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TREES FOR URBAN USE IN PUERTO RICO AND THE VIRGIN ISLANDS

INSTITUTE OF TROPICAL FORESTRY PUBLICATION

by

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TREES FOR URBAN USE IN PUERTO RICO AND THE VIRGIN ISLANDS

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Summary

Forty-six tree species useful for shade and ornament in Puerto Rico and the Virgin Islands are described and illustrated. Information is also provided about planting, maintenance, and appropriate use of trees in urban areas.

Acknowledgments

I thank the following for their help: Terry Tenold of the Caribbean National Forest for preparing original drawings; Prof. Roy O. Woodbury for help with identification, nomenclature, and characteristics of the various species; and Dr. Luis F. Martorell for information on insects, diseases, and other problems.

Contents

Introduction

The increasing urbanization of our society means that more and more people are isolated from nature. Trees can help make urban areas more pleasant and liveable by introducing diversity, greenness, and beauty into an otherwise monotonous scene of buildings and pavement. Trees with colorful flowers or foliage add extra attractiveness.

Trees also affect the physical environment. In the tropics, where there is year-round warmth and sunshine, they help reduce temperatures by providing shade and by intercepting, absorbing, and reflecting solar radiation. Also, they function as natural air-conditioners by evaporating water from their leaves through the process of transpiration. A single, large well-watered city tree can transpire 100 gallons (about 380 liters) of water in one day, producing the cooling effect of five average room air-conditioners running 20 hours a day. A single tree standing alone will not affect the overall surroundings much, but groups or belts of trees or many trees scattered throughout a neighborhood can be quite effective.

Trees may also help reduce air pollution. Leaves can absorb gaseous pollutants and can physically trap particulates on their surfaces, especially if surfaces are hairy, spiny, or waxy. Twigs, branches, and stems can also intercept particulates. High concentrations of pollutants can damage and even kill trees, although species and even individuals within a species vary in their tolerance of pollutants. Trees that are particularly sensitive could be used as early warnings of high pollution levels.

Trees and shrubs serve as screens to help insure privacy for house and garden. In properly designed belts they can decrease the force of the wind and reduce noise levels from highways and other sources. Even individual trees, if strategically placed around a house, can provide relief from noise and from annoying lights at night.

Trees and other vegetation also provide shelter for birds and other wildlife that would otherwise not be found within the city. Patches and belts of

vegetation serve as access routes allowing wildlife to penetrate into urban areas far from their natural habitat.

The benefits of trees in urban settings are greatest when good judgment is used in their location, selection, and care. The purpose of this booklet is to inform urban dwellers in Puerto Rico and the Virgin Islands about where to plant, what species to choose, and how to assure lasting benefits by good tree care. Forty-six of the most desirable trees for this region are reviewed in detail. Species included have been limited to those that are widely used and known to be adapted. Twenty-one less suitable or less adaptable species, and their limitations, are mentioned briefly in the Appendix. Fruit trees have not been included unless they are equally useful for shade or ornament. Successful culture of citrus and other trees for their fruit involves special techniques beyond the scope of this booklet. If you are interested in fruit trees, contact the local office of the Agricultural Extension Service.

Additional help on urban tree problems can be obtained through the Division of Forestry of the Puerto Rico Department of Natural Resources, the Forestry Program of the Virgin Islands Department of Agriculture, the Agricultural Extension Service, and commercial nurseries.

Where to Plant

The first thing to consider when planning for trees in your yard is the amount of space available. The size of your lot and the placement of the house on it limit the number and size of trees you can use. Figures 1 through 8 show some sample lots, house locations, and placement of trees.

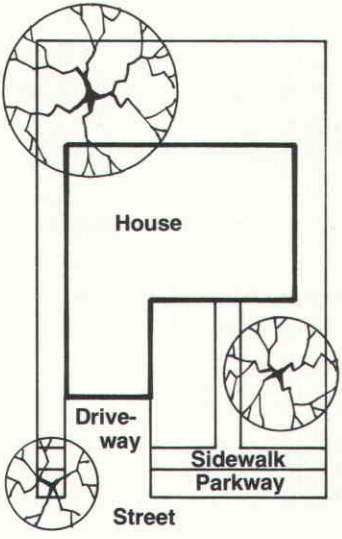


Figure 1.—Small lot with two small trees in front, larger one in back.

