twenty-seven shopping malls around the country, while he supervised the replanting of the interior landscaping at the Charlottetown Mall, Charlotte, North Carolina. Mr. Brown's comments about light were quite similar to many of those heard by the researcher during earlier interviews with plant authorities. "There's always a plant that will grow in almost any light situation," explained Brown, "and I prefer not to have to use artificial lights with the plants."<sup>20</sup>

An interior landscaper in the Greensboro, North Carolina area reported that she never provided any special lighting for the plants she installed in commercial interiors. She preferred to select plants that could survive at low lighting levels, such as dracaenas, aglaonemas, spathphyllum, and palms. This seemed to be the general approach of many of the experts surveyed. They reported that better results were obtained by selecting plants that could tolerate light as low as 50 to 100 footcandles for long periods of up to a year. These plants were then replaced as needed and the cost figured into the regular maintenance budget. This was found to be cheaper in the long run than the installation

of expensive additional artificial lighting that might not add appreciably to the total amount of footcandles reaching the plants.

An Atlanta nurseryman reported that he often recommended additional lighting to his customers, but that the lighting was seldom added, either for decorative or budget reasons. He disclosed that plants received little benefit if they were located over five feet from the source of artificial light, and that there was a negligible effect from lighting under the plants. One landscape architect stated that in his experiences with interior landscaping, special additional lighting had been possible only in very limited situations, as it usually interfered with marketing plans or his customer's budget. LaMarr Bunn, a Raleigh, North Carolina landscape architect whose firm has done extensive interior landscaping layouts, said, "Most artificial light sources would have to be located too far from the plants to be of much benefit. Therefore, I rarely recommend any special lighting to my clients."<sup>21</sup> One of the largest interior landscaping firms in the New York City area reported that their firm suggested additional lighting to their customers whenever the footcandle level was below 100.

Several types of bulbs for interior landscaping were suggested by the survey group. Both "Grow-Lux" and "Duro-Test" bulbs were recommended, with the wattage depending on the area to be covered, the distance from the plants, and the type of plants used. However, according to Brown, regular fluorescent and incandescent bulbs were as beneficial to plants as the special plant lights, and the cost of the regular bulbs was perhaps half that of the specialty bulbs.<sup>20</sup> Three individuals reported good results using both cool-white and warm-white fluorescent bulbs,

and two of these persons urged that timers be installed with the fluorescent bulbs to insure their being used daily for 12 to 14 hours. They felt this duration of light was necessary for good plant maintenance. One horticulturist recommended using regular incandescent spotlights for accent lighting on interior plant specimens.

Another aspect of lighting mentioned by the plant authorities was the checking of the orientation or exposure of the area of the commercial building where the interior landscaping would be located. One nurseryman felt this was extremely important, since a window with a western orientation would receive light of much greater intensity than a window facing north or east.

#### Watering

According to Bunn, lighting and provision for water were the two most important considerations when planning a commercial interior landscaping job. Bunn reported that he checked blueprints to locate water outlets in planned construction and he insisted on their installation if adequate outlets had not been provided in the needed locations. He said the usual method of watering plants in large commercial interiors such as shopping malls was by hose, with the building's regular janitorial staff handling this as one of their usual chores.<sup>21</sup>

In some of his firm's larger interior landscaping jobs, Bunn said that an installed irrigation system had been used. However, he did not recommend this system as he felt the high initial expense was not warranted by its utility. He pointed out that with a built-in system some plants would receive more water than their requirements, while other plants would not receive as much water as they needed for healthy growth.<sup>21</sup>

Brown concurred in this opinion and said his firm had taken out some automatic irrigation systems because they had proved unsatisfactory when a variety of plants were used in one grouping.<sup>20</sup> Bunn related that an installed misting system was also quite expensive and his firm had encountered some problems with this type of watering system. Bunn cited cases where the copper tubing installed up along the stems of larger plants had oxidized and killed some varieties of plants, such as scheffleras. "Misting indoor plants is a waste of time," said Bunn.<sup>21</sup> He stated it made better sense, instead of misting the plants, to completely replant the installation periodically as needed to keep it attractive in appearance. However, Harold Ritter, State Superintendent of Grounds, Raleigh, North Carolina, felt that misting the plants by hose was good practice and he tried to have this done daily when the State Legislature Building was lightly occupied.<sup>22</sup> Two other individuals recommended misting plants by hose, whenever this was feasible in large commercial buildings. This, of course, could not be done with single specimen plants in small offices and stores and in locations where the flooring material would be damaged by excessive water.

Kent Kimmins, a horticulturist on the staff of North Carolina State University, suggest the "double-potting" of all indoor plants as a good technique to avoid over-watering of the plants. This potting method supplies water to the plant through the sides of the clay pot, and the soil in the inner pot dries slowly. Double-potting is particularly helpful when growing plants in very dim light, where the normal amounts of water might cause weak, spindling growth or with plants requiring a low level of soil moisture. Less moisture is required with this method,

and watering can be less frequent than with regular potting methods. For double-potting, the plant is first potted into a porous clay container which is placed inside a larger, water-tight container. The space between the two containers is filled with sphagnum moss. After the initial watering of the plant, water is supplied only to the moss between the containers. The moss holds the water, and the plant draws it in through the porous clay pot sides as needed. This way the plant is never over-watered. A coarse layer of gravel for drainage should be placed in the bottom of the pots. When a large permanent planter is used, plants can also be double-potted and moss placed around the top to give them the appearance of actually being planted there. Kimmins suggested insertion of a pipe that reached to the bottom of the planter whenever working with a large permanent planter. Occasionally a suction device can be used with the pipe to remove any excess water that has collected in the bottom of the planter.<sup>23</sup>

#### Drainage

Closely related to proper watering of plants in commercial interiors is the correct drainage system for these plants. Bunn said he advised all his clients to have built-in drainage in all large permanent planters, with copper tubing inserted to tie it into the storm drainage system.<sup>21</sup> When using individual containers, the experts reported that their preferred drainage method was to place the plant in its own individual container with drainage holes into a larger water-tight container. Usually gravel or another material was used at the bottom of the container to raise the inner pot two or three inches to ensure that the

roots would not stand in water. Then material such as sphagnum moss, ground pine bark, pine nuggets, or small round pebbles were used on top of the soil to make the plant appear to be "planted" in the outer container, to retain moisture, and to add to the neat appearance of the single plant.

#### Weight of Built-In Planters

Bunn reported that the weight of large planters was a consideration to be checked during the planning stage of a commercial interior landscaping job.<sup>21</sup> He checked the structural strength of the area to be sure it could support the heavy weight of a large planter filled with potting soil, plants, and ground covers.

#### Humidity

Most of the participants in the survey expressed concern about the levels of humidity present in the commercial buildings where they had interior landscaping jobs. However, in general, those persons planning and installing live plants in commercial interiors had little if any control over the humidity levels to be maintained in the vicinity of their plant installations. Therefore, they found the most practical solution to be the selection of plant material that could tolerate the fairly low relative humidity usually found in commercial interiors.