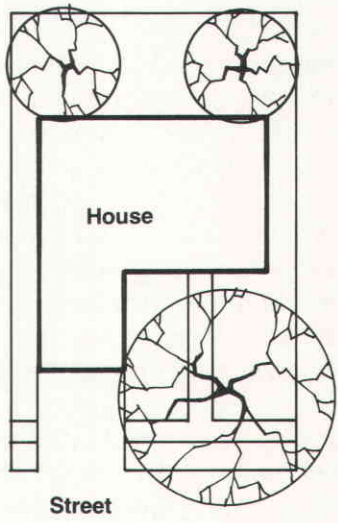


Figure 2.—Small lot with medium tree in front, two small ones in back.

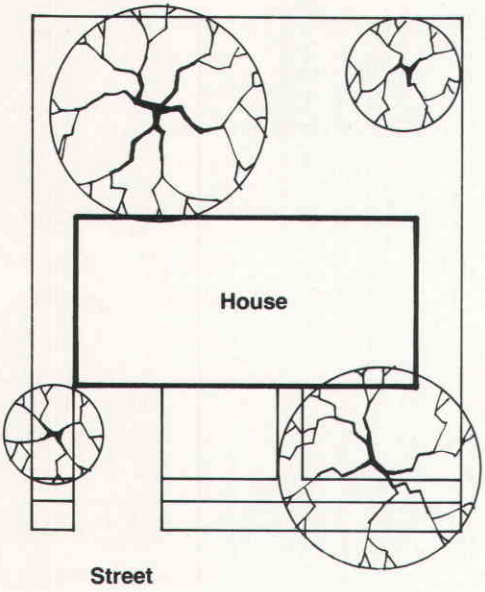


Figure 3.—Medium lot with house toward front.

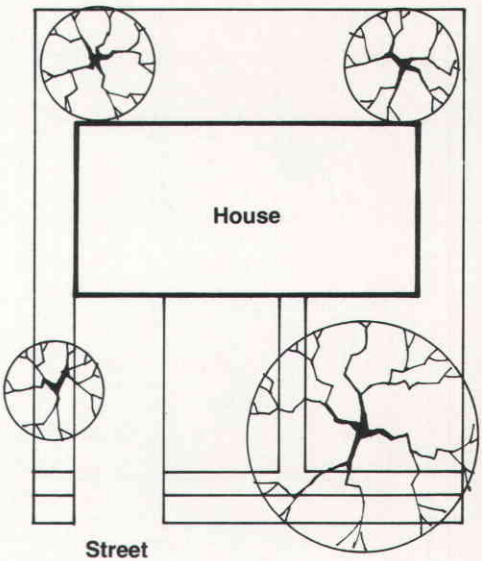


Figure 4.—Medium lot with house toward back.

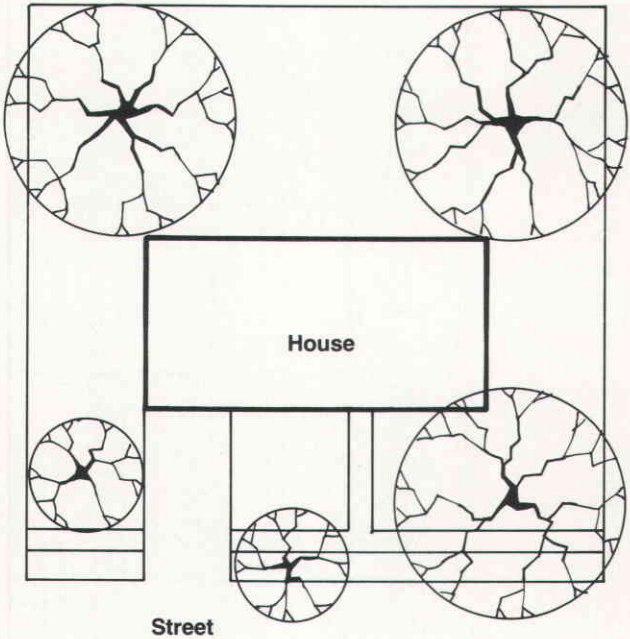


Figure 5.—Large lot with house in center.

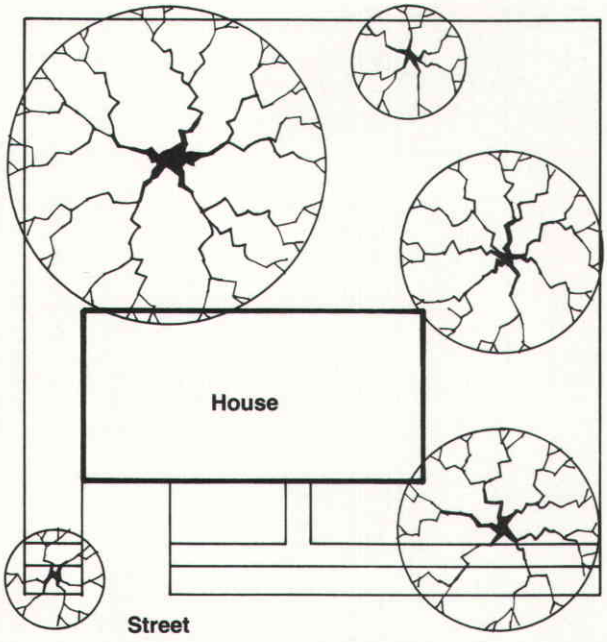


Figure 6.—Large lot with house toward front, leaving space for large tree in back.

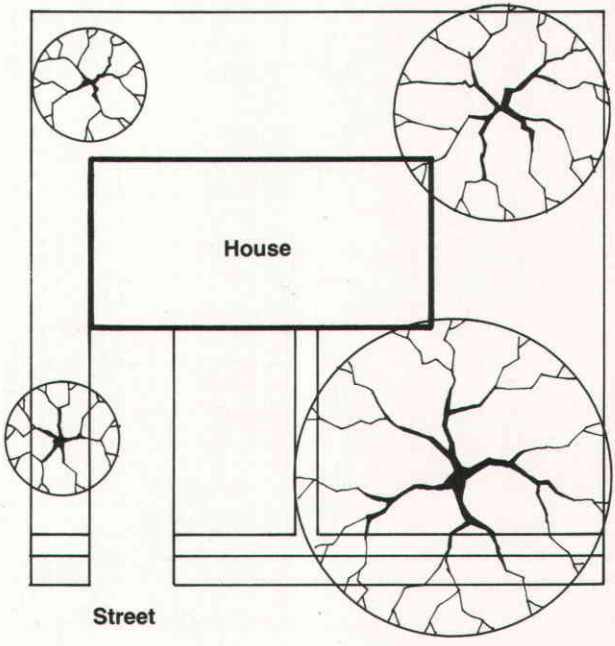


Figure 7.—Large lot with house toward back, large tree in one front corner.

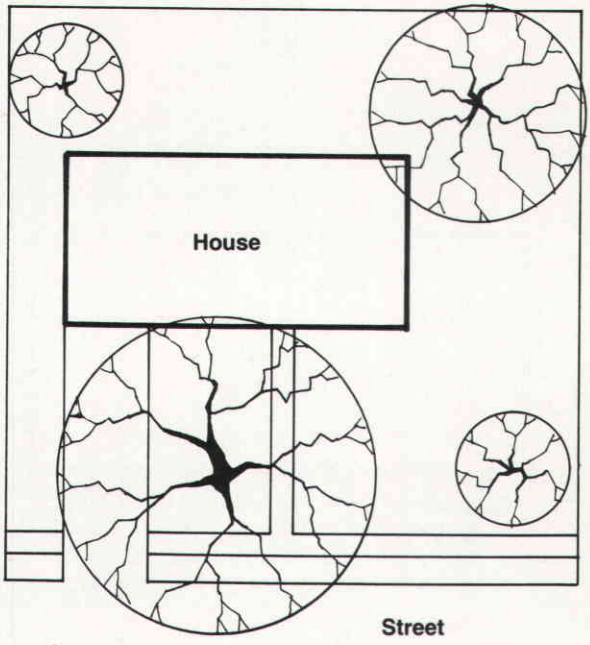


Figure 8.—Large lot with house toward back, large tree between entrance walk and driveway.