No plant expert contacted recommended the installation of any special equipment to increase the humidity near plant groupings. However, the State Legislature Building in Raleigh features Kentia palms growing in planters surrounded by pools and fountains, and Ritter felt this water was beneficial in that it raised the level of humidity near the plants.<sup>22</sup>

### Temperature

Five of the nineteen participants in this survey reported they checked the temperature levels in commercial buildings when planning their jobs. They tried to verify the average daily temperature and if the thermostat was kept at lower levels during weekends and holidays. Brown said this has become more of a problem since the energy crisis and higher electric rates of recent years.<sup>20</sup> His company's malls try to maintain an average temperature of 68 degrees. However, a mall filled with people is much warmer than an empty one, and some problems had occurred when the mall temperature dropped too low during early morning hours when empty. Brown said the plants weren't adversely affected unless the temperature dropped near 50 degrees.<sup>20</sup> All five experts cautioned against placing plants directly in the path of gusts of air from heating or air conditioning ducts. Inspecting commercial buildings for locations of ducts and for drafts, particularly in lobbies or reception areas of buildings was done by each of these plant authorities.

### Space

Eleven of the nineteen persons in the survey reported the amount of space for the plants was an important consideration during the planning stage of a job. The available floor space greatly influenced the choice of plant species selected. Closely related to space requirements was the use of the area. For example, a large reception area or a restaurant setting might require vastly different sizes and shapes of plants from an executive's office or a doctor's waiting room. The amount of traffic in the area was also a consideration. Some plants are too fragile to be



used in locations with heavy traffic. Interior landscaper Mike Moore reported that his firm checked the overall space for plants, including the desirability of future growth. He reported that he "ascertains the total effect desired by the client, e.g. visual barrier, texture effects, dramatic or decorative effect, etc."<sup>24</sup>

Ceiling height of the commercial building was mentioned as a factor to be considered by three of the plant experts surveyed. They felt the height of the area frequently dictated the size and variety of plants they selected, as larger plants would probably be used in buildings with very high ceilings. In some shopping malls and office lobbies, huge scheffleras and ficus trees from 20 to 35 feet tall had been installed by several of the firms contacted. One nurseryman reported checking the ceiling structure to locate spots to install hooks for hanging baskets.

#### Original Sources of Plants

All of the interior landscaping firms contacted reported that Florida was the original source of all their tropical foliage plants and the larger firms bought directly from growers in the Homestead, Miami, and Apopka, Florida areas. None reported growing their own stock, although one firm did some rootings from stock purchased in Florida. Two of the firms also bought a few varieties of small plants from California, but cited higher shipping costs from California to the East Coast as a factor to be considered in the purchase. Seven individuals reported that small plants were bought from local growers. These included hanging baskets, ferns, ivies and plants in one to four inch pots.

Moore's firm had found that it was not economically feasible to grow larger foliage specimens in heated greenhouses.<sup>24</sup> Two firms in the Greensboro area used their greenhouses only as a holding facility for future jobs and did not attempt to grow their own plants because of the high costs involved in heating the greenhouses over the winter months. This cost has become increasingly high as fuel prices continue to climb.

Three of the plant authorities described personal plant buying trips to South Florida. Their method of operation was to visit the grower and select plants they wished to purchase. These plants were then tagged and either held for future delivery, or loaded onto their own trucks at the time of purchase. Growers guarantee plants to be healthy at the time of loading and unless prior disease can be proved, buyers must then assume full responsibility for their transportation and care. For this reason they tended to make repeat purchases from the growers with whom they had experienced good results. The buyer must add handling, insurance and shipping costs to the wholesale price he pays for the plants.

#### Root-Pruning

LeRoy Brown's firm maintains their own tree farm in Florida, where they grow and hold plants until needed in one of their mall installations. During the interview at the Charlottetown Mall, Brown showed the researcher an eighteen-foot ficus nitida tree that had been root-pruned several times before shipment to the mall. He explained this is done on all their large trees and plants over a minimum time period of six months, with one or two years preferable.<sup>20</sup> While the roots are pruned, the tree

remains in the ground and continues growing, but when the tree is moved to an interior location, the tree roots receive no drastic shock since they have been periodically pruned. Therefore, in new locations their trees suffer very little leaf defoliation, as commonly occurs with large plants that have not been root-pruned.

### Potting Soil

Great diversity of opinion was expressed by those surveyed on the type of potting soil used for their plants. Each firm appeared to have their own special soil mixture, but similarities existed between a number of the mixtures. Bunn declined to share his soil formula, stating it was a company trade secret. Bunn did caution that the temperature of the soil mixture was extremely important, and could be measured with an oven thermometer. He said highly organic matter can become heated beyond recommended levels, and "burn" the plant. He cited an example of just such a situation in a large shopping mall where most of the plants died from the overheated soil mixture and had to be replaced.<sup>21</sup>

Moore recommended a soil formula of 30 percent loam, 20 percent sand, and 50 percent pine bark for tropical plants and a mixture of one-third clay, one-third perlite and one-third peat moss for other greenhouse plants.<sup>24</sup> Williams used a potting mixture consisting of one-half sand, one-fourth peat moss and one-fourth ground pine bark for tropicals such as dracaenas and palms.<sup>25</sup> To all soil mixtures he added some perlite to lighten and aerate the soil and to provide good drainage. For plants in the ficus family Williams changed the basic soil mixture somewhat to one-third sand, one-third peat moss and one-third ground

pine bark. He also used this mixture with grape ivy and kangaroo ivy. This same soil mixture is used by Lambeth, with the addition of small amounts of lime and fertilizer.<sup>26</sup> For the plants in the State Legislature Building, Ritter used a basic soil mix of one-half finely ground pine bark, one-fourth sand and one-fourth peat moss. He adds a slow release fertilizer at the time of potting the plants.<sup>22</sup> While the materials are the same as those used by Williams and Lambeth, the proportions are slightly different.

Wolson uses a packaged plant soil, "Gro-Mix" and adds to this her own percentages of sand and peat moss, depending on the plant variety. She also provides fertilizer, as the packaged soil does not contain sufficient nutrients.<sup>27</sup> Conklin recommended a potting soil of one-third peat moss, one-third "Gro-Mix" and one-third perlite.<sup>28</sup> Kluttz recommended a mixture consisting of 20 percent sand, 20 percent peat moss, 20 percent vermiculite, 20 percent ground pine bark or manure and 20 percent natural soil.<sup>29</sup> One interior landscaping firm in New York City used a good loam with generous portions of perlite and peat moss and small amounts of sand, while another landscaping firm in New York City recommended a mix of one-third top soil, one-third peat moss and vermiculite and one-third sand for plants in commercial settings. Kimmins used a soil mixture at Texas A & M containing one-half sphagnum peat moss and one-half horticultural grade perlite. To each bushel of mix he added two ounces of 20 percent superphosphate and four ounces of 5-10-5 fertilizer.<sup>23</sup> Although these soil formulas vary somewhat, each participant in the survey reported good results with his particular potting soil mixture. This suggests that a variety of materials may be used successfully for plants in commercial interiors.

### Cooperation With Architects and Designers

The landscape architects contacted reported working closely with architects and building owners in the initial planning of their interior landscaping jobs. The interior landscaping firms also frequently worked with the architect or owner in drawing up a plan, although two nurserymen reported doing most of their own planning for small offices. When doing shows for the Southern Furniture Market, one Greensboro interior landscaper stated that she simply supplied plants as requested by interior designers. O'Hara worked from architect's floor plans. However, she stated, "We have found that the majority of the interior designers have no idea what will or will not survive in a given light and interior environment."<sup>30</sup>

### Maintenance Services

The continuing maintenance care of the plants they supplied was a major phase of their business for all the nurserymen surveyed, with one exception. The owner of this firm felt her operation was too small to provide a maintenance service, but thought this might be a future direction for her firm. She specialized in small offices and residential jobs and included one or two free follow-up calls in her original installation fee. She also made an effort to train one person about plant care at each business where she did interior landscaping work. This plant authority recommended that only one person be designated at each firm to water and groom the plants. When several persons handled this chore, she found that the plants did not receive the correct amounts of water and care.