Next consider the orientation of your house and lot. An example is shown in figure 9, although most lots will not be oriented so perfectly to compass directions. What are the factors you want to modify? The hottest sun comes from the southwest in the afternoon, so make sure the trees you plant here will shade your window, patio, or garden area. Of course, you may also have areas you want to shade from the morning sun. Breezes, except in the interior of islands, usually come from the ocean in the day and the mountains at night, and you probably will not want to block these from cooling your house (fig. 10). However, you may want trees to serve as a screen or windbreak for protection near the ocean, to block out a highway or objectionable view, or to provide privacy for family areas of the garden. Bear in mind also that trees are the major and most permanent features of your garden, but that you will also have lawn, flowers, ground covers, and shrubs to achieve the overall effect you want.

Overhead wires, underground utilities, and the characteristics of the lot itself limit where you can plant. Overhead wires restrict the size of the trees that can be planted underneath or near them. Trees should not ordinarily be planted near underground utilities because if digging for repairs is needed the trees may be damaged. Also, roots can damage underground pipes.

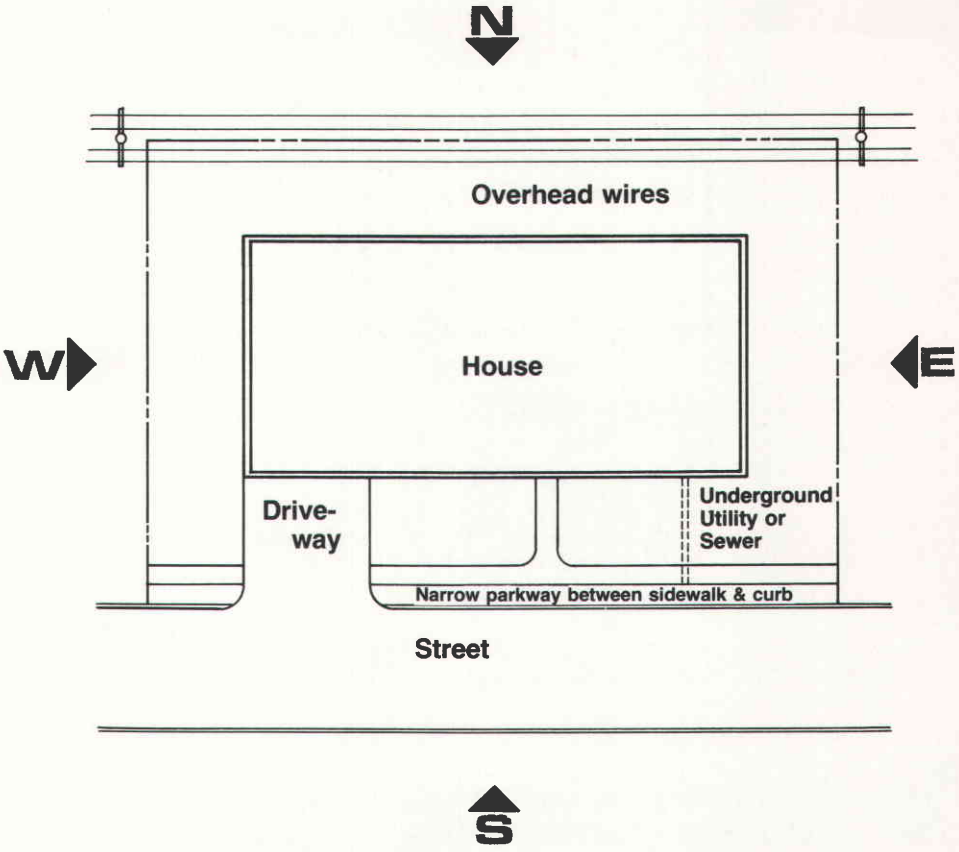


Figure 9.—Typical lot with compass directions and limiting factors indicated.

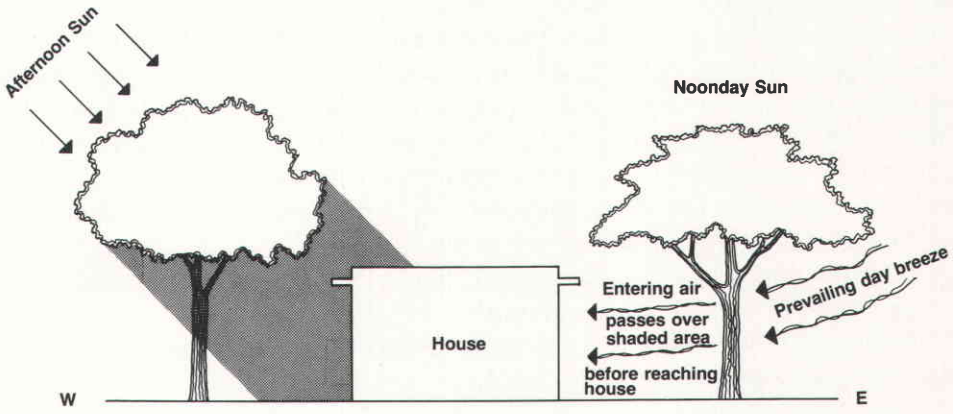


Figure 10.—Tree on left provides shade from afternoon sun. Tree on right is pruned permitting breeze to pass beneath crown.

Use grass, flowers, ground covers, or shrubs in such areas. Confined areas, such as a narrow unpaved parkway between the sidewalk and curb, are suitable only for trees whose trunk and roots are not likely to cause damage. Figure 11 illustrates some common problems that should be avoided.

Spacing of trees is also determined by size. Trees that will be large at maturity can be spaced closely for quick early coverage. As they grow larger, however, you will need to thin out the poorer trees to leave enough room for the remaining ones.