All of the nurserymen surveyed preferred to sell plants outright to their customers. Most reported submitting a maintenance contract with their original bid for a plant installation, and were awarded maintenance jobs on this basis. The contracts were generally for a year's minimum, and might cover two, three or more years.

Only one nurseryman interviewed was willing to rent plants. This firm had an agreement with a major photographic studio in High Point, North Carolina, to supply plants as needed for photography layouts. The studio would telephone the size, type of plant and dates needed, and her firm would deliver them when desired. Most plants stayed at the studio for short periods of one to three days. The owner of this interior landscaping firm mentioned one hazard with this particular rental beyond the normal wear and tear of moving the plants. The immense heat from the lights used for photography caused some damage to the plants, but her rental rates were priced to include this problem. She also supplied plants to manufacturers showing at the twice-yearly Southern Furniture Market on a rental basis. During the week long furniture market she frequently made daily maintenance trips to water and groom the plants. She also provided plants for outdoor parties and wedding receptions. Because of the fragile quality of plants, her rental rates were set high enough to cover not only her labor and transportation costs, but also her plant replacement costs. Her most frequent problems were breakage of stems and leaves during the moving process, alcohol damage and too much or too little of both light and water.

At one time another interior landscaper in Greensboro had rented plants, but she found her replacement costs outran her profits on plant

rentals and phased out this part of her operation. Four interior landscaping firms, all in the New York City area, reported their companies had plant rentals. These, for the most part, were for a short-term basis and only to commercial clients. All of these firms sold plants outright when doing a permanent or semi-permanent interior plant installation.

With one exception, each interior landscaping firm surveyed reported having maintenance contracts for all their large commercial installations. For small offices, a maintenance contract might or might not be included. The average installation was visited once a week on a complete maintenance contract, and once a month if the firm acted only in a supervisory capacity. Moore's firm visited plant installations twice a week if blooming plants were furnished.<sup>24</sup> On a complete maintenance contract the interior landscaping firm handled all the watering, grooming, pruning, fertilizing and spraying for pests and disease. With a supervisory maintenance contract, these firms handled only fertilizing, major pruning and spraying for pests and disease. The regular watering and grooming was left up to the client's own personnel. On both types of contracts, the replacement of plants was made as needed, and according to the guarantees made in the original agreement with the client.

One of the largest interior landscaping firms in Greensboro provided maintenance contracts on all the jobs they installed, and considered this a major part of their business. This company supplied the plants for the Hyatt House in Winston Salem, North Carolina. This motor hotel features an enclosed central court rising a number of floors and is extensively and imaginatively planted with large amounts of live foliage plants as part of the overall decor. Their firm sends maintenance personnel to the Hyatt House three times weekly to water, prune, and groom the plants.

The researcher accompanied their staff on one of their regular maintenance trips to the Hyatt House to observe their methods first-hand. Each room facing the interior courtyard had a balcony featuring long planters. These were filled with trailing plants such as grape ivy and Peruvian ivy. These plants required frequent pruning to remain attractive in appearance. Great care was taken to see that dropped or unsightly leaves were not left on or near the plants.

The leaves of the larger plants, such as scheffleras and dracaenas, were washed once or twice a week by hand with a damp sponge. For most plants, water was used sparingly and fertilizer was applied only three or four times a year. The plants were checked carefully for pests at each visit and a small spray can of insecticide was used on the spot for minor problems. The maintenance personnel always did their chores during off-hours, so as not to unduly disturb the hotel patrons. If a plant needed extensive treatment for pests or disease, it was removed and replaced. Care was taken to use the insecticides as little as possible at the site.

Judy Brown, the maintenance person this researcher observed, explained that the theft of small plants was a continuing problem and that she usually carried a few replacement plants with her on each trip.<sup>31</sup> Another problem she mentioned concerned the plants located in the bar and in the dining area. A number of these plants had been killed overnight when patrons dumped drinks containing alcoholic beverages directly into the soil around the plants. The plants placed in the motel bar had the additional problem of extremely low lighting levels of less than 50 footcandles. Their solution for this last problem was to use low-light



tolerant plants such as spathiphyllum or aglaonema, and to rotate these plants every two weeks before the effects of poor lighting irreparably damaged the plants.

For their maintenance services, this firm was paid a set monthly fee. Williams stated that it took several years for a new firm to make money on maintenance contracts. He felt most businesses lost money the first year or two on their maintenance contracts until they had built up enough volume to make maintenance work pay.<sup>25</sup> Williams and Bunn both stated that there was roughly a ten percent plant loss the first year, per job, and recommended that this figure be included in the maintenance budget.<sup>25, 21</sup> Bunn found that a five percent plant loss after the first year was the usual occurrence in his experience with interior landscaping.<sup>21</sup>

As a landscape architect, Bunn worked only in an advisory capacity for his clients but related that for large jobs he always recommended that his clients take his landscaping plans and then buy plants directly from a Florida grower, have them shipped to the site, and installed by a local nurseryman, rather than have the local nurseryman supply both the plants and the installation. Bunn felt this saved his clients money even though there was no guarantee on the plants from the local nurseryman. He mentioned that tax advantages for the customer favored the customer's out-right buying of the plants as opposed to long-term rental of the plants. Bunn further recommended that professional nurserymen be hired to maintain the plants after the initial installation. He felt the best results were obtained when his clients used a complete maintenance contract that included the weekly water and grooming of the plants by professional nurserymen. At a minimum, he suggested at least a once a

month supervisory maintenance contract for fertilizing, pest control, cleaning and pruning of the plants. However, Bunn reported that most of his clients left the regular watering of plants to their building maintenance men who usually had little or no knowledge of plant horticulture.<sup>21</sup>

### Fertilization

The survey group made a variety of recommendations concerning how often plants used for commercial interiors should be fertilized. The range was from once a month to twice a year. One nurseryman explained that he fertilized monthly if the light was good and the plants were small, but in poorly lighted interior spaces he fertilized only once a year. Another nurseryman stated that he fertilized once a month from March through October and once every two months from November to February.

No one gave the exact formula for their fertilizing solution, but the group consensus was that care should be taken not to over-fertilize the plants, particularly those plants in darker locations or specimens they wished to keep at approximately the same size as when installed. Many in the group advised the researcher that they used a weak solution or less than half the manufacturer's recommended strength of solution. Two of the professionals reported using a slow-release fertilizer, such as Osmocote, once or twice a year.

### Insecticides

The most common response received on the subject of spraying plants for pests and disease was "only when needed." Those persons who cared to explain further felt that plants should be checked often for pests,

but little or no insecticide should be applied on the site. One Greensboro interior landscaper washed her plants often and usually caught bugs before they spread. She never sprayed the plants on the job. If a severe infestation escaped her notice, she would simply remove the plant and replace it with a healthy specimen. Then she would take the affected plant back to her greenhouses where it would be isolated, treated, and later put back into service when again in good condition.

Ritter, while stating that he sprayed as needed, added that he usually had the plants hosed down daily and this water spray checked pest infestations to some extent. He recommended Kelthane for spider mites and malathion for scale and mealy bugs.<sup>22</sup> Kimmins advised using these same insecticides, plus a soapy solution for pests. He further suggested that regular cleaning with a sponge, camel's hair brush or cheesecloth would cut down on pests.<sup>23</sup> Kluttz suggested spraying plants twice a month,<sup>29</sup> while Moore responded he sprayed only as absolutely necessary because "the most effective insecticides have an unpleasant odor for interior use."<sup>24</sup> Brown said he only used malathion, as they had never had bad results with it, either where plants or people were concerned.<sup>20</sup>

#### Plant Replacement

No exact averages were given in response to the question of how often the interior landscapers replaced or rotated plants. Generally they stated "as necessary." Depending on the plant material and the location, this could vary from several weeks for blooming plants up to several years for very hardy specimens. Williams found that many plants survived indoors for years, but they looked better if they were rotated

every year or two. After a year or so his firm returned plants to the greenhouse where they were pruned, repotted and misted frequently. After a period of six months or more, these plants were ready to be returned to commercial interiors.<sup>25</sup>

#### Ground Covers

"I never use bark chips for ground cover, but instead use small plants as filler material," said Brown. "The bark chips cover up a lot of problems," continued Brown.<sup>20</sup> He explained that patrons of malls were prone to pour leftover drinks of coffee and carbonated beverages into the bark chips surrounding the plants. This sugar content eventually turned to alcohol, which could have a devastating effect on the plants. The sugar also attracted bugs and rodents, which were hidden by the bark chips. Cigarette butts, candy wrappers, etc., were also stuffed into the chips. The chips prevented the maintenance personnel from quickly ascertaining if the soil around the plants had dried out and needed water. Problems with the plants were not noticed as quickly when the chips surrounded the stems of the plants. With bare soil showing between the filler plants, Brown felt that maintenance of the plants was far easier than when bark chips or a thick ground cover plant such as ivy was used to cover the soil. Some filler plants that Brown recommended are: *Spathiphyllum* 'Mauna Loa', *Aglaonema commutatum* 'Pseudo-bracteatum', *Aglaonema modestum*, *Aglaonema simplex*, and small specimens of *Dracaena* 'Janet Craig', and *Dieffenbachia amoena*.

Fifty-Two Plants Selected With Specifics for Maintenance

The following summary of plants, listed alphabetically according to botanical name, lists those plants chosen by the survey group as most suitable for use in commercial interiors. The common name of each plant, if different, is listed in quotation marks after the botanical name of the plant. A brief summary of their culture is included. The soil recommendations for each plant are not included, since many of the soil mixtures recommended in Chapter IV have been used successfully with these plants in commercial interiors. The size shown for certain plants refers to the average size used in commercial interiors rather than the eventual size the plant may grow. The abbreviation FC stands for footcandles of light.

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1. Aglaonema commutatum 'Pseudo-bracteatum'.
2. Aglaonema modestum. "Chinese evergreen".

Light: Prefers shade, no direct sun; average light 50 to 200 FC; can tolerate down to 10 FC for periods of up to several months.

Water: Keep on dry side.

Size: 1 to 2 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Accent or filler plant for groupings in planters; small specimen for low tables, desks, shelves.

Comments: Very durable, long lived; excellent in dark locations.

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3. Araucaria heterophylla. "Norfolk Island pine"

Light: Prefers good light from sunny to partial shade, full sun in winter. Does best in high light over 200 FC.

Water: Keep evenly moist.

Size: 2 to 6 feet, up.

Temperature: Moderate, 50 - 65 degrees, up.

Uses: Large specimen in floor container for lobbies, airport terminals, entries. Small specimen for offices, accent plant in groupings; good for cooler locations.

Comments: Slow growing evergreen, gives clean forest feeling. Durable, tolerant of chills, heat, sun or shade.

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4. Asparagus densiflorus 'Sprengeri'. "Asparagus fern"

Light: Partial shade, diffused sun. Does well in north light. Needs 100 to 200 FC up, but avoid full sun.

Water: Keep on dry side.

Size: Hanging fronds.

Temperature: Moderate, 50 - 65 degrees, up.

Uses: Hanging baskets, small specimen for tables, book shelves, desks.

Comments: Durable, gives a soft green, airy look.

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5. Aspidistra elatior. "cast-iron plant"

Light: Prefers shade, avoid full sun. Can tolerate low light below 50 FC, but does best with 50 to 100 or more FC.

Water: Keep evenly moist.

Size: 15 to 24 inches.

Temperature: Moderate, 50 - 65 degrees, up.

Uses: Filler plant for planters, small specimen for offices.

Comments: Very tolerant of neglect, does well in cool, unfavorable locations.

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6. Asplenium nidus. "birdsnest fern"

Light: Shade - keep away from sun. Does well with 50 to 1,000 FC.

Can tolerate down to 25 FC.

Water: Keep evenly moist.

Size: 15 to 24 inches.

Temperature: Warm - 62 to 80 degrees.

Uses: Small specimen for tables, shelves, floor containers in offices, accent plant - planters.

Comments: Needs 50 percent or more humidity - mist often, avoid drafts.

Unusual fern.

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7. Brassaia Actinophylla. "Schefflera"

Light: Likes bright indirect light or full sun but tolerates down to

50 FC. Usual - 100 - 200 FC.

Water: Keep on dry side.

Size: 18 inches to 8 feet or more.

Temperature: Average to warm, 62 to 80 degrees, can tolerate to 45 degrees.

Uses: Large specimen for malls, airport lobbies, reception areas, offices.

Accent plant in planters.

Comments: Fast grower, fairly durable.

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8. Chamaedorea elegans. "parlor palm"

9. Chamaedorea elegans 'bella'. "neanthe bella palm"

Light: Prefers shady locations. Usual light is 50 to 1,000 FC, but tolerates down to 40 FC. No direct sun.

Water: Keep evenly moist.

Size: Under 3 feet.

Temperature: Average to warm, 62 - 80 degrees.

Uses: "Parlor palm" is one of best indoor palms. Tolerates abuse, excellent keeper in shade. "Neanthe bella" is slow growing, fairly hardy.

Comments: Accent plants, small specimen for offices, gives tropical effect.

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10. Chamaedorea erumpens. "bamboo palm"

11. Chamaedorea seifrizii. "reed palm"

Light: Prefers shade, no direct sun. Partial shade or diffused sun is good. Usual light is 50 to 1,000 FC. Should have at least 40 FC.

Water: Keep evenly moist.

Size: 2 to 8 feet.

Temperature: Average to warm, 62 - 80 degrees.

Uses: Large specimen for lobbies, offices. Good accent plants, both varieties give an oriental look. Erumpens - fast growing.

Comments: Seifrizii uses more water and food than most palms.

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12. Chlorophytum comosum 'Vittatum'. "spider plant"

Light: Prefers partial shade - diffused sun. Usual light 1,000 FC up.

Can be maintained on 100 - 200 FC. Good in north light all year.

Water: Keep evenly moist.

Size: Under 12 inches - hanging fronds.

Temperature: Average to cool, 50 - 65 degrees.

Uses: Hanging baskets, can be suspended from screens, used as room dividers, good in small offices, accent plant.

Comments: Unusual, cascading stems bear new plantlets.

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13. Chrysalidocarpus lutescens. "areca palm"

Light: Partial shade, filtered sun. Can be maintained by 100 - 200 FC, or more.

Water: Keep evenly moist.

Size: 3 to 10 feet.

Temperature: Warm, 62 - 80 degrees, can tolerate down to 50 degrees.

Uses: Good specimen plant in single container, accent plant in planters.

Comments: Very graceful appearance.

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14. Cissus rhombifolia. "grape ivy"

Light: Diffused sun - partial shade. Maintained on 75 - 200 FC. Needs at least 50 FC to hold up 6 months or more.

Water: Keep evenly moist.

Size: Hanging fronds.

Temperature: Warm, 62 to 80 degrees.

Uses: Hanging baskets, ground cover for planters, good for tables, desks, book shelves where trailer is needed. Pinch often.