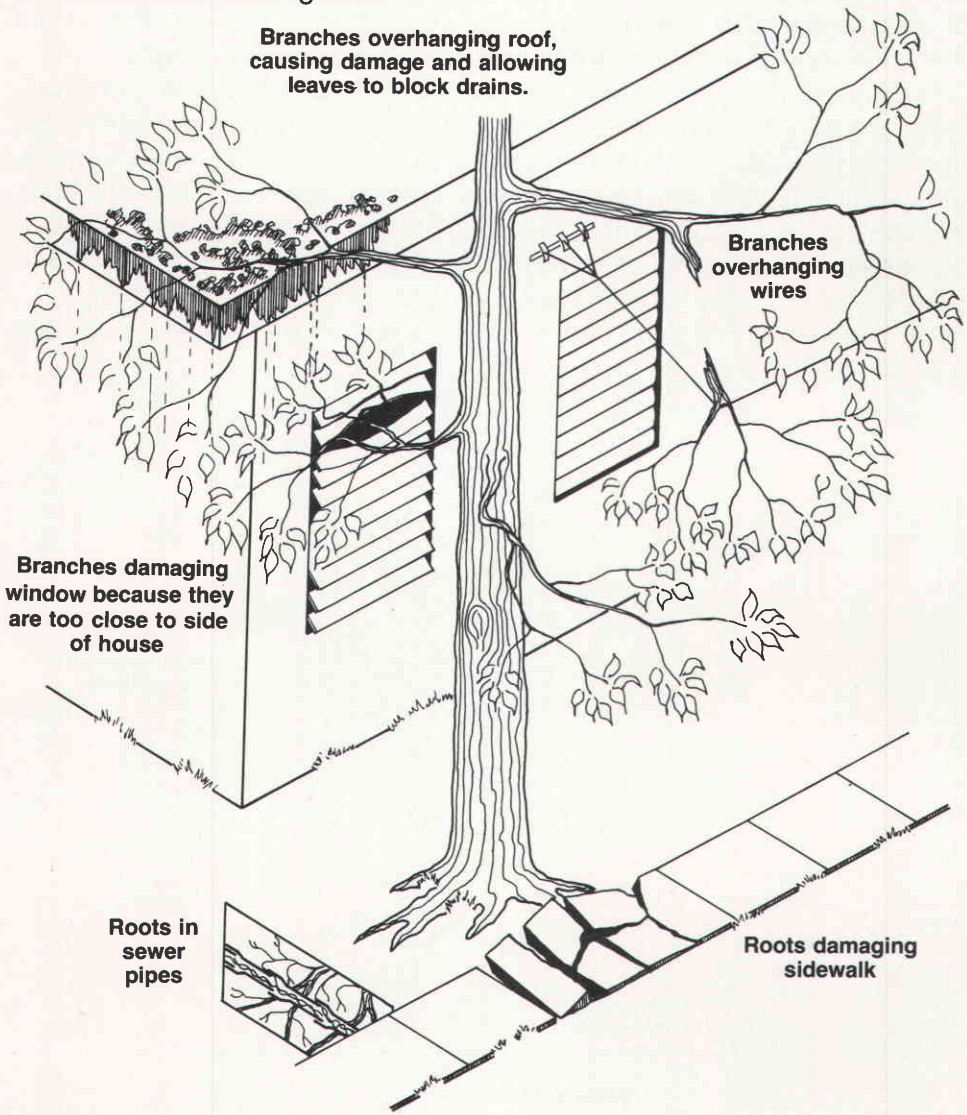


Figure 11.—Results of poor planning in tree location.

Trees along property lines should be located with consideration for their effect on neighboring yards. If you plant trees (and other vegetation) close to carports or driveways, be sure they will not block the view of drivers entering or leaving. Locate trees along the street so they do not interfere with street lighting, and do not plant so close to intersections that trees obscure approaching cross traffic.

Planting trees can be a community as well as an individual project. Trees can screen traffic along through roads and limited-access highways not directly bordered by trees in residential areas. The minimum setback from the roadway is prescribed by regulations of the Federal Highway Administration and local agencies, but within these limitations trees can relieve monotony if long stretches are not planted to only one species. Also, trees can highlight interesting features or views by leading up to or framing them. Planting a stand of flowering or ornamental trees in the open spaces within cloverleaf intersections adds visual variety and reduces maintenance; smaller trees and shrubs can screen opposing lanes of traffic (fig. 12). Here again, regulations govern the minimum setback from the ramp pavement, and trees should not be located where they will conceal merging traffic.

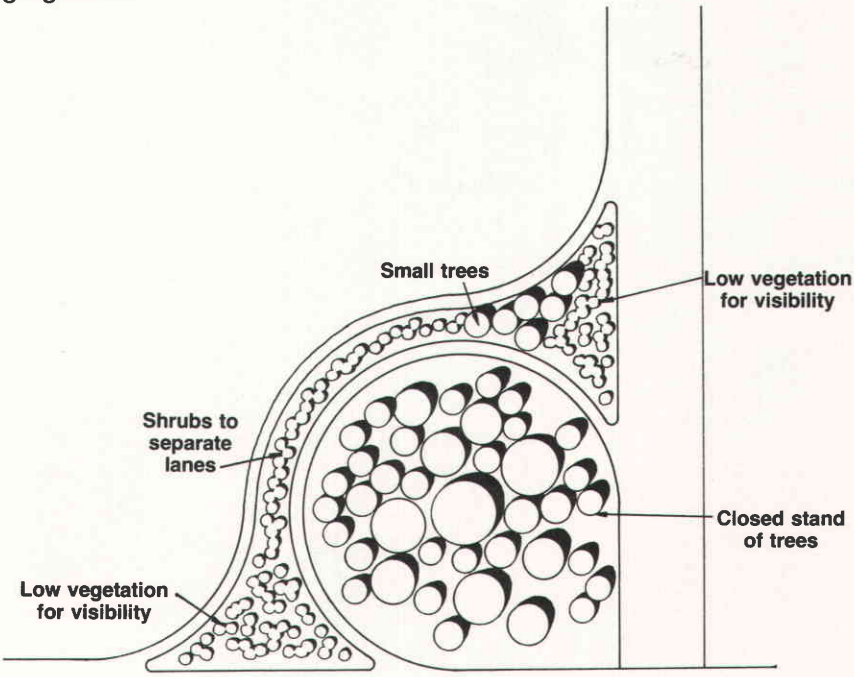


Figure 12.—One quarter of a clover-leaf intersection planted with trees and shrubs.