Comments: Good keeping qualities, dark glossy leaves.

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15. Citrus mitis. "calamondin orange"

Light: Requires high light, full sun, ideal for sunny window. Needs over 200 FC.

Water: Keep on dry side.

Size: 12 inches to 4 feet.

Temperature: Average, 50 to 65 degrees and up.

Uses: Specimen for low tables, floor in offices.

Comments: Very decorative when fruiting, may be hard to maintain.

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16. Dieffenbachia amoena. "giant dumbcane"

17. Dieffenbachia 'Exotica'.

18. Dieffenbachia picta. "spotted dumbcane"

Light: Partial shade, diffused sun. Needs 100 - 200 FC for good maintenance. Can survive for several months with FC down to 15 - 25.

Foliage more colorful with more light.

Water: Keep on dry side.

Size: 2 to 6 feet, amoena to 8.

Temperature: Warm, 62 - 80 degrees, up.

Uses: Small specimen for tables, shelves; good filler plant in planters, accent plant in grouping. Large specimen for malls, lobbies, restaurants.

Decorative.

Comments: Very durable, good keeping qualities. Gives a lush, tropical effect in groupings.

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19. Dizygotheca elegantissima. "false aralia"

Light: Requires medium light of 100 to 200 FC for maintenance. Must have at least 50 FC, and prefers strong indirect light, some winter sun.

Water: Keep evenly moist.

Size: 2 to 6 feet.

Temperature: warm, 62 - 80 degrees, up.

Uses: Accent plant in planters - adds height and lightness. Large specimen in offices, lobbies.

Comments: Avoid drafts, somewhat temperamental. Very graceful, gives oriental feeling.

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20. Dracaena deremensis 'Janet Craig'. "green dracaena"

21. Dracaena deremensis 'Warneckeii'. "striped dracaena"

22. Dracaena fragrans massangeana. "corn plant"

Light: Partial shade, diffused sun. Needs medium light of 100 - 200 FC for good maintenance. Warneckeii does well on poor light down to 15 FC.

Water: Keep evenly moist.

Size: 2 to 6 feet, massangeana to 8 feet up.

Temperature: Warm, 62 - 80 degrees.

Uses: Specimen in offices, lobbies, airport terminals, restaurants. Accent plant in planters. Small specimen for tables, shelves.

Comments: Highly recommended for all commercial interiors, very durable. Keep well in poor light.

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23. Dracaena draco. "dragon tree"

24. Dracaena marginata. "Madagascar dragon tree"

Light: Partial shade, diffused sun. Needs 100 - 200 FC for maintenance.

Marginata tolerates down to 30 FC for fairly long periods.

Water: Keep evenly moist.

Size: Draco, 2 to 6 feet. Marginata, 2 to 12 feet.

Temperature: Warm, 62 - 80 degrees.

Uses: Unusual accent plant for planters. Small specimen for tables, shelves in offices. Large specimen in lobbies, malls, airport terminals, restaurants, offices. Especially good in contemporary settings.

Comments: Marginata highly recommended for all commercial interiors.

Its twisted stems give an architectural appearance. Slow grower.

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25. Dracaena godseffiana. "gold dust dracaena"

Light: Partial shade, diffused sun. Needs 100 - 200 FC for maintenance.

Water: Keep evenly moist.

Size: 8 to 18 inches.

Temperature: Warm, 62 - 80 degrees.

Uses: Good small specimen for desks, tables, shelves. Good filler plant for planters. Ideal miniature for novelty plantings.

Comments: Compact, durable and decorative.

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26. Ficus benjamina. "weeping fig"

27. Ficus benjamina 'Exotica'. "Java fig"

Light: Does best with maximum sun and bright light above 500 FC. Can be maintained on 100 - 200 FC. Can tolerate down to 50 FC, but has more leaves with more sun.

Water: Keep on dry side.

Size: 5 to 12 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Large specimen in lobbies, restaurants, airport terminals, offices.

Comments: Graceful tropical tree; avoid drafts. Excellent as single specimen in floor containers.

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28. Ficus elastica 'Decora'. "rubber plant"

Light: Diffused sun to full sun. Needs 100 to 200 FC for maintenance.

With more light, more robust growth. Can tolerate down to 20 FC.

Water: Keep on dry side.

Size: 2 to 8 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Accent plant in planters. Large specimen in offices, lobbies.

Comments: Tolerates dry interiors, very durable if enough light.

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29. Ficus lyrata. "fiddleleaf fig"

Light: Needs bright filtered sun - avoid full sun or foliage may scorch.

Tolerates down to 40 FC.

Water: Keep on dry side.

Size: 3 to 7 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Dramatic large specimen in high ceilings of reception areas; good accent plant in planters.

Comments: Strong tree with thick, leathery leaves; grows quite large.

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30. Ficus retusa nitida. "Indian laurel"

Light: Sun lover - needs 50 to 500 FC. Holds more leaves with more light.

Water: Keep on dry side.

Size: 5 to 15 feet.

Temperature: Warm, 62 - 80 degrees.

Uses: Large specimen in offices, lobbies. Good whenever a tree effect is needed.

Comments: Can be pruned to shape.

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31. Howeia forsteriana. "Kentia palm"

Light: Partial shade - diffused sun. Tolerates poorer light than other palms, down to 20 FC. Does better with 50 to 100 FC.

Water: Keep evenly moist.

Size: 3 to 10 feet.

Temperature: Moderate, 50 to 65 degrees, up.

Uses: Good accent plant, small specimen for offices, large specimen for lobbies, restaurants, etc.

Comments: Tolerates abuse, stands up well in dry, unfavorable spots.

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32. Monstera deliciosa. "Mexican bread fruit"

Light: Partial shade, diffused light. Needs good light to maintain growth of large leaves. Needs 100 - 200 FC for maintenance, tolerates down to 20 FC.

Water: Keep evenly moist.

Size: 2 to 6 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Large or small totem pole specimen; accent plant - leaf shape good contrast.

Comments: Very durable jungle vine.

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33. Nephrolepis exaltata bostoniensis. "Boston fern"

Light: Needs filtered light - no direct sun except in winter. Needs a minimum of 25 FC, does better with 100 FC.

Water: Keep evenly moist.

Size: Approximately 12 inches.

Temperature: Cool, 50 to 65 degrees, up.

Uses: Small specimen for desks, tables, shelves; hanging baskets, filler plant in planters between tall specimens.

Comments: Old favorite. Prefers high humidity; avoid drafts. Graceful, drooping plant.

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34. Pandanus veitchii. "variegated screw pine"

Light: Partial shade, medium light. Needs 100 FC up.

Water: Keep on dry side.

Size: 12 inches to 5 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Decorative accent plant in planters; small specimen for offices.

Comments: Resembles dracaenas.

---

35. Peperomia caperata. "emerald ripple"

Light: Indirect sun or partial shade. Needs 100 to 200 FC for good maintenance, but survives for long periods with less than 100 FC.

Water: Keep on dry side.

Size: 4 to 6 inches.

Temperature: Warm, 62 to 80 degrees.

Uses: Good for desks, tables, shelves; accent plant or filler for planters.

Comments: Good sturdy small plant.

---

36. Philodendron 'Burgundy'.

Light: Partial shade, diffused sun. Can tolerate down to 15 FC, but better leaf growth at 200 FC.

Water: Keep evenly moist.

Size: 2 to 3 feet - on pole.

Temperature: Warm - 62 to 80 degrees.

Uses: Good totem pole specimen.

Comments: Compact grower - should be tied to support.

---

37. Philodendron 'Emerald Queen'.

38. Philodendron domesticum (hastatum). "elephant's ear"

Light: Partial shade, diffused sun. Needs 100 to 200 FC for maintenance, but tolerates shade well.

Water: Keep evenly moist.

Size: 3 feet up.

Temperature: Warm, 62 to 80 degrees.

Uses: Excellent climbers for totem poles. Domesticum - good filler plant in planters.

Comments: Disease resistant, vigorous.

---



39. Philodendron oxycardium (cordatum). "heartleaf philodendron"

Light: Prefers good light, partial shade, but keeps in dim light down to 15 FC. Leaf size larger, more uniform with more light.

Water: Keep evenly moist.

Size: 4 inches as trailing plant, to 5 feet as totem pole.

Temperature: Warm, 62 to 80 degrees.

Uses: Hanging baskets, ground cover in planters, totem pole specimen, room dividers; and as trailing plant on shelves, tables.

Comments: Durable, rapid climber.

---

40. Philodendron sellom.

Light: Prefers good light but can adapt down to 15 FC, but leaf stalks stretch.

Water: Keep evenly moist.

Size: 2 to 3 feet, up.

Temperature: Warm, 62 to 80 degrees.

Uses: Large specimen in lobbies, malls; small specimen in offices.

Comments: Especially good as large specimen where space allows it to spread.

---

41. Phoenix roebelenii. "pigmy date palm"

Light: Prefers shade with no direct sun, 20 to 100 FC.

Water: Keep evenly moist.

Size: 2 to 5 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Small specimen plant for offices.

Comments: Slow growing, hardy, gives graceful tropical effect.

---

42. Plectranthus australis. "Swedish ivy"

Light: Partial shade, diffused sun.

Water: Keep on dry side.

Size: Trailing plant.

Temperature: Moderate, 50 to 65 degrees, up.

Uses: Hanging baskets, ground cover in plants; small specimen for shelves, wall containers.

Comments: Durable, vigorous, fast growing trailing plant; tolerates abuse.

---

43. Pleomele reflexa. "Malaysian dracaena"

Light: Diffused sun, partial shade.

Water: Keep evenly moist.

Size: 3 to 6 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Large specimen for offices, malls; contrast plant for planters.

Comments: Slow growing, thrives with humid air.

---

44. Podocarpus macrophyllus 'Maki'. "Southern yew"

Light: Prefers sunny, maximum light but can adjust down to 50 FC.

Water: Keep evenly moist.

Size: 2 to 8 feet.

Temperature: Moderate, 50 - 65 degrees, up.

Uses: Container specimen for offices, lobbies; especially good for cool locations.

Comments: Compact evergreen shrub, can be pruned and shaped.

---

45. Rhapis excelsa. "lady palm"

Light: Prefers bright filtered light, partial shade; does well in low light, but does better with more than 50 FC.

Water: Keep evenly moist.

Size: 4 to 7 feet.

Temperature: Moderate, 50 to 65 degrees, up.

Uses: Single specimen in floor containers for offices, entrances, restaurants; ideal for cooler locations.

Comments: Durable, slow grower, more expensive than other palms; bamboo-like canes oriental in feeling.

---

46. Sansevieria trifasciata laurentii. "snake plant"

Light: Partial shade, diffused sun; tolerates poor light from 50 to 100 FC.

Water: Keep on dry side.

Size: 12 to 18 inches.

Temperature: Warm, 62 to 80 degrees.

Uses: Good filler plant in planters, small specimen for offices - does well in difficult locations.

Comments: Very tough, tolerates drafts and dryness; sword-like leaves.

---

47. Scindapsus aureus. "pothos"

Light: Partial shade, diffused sun. Needs 100 to 200 FC for maintenance.

Water: Keep on dry side.

Size: 6 inches as trailing plant, to 3 feet on totem bark.

Temperature: Warm, 62 to 80 degrees.

Uses: Small specimen for desks, tables, shelves; hanging baskets, ground cover for planters, climber for totem poles, screens.

Comments: Hardy, thrives in over-heated conditions.

---

48. Spathiphyllum 'Clevelandii'. "white flag"

49. Spathiphyllum 'Mauna Loa'. "white anthurium"

Light: Partial shade, no direct sun; adapts readily to low light levels - tolerates down to 20 FC, but needs 50 FC up to flower.

Water: Keep evenly moist.

Size: 12 to 30 inches.

Temperature: Warm, 62 to 80 degrees.

Uses: Excellent filler plant for large planters in malls, especially Mauna Loa; pot plant for desks, shelves, tables.

Comments: Vigorous grower, good with air conditioning.

---

50. Veitchia merrillii. "Adonidia palm"

Light: Partial shade, diffused sun; tolerates deep shade down to 25 FC.

Water: Keep evenly moist.

Size: 4 to 12 feet.

Temperature: Warm, 62 to 80 degrees.

Uses: Large specimen for lobbies, offices.

Comments: Tolerates abuse; glossy-green fronds with lustrous red fruit.

---

51. Yucca elephantipes. "Joshua tree"

Light: Prefers full sun but can tolerate dim light down to 20 FC.

Water: Keep on dry side.

Size: 2 to 6 feet.

Temperature: Cool, 50 to 65 degrees.

Uses: Large specimen for malls, lobbies, and offices. Striking silhouette gives stiff, desert effect.

Comments: Tolerates abuse; can be used in cool or warm locations.

---

52. Zebrina pendula. "silvery wandering jew"

Light: Prefers sunny location but tolerant to light or shade.

Water: Keep on dry side.

Size: Small pendant plant.

Temperature: Average, 50 to 62 degrees, up.

Uses: Hanging baskets, wall containers, trailing plant for shelves; contrast for plant groupings.

Comments: Fast growing, needs frequent pinching; tolerates warm or cool locations.

---

The preceding summary, consisting of fifty-two plants and their culture, represents those plants used most often for interior landscaping by the nineteen plant authorities participating in this study. The majority of these plants can be characterized as hardy, and most of them can survive in the average over-heated, dry environments of commercial interiors for long periods of time with minimum care.

## CHAPTER V

## SUMMARY AND CONCLUSIONS

The use of natural plants for commercial interiors has grown appreciably in the past five years and can add immensely to the beauty of our indoor surroundings. However, many architects and interior designers in charge of the selection and design of commercial interior landscaping layouts have limited knowledge to aid them in the selection of proper plants.

The literature suggested a need for more information regarding the selection and maintenance of plants suitable for the commonly dry, over-heated and dimly-lit environments encountered in commercial interiors. The objectives of this study were: to determine those species of plants most adaptable for use in commercial interiors, and to determine the correct methods of maintaining these selected plants in commercial settings.

Data were obtained by interviews with twelve nurserymen, landscape architects, and horticulturists practicing in the central Piedmont section of North Carolina and by seven questionnaires returned from selected plant authorities located outside the geographic limits of the study.

Eleven species of plants were recommended by five or more of the plant authorities. In order of selection these are: (1) *Dracaena marginata*, (2) *Ficus benjamina* 'Exotica', (3) *Brassaia actinophylla*, (4) *Dracaena deremensis* 'Warneckei', (5) *Dracaena fragrans massangeana*,

(6) *Ficus elastica* 'Decora', (7) *Chrysalidocarpus lutescens*, (8) *Spathiphyllum* 'Mauna Loa', (9) *Chamaedorea erumpens*, (10) *Howeia forsteriana*, and (11) *Philodendron selloum*. In all, fifty-two species of plants were recommended by the survey group for use in commercial interiors.