Around public buildings and in parks and plazas more and larger trees can be used than fit around most homes. Trees can guide traffic to the entrance, screen the parking area and part of the building, and provide framing and landscaping (fig. 13). In parks and plazas, trees can create a restful, country-like atmosphere in the midst of the city.

Trees can also be used to form greenbelts along streams or between subdivisions, to provide shelter for wildlife, and to bring the feeling of the forest into the urban area. They could be used, within the limitations of air traffic rules, as multi-row belts around the edges of airports to screen the noise and movement of aircraft from the surrounding neighborhoods (fig. 14). And they can be used in beach areas to provide protection from wind and salt spray, to furnish shade and relief from glare for beachgoers, and to create the tropical effect so commonly associated with Puerto Rico and the Virgin Islands.

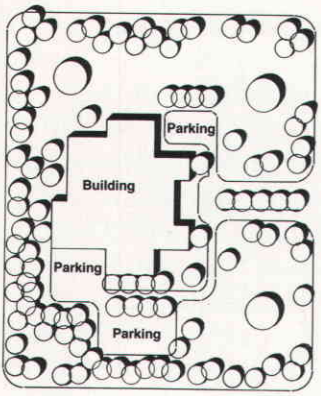


Figure 13.—Use of trees around public building.

Figure 14—This belt of casuarina planted beyond edge of airstrip screens adjacent area from air traffic.

What to Plant

Once you have decided where you want your trees, you need to consider the reason for planting each one. Is it for shade, screening, to frame the house or set off a view, to provide color with a flowering tree, or simply to have something green? The same tree can serve more than one function, but be sure that the species you select will fulfill your purpose.

The adaptability of the species is a first consideration. Some species will grow well under widely varying conditions, but others do best only under specialized conditions. For example, some will grow in dry areas, or on rocky or sandy soil; others, however, need good soil with adequate moisture and good drainage. Conditions can be modified, such as by supplying extra water or fertilizer, but planting a species adapted to your situation in the first place is easier. Also some conditions such as poor drainage or salt spray close to the ocean may be expensive or impossible to modify.

The ultimate size and growth habit must also be considered. The mature size of the tree should fit its location. A species with a large spreading crown should not be planted where it will interfere with overhead wires or nearby buildings (fig. 15). If it cannot be given enough room, smaller species should be chosen. The type of foliage influences other vegetation to be planted beneath the tree, because many grasses, flowers, and shrubs will not grow well under trees with dense evergreen crowns. The tree species planted and the underplanting should be compatible. If a lawn or other shade-intolerant vegetation is desired, use trees that cast only light shade. Or if a dense-crowned tree is planted, use a shade-tolerant ground cover.

You should also consider the tree's rooting habit. All trees have some roots near the surface, where most nutrients are available. But in some species these roots grow quite large on the surface of the ground and may

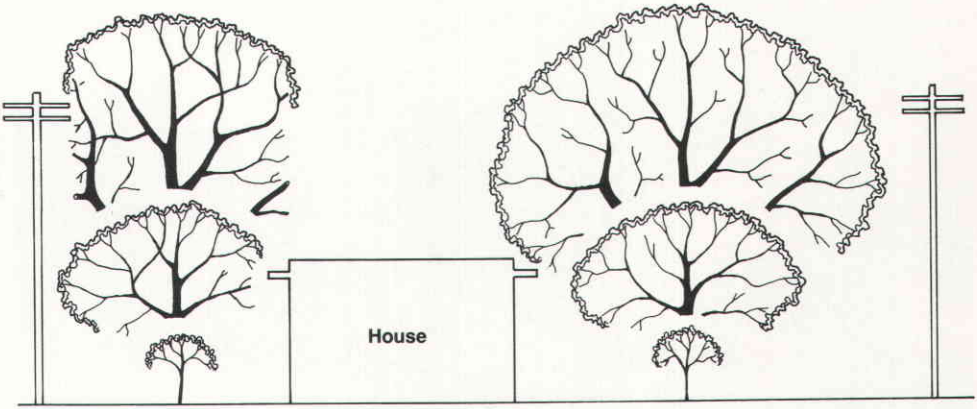


Figure 15.—Tree on left, although apparently with adequate room when small, will be too close to house and wires as it matures. Tree on right has adequate room for mature size.