Adequate light was considered the foremost environmental factor in maintaining plants in commercial settings. The majority recommendation was to select species of plants that can survive for extended periods with lighting levels of 50 to 200 footcandles. This was considered preferable to installing supplemental lighting which might not add appreciably to the total footcandles of light the plants received. Plants considered ideal for dimly-lit commercial environments with 50 footcandles of light or below were species of *aglaonema*, *spathiphyllum*, *dracaena*, *aspidistra*, and palms.

Correct watering of plants in commercial settings was rated as the second most important factor in the maintenance of live plants in interiors. Since different species of plants have widely varying requirements for water, great care must be taken to ensure that each plant receives its proper allotment of water. Best results were obtained when trained professional nurserymen handled the regular watering of plants in commercial interiors. It was reported that when watering was handled by the commercial building's regular maintenance staff, the results were often unsatisfactory.

As might be expected, when a number of authorities in the same field were asked to state their views on the same questions, a rather wide diversity of opinion was expressed. This was particularly true on

the questions concerning soil mixtures and on the strength of solutions and frequency of fertilization. The diverse responses given on these two questions and the differences that existed in both methods and materials used suggests that more than one method may be used successfully for the maintenance of live plants in commercial interiors.

While each person contacted in this survey had his own particular methods of planting and maintaining indoor plants, the general approach was quite similar. Each plant authority had great respect for the natural growth patterns and environmental requirements of specific plants and tried to supply these conditions rather than attempt to adapt a plant to a completely foreign environment. The plant professionals were successful in growing plants under the usually adverse conditions found in commercial buildings because they investigated and determined the existing environment at each job site and selected species of plants accordingly. Plants with highly restrictive environmental requirements were not recommended for use in commercial interiors. Generally, plants capable of living with low lighting levels, low humidity, and moderate to warm temperatures should be selected for long-term use in commercial buildings. Care should be taken not only in the selection of plants, but also in the selection of qualified plant professionals to supervise the installation and long-term maintenance of plants in commercial interiors.

Research under controlled laboratory conditions is needed on lighting requirements of plants suitable for use in commercial interiors. More research needs to be conducted on watering methods for plants in commercial settings. Systems for misting and irrigation, both automatic and manual, need to be studied and compared.



The correct use of live plants is an important design concept that needs to be included in the course of study of interior designers and architects. At a minimum, a seminar or short course on the selection and maintenance of natural plants for commercial interiors would help in the training of this important design concept.

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4. Howell, Mary C., Ed. "Spreading Its Wings." Interior Design, October 1972, pp. 184 - 187.
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8. Colby, H. W., and Campbell, L. V. "Light and Lighting - a Horticultural View." Lighting Design and Application, November 1974 (Reprint).
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11. Wolf, Alfred B. Indoor Plant Manual. K. Reinhardt, W. A. Mosby Company, 1974.
12. Guide to Interior Planting, Systems, Controls and Services, Inc. Lansing: John Wiley Company, 1972.
13. "Seven Indoor Plants You Should Know." Scientific Horticulture, August 1976, pp. 33 - 45.

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10. Conover, C. A.; Sheehan, T. J.; and McConnell, D. B. Using Florida Grown Foliage Plants. Bulletin 746. Gainesville: Florida Agricultural Experiment Stations, October, 1971.
11. DeWerth, A. F. "Indoor Landscaping . . . with Live Foliage Plants." Texas Agricultural Progress, Summer, 1964, pp. 3 - 6 (Reprint).
12. Graf, Alfred B. Exotic Plant Manual. E. Rutherford, N. J.: Roehrs Company, 1974.
13. A Guide to Interior Planting, Everett Conklin and Company, Inc. Lansing: John Henry Company, 1973.
14. "Twelve Indoor Plants You Should Know." Grounds Maintenance, August, 1974, pp. 33 - 45.

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16. Everett, T. H. How to Grow Beautiful Houseplants. Greenwich, Conn.: Fawcett Publications, Inc., 1973.
17. "Lightweight Soil Mix for Pots." Sunset Magazine, April, 1975, p. 222.
18. Conover, Charles. "Pointers on Growing Foliage." Grower Talks, George Ball, Company, [n.d.], (Mimeographed).
19. Wilson, Helen Van Pelt. Houseplants Are for Pleasure. New York: Doubleday & Company, Inc., 1973.
20. Brown, LeRoy. Manager, Interior Landscaping, The Rouse Company, Columbia, Maryland. Interview on October 14, 1975.
21. Bunn, LaMarr. Specialist - Interior Landscaping, Lewis Clarke & Associates, Raleigh. Interview on June 5, 1975.
22. Ritter, Harold. State Superintendent of Grounds, Raleigh. Interview on March 25, 1975.
23. Kimmins, Kent. Visiting Instructor, Department of Horticulture, NCSU, Raleigh. Interview on March 25, 1975.
24. Letter from Moore, Michael E. Atlanta: Gladview Gardens, Inc., May 14, 1975.
25. Williams, Allan. Specialist - Interior Landscaping, Sedgfield Interior Landscapes, Greensboro. Interview on February 5, 1975.
26. Lambeth, Ann. Owner, Indoor Landscaping, Greensboro. Interview on March 18, 1975.
27. Wolson, Del. Owner, Orchids & Exotics by "Del", Colfax, North Carolina. Interview on March 4, 1975.
28. Letter from Conklin, Everett. Montvale, New Jersey: Everett Conklin & Company, Inc., March 4, 1975.
29. Letter from Kluttz, Jimmy H. Atlanta: Jimmy H. Kluttz & Associates, May 8, 1975.
30. Letter from O'Hara, Jenny. New York: Jacob O'Hara & Company, February 28, 1975.
31. Brown, Judy. Maintenance Specialist, Sedgfield Interior Landscapes, Greensboro. Interview on February 6, 1975.

## APPENDIX A

## PLANTS SUITABLE FOR COMMERCIAL INTERIORS\*

1. *Chamaedorea elegans* (bella palm)\*
2. *Dracaena marginata*\*
3. *Crassula argentea* (jade plant)
4. *Ficus benjamina*\*
5. *Cissus encisa* (grape ivy)\*
6. *Araucaria excelsa* (Norfolk Island pine)\*
7. *Brassaia actinophylla* (schefflera)\*
8. *Howeia forsteriana* (Kentia palm)\*
9. *Agave americana* (century plant)
10. *Sansevieria trifasciata* (snake plant)\*
11. *Aspidistra elatior* (cast-iron plant)\*
12. *Senecio mikanoides* (German ivy)

"Twelve Indoor Plants You Should Know." Grounds Maintenance, August, 1974, pp. 33 - 45.

- 
- |                                     |                                  |
|-------------------------------------|----------------------------------|
| 1. Schefflera*                      | 13. <i>Ficus lyrata</i> *        |
| 2. Chinese loquat                   | 14. <i>Dracaena marginata</i> *  |
| 3. Pittosporum                      | 15. Norfolk Island pine*         |
| 4. Kentia palm*                     | 16. <i>Ficus retusa nitida</i> * |
| 5. <i>Dracaena massangeana</i> *    | 17. <i>Aglaonema</i> *           |
| 6. <i>Ficus benjamina exotica</i> * | 18. Boston fern*                 |
| 7. Podocarpus*                      | 19. <i>Yucca brevifolia</i> *    |
| 8. <i>Fatsia japonica</i>           | 20. Lady palm*                   |
| 9. Date palm*                       | 21. Bamboo palm*                 |
| 10. <i>Dieffenbachia amoena</i> *   | 22. <i>Asparagus sprengeri</i> * |
| 11. Bella palm*                     | 23. Ligustrum                    |
| 12. European fan palm               | 24. Grape ivy*                   |

Howell, Mary C., Ed. "Greening is Blooming." Interior Design, October, 1972, pp. 188 - 191.

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\*Denotes plants included in the list of fifty-two plants compiled by this study. See Page 27.

## APPENDIX B

## QUESTIONNAIRE AND THE FIRST SHEET OF INTERVIEW SCHEDULE

1. List the 8 - 10 species of plants you've used most often in commercial interiors.  
(1) (6)  
(2) (7)  
(3) (8)  
(4) (9)  
(5) (10)
2. When first visiting a commercial site before planning a job, what factors do you check: (for example - humidity, drafts, lighting, space, etc.)
3. Do you provide any special lighting for your plants? If so, please state the type of bulb and the recommended wattage.
4. What are your original sources for your plants? (for example - from Florida, California, grow own, etc.)
5. (a) Do you sell most plants outright to the customer?  
(b) Do you rent plants?  
(c) Do you provide maintenance contracts on the jobs you install (some, none, or all)?  
(d) How often do you visit an average installation for maintenance?
6. What general potting mixture do you use for most plants (state % of loam, peat, sand, perlite, etc.)?
7. On a maintenance contract, how often do you (a) fertilize, (b) spray for pests and disease, (c) replace or rotate plants?
8. Do you work mostly from plans submitted by architects and interior designers, or do you do most of the initial planning?

## APPENDIX C

## INTERVIEW SCHEDULE

INTERVIEWEE _____	(1) Size	(2) Cost
RATING _____	1 - 3 Feet _____	Inexpensive _____
PLANT _____	4 - 6 Feet _____	Moderate _____
VARIETY _____	7 - 10 Feet _____	Expensive _____
	Larger _____	Comments _____
(3) Potting Mixture	(4) Container	(5) Watering Schedule
% Topsoil or Loam _____	Clay _____	Daily _____
% Sand _____	Plastic _____	Every Other Day _____
% Peatmoss _____	Metal _____	3 Times Weekly _____
% Humus _____	Glazed _____	Weekly _____
% Leafmold _____	Wood _____	Other _____
% Bonemeal _____	Other _____	
% Perlite or Vermiculite _____		
% Other _____		
(6) Feeding Schedule	(7) Fertilizer-Strength	(8) Repotting-Pruning
Weekly _____	Name Brand _____ % _____	3 - 6 Months _____
Bi-Weekly _____	_____ % _____	6 - 12 Months _____
Monthly _____	_____ % _____	Yearly _____
Every 3 Months _____	_____ % _____	Every 2 Years _____
Every 6 Months _____	_____ % _____	Other _____
Yearly _____	_____ % _____	
Other _____		
(9) Life Expectancy	(10) Rate of Growth	(11) Hardiness
Less Than 6 Months _____	Rapid _____	Delicate _____
6 Months - Year _____	Average _____	Average _____
2 Years _____	Slow _____	Hardy _____
3 Years _____		
4 - 5 Years _____		
Longer _____		
(12) Artificial Lighting	(13) Pest Control	
Fluorescent _____ Wattage _____	Incandescent _____ Wattage _____	Insecticide _____ How Often _____
Plant-Gro _____	_____	Malathion _____
Gro-Lux _____	_____	Kelthane _____
Plant-Light _____	_____	Black Leaf 40 _____
Vita-Light _____	_____	Sevin _____
Other _____	_____	Other _____
Number of _____	_____	
Fixtures Used _____	_____	

## APPENDIX D

## NAMES AND ADDRESSES OF THE TWELVE PLANT AUTHORITIES INTERVIEWED

Horticulturists

- |  |   |
|--|---|
| <p>1. Kent Kimmins<br/>Visiting Instructor<br/>Department of Horticulture<br/>North Carolina State University<br/>Raleigh, North Carolina</p>  | <p>2. Harold Ritter<br/>Supt. of State Grounds<br/>General Services Division<br/>216 E. Jones Street<br/>Raleigh, North Carolina</p>    |
| <p>3. Dr. Russell M. Southall<br/>Professor<br/>Department of Horticulture<br/>North Carolina State University<br/>Raleigh, North Carolina</p> | <p>4. Dr. James Strobel<br/>Chairman<br/>Department of Horticulture<br/>North Carolina State University<br/>Raleigh, North Carolina</p> |
- 

Nurserymen

- |   |   |
|---|---|
| <p>1. The Arbor House<br/>Charles Cutts<br/>605 W. Market Street<br/>Greensboro, North Carolina</p>             | <p>2. Indoor Landscaping<br/>Ann Lambeth<br/>3 St. Francis Court<br/>Greensboro, North Carolina</p>                 |
| <p>3. Orchids and Exotics by "Del"<br/>Del Wolson<br/>Box 207<br/>Colfax, North Carolina</p>                    | <p>4. Sedgefield Interior Landscapes<br/>Allan Williams<br/>5000 High Point Road<br/>Greensboro, North Carolina</p> |
| <p>5. Sedgefield Interior Landscapes<br/>Judy Brown<br/>5000 High Point Road<br/>Greensboro, North Carolina</p> | <p>6. The Rouse Company<br/>LeRoy Brown<br/>Columbia, Maryland</p>  |
- 

Landscape Architects

- |  |   |
|--|---|
| <p>1. Lewis Clarke and Associates<br/>LaMarr Bunn<br/>5 Koger Executive Park<br/>Suite 205<br/>Raleigh, North Carolina</p> | <p>2. Heath Carrier<br/>Jamestown, North Carolina</p> |
|--|---|

## APPENDIX E

## SAMPLE COVER LETTER

1421 Harper Road  
Asheboro, North Carolina  
February 19, 1975

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

As partial fulfillment of the requirements for a master's degree in Interior Design at the University of North Carolina at Greensboro, I am currently completing a thesis entitled, "Selection and Maintenance of Natural Plants for Commercial Interiors." In my research of previously published literature on this subject, your name has come up repeatedly in articles in magazines such as Interior Design and Horticulture as a leader in the interior landscaping field.

Limited information has been previously published relating specifically to live plants as used in commercial interiors, and so few firms in this area do any actual work in this field that I am encountering some difficulty in assembling adequate data for my thesis. Therefore, I'd be especially grateful for any information you can send me on your experiences working in this area. I am particularly interested in having any literature, such as brochures or catalogues that you print or provide to customers. I will mail a check to cover all costs, including mailing and handling, if you will let me know the correct amount to send.

Enclosed is a list of questions that I would appreciate you or one of your staff answering as time permits. Thank you for your assistance in this matter.

Sincerely,

Nancy Falta



## APPENDIX F

NAMES AND ADDRESSES OF THE SEVEN PLANT AUTHORITIES WHO  
RETURNED A MAILED QUESTIONNAIRE

1. The Everett Conklin Companies  
Seven Brook Avenue  
Montvale, New Jersey 07645
2. Gladview Gardens, Incorporated  
Michael E. Moore  
1952 Browns Mill Road, S. E.  
Atlanta, Georgia 30315
3. The Greenhouse  
254 E. 51st Street  
New York City, New York 10022
4. Horticulture House, Peter Dunlop, Incorporated  
347 E. 55th Street  
New York City, New York 10022
5. C. Kind and Company  
100 West 28th Street  
New York, New York 10001
6. Jimmy Kluttz and Associates  
Landscape Architect  
Suite 1708, A-B Gaslight Tower  
Atlanta, Georgia 30303
7. Jacob O'Hara and Company  
Jenny O'Hara  
514 West End Avenue  
New York City, New York 10024