damage sidewalks, driveways, other improvements, and even the foundations of buildings. If a tree of this type is planted, it should be in a large area where roots are free to develop without interfering with structures or other plantings. Also, the roots of certain species are known to grow into and clog sewer and other water lines, so do not plant these species near storm or sanitary sewers, septic systems, leach beds, or any open water pipe.

All trees shed leaves, fruit, dead branches, and other parts from time to time. Some species shed gradually, and shedding is hardly noticeable. But others create considerable litter because the leaves are large, because most leaves fall in a short time, or because falling flowers or fruits are messy. Do not plant such trees around a formal patio or other garden area that must be kept tidy, or near a swimming pool. Also, trees that will overhang a driveway or other parking area should not have sap or fruit that stains cars.

Some trees have thorns or spines, irritating or poisonous sap, or poisonous fruits, seeds, or leaves. These species should not ordinarily be planted, especially where there are small children, unless they are planted in a safe out-of-the-way place. For some situations such species may be chosen because of specific attributes of growth or appearance, but this should be done with full knowledge of the potential hazard they represent.

Hurricanes and high winds must be considered in the Caribbean area. If you plant species that are particularly susceptible to wind throw or breakage, place them where their loss will not cause any major damage.

A tree intended to frame the house should not be so large that it completely dwarfs the building. One planted to provide color should complement the overall decor. If you want to set off a view, plant species that will frame the view but not intrude into it. If the tree itself is to be the focal point, choose a species that will draw attention because of its shape or floral display.

Some trees are most effective when more than one is used at a time. For example, casuarina and coconut give a maximum tropical effect when planted in groups along the beach. And the full stately effect of the Puerto Rico royalpalm is obtained when a row of them is planted along a street, walk, or border. Planting of trees along streets is usually most effective when the same species is used along a section, giving an impression of order and planning. But planting large areas with a single species is risky, because an insect or disease could cause catastrophic losses. A possible solution is to plant the same species along one block of a street, alternating with more or less equal-length sections of several to many other species.

Establishing and Caring for Your Trees

Selecting Stock for Planting

Most readers probably will obtain their planting stock from a nursery. Nursery stock is usually available either as bare-root or as container-grown plants. Bare-root means that the plant has been dug up and all the soil removed from the roots so it can be handled and transported easily. Some roots are destroyed in the process, and those that remain must be carefully protected from drying and breakage. Bare-root plants are often used for large-scale forest plantings, but not so often for ornamental plants that are individually more valuable.

Container-grown plants are raised in cans, plastic pots, polythene bags, or similar containers. The tree is carefully removed from the container and planted with the roots and soil intact. The tree is not subjected to the shock of having its roots disturbed and removed from the soil, so planting may be more successful even during dry weather.

Many species can be propagated vegetatively, by producing a new plant from a branch or root of an existing one. Vegetative propagation is the only way to reproduce many horticultural varieties such as particular growth forms, flowering types, and fruit that will not come true from seed. Methods of vegetative propagation are shoot and root cuttings, grafting and budding, layering, and inarching. The usual method of propagation is mentioned for each species in the individual descriptions. If you are interested in more information on vegetative methods, consult a book such as Hartmann and Kester (1975).

Planting

First, clear all vegetation in a circle at least 6 inches (15 cm) wider on each side than the diameter of the planting hole you plan to dig. The planting hole itself should be about 2 feet (60 cm) wider and 6 inches (15 cm) deeper than the root mass of the tree. Also break up the soil at the bottom of the hole so roots can penetrate it more easily (fig. 16). Save the soil you remove and mix it with peatmoss, compost, or other organic matter to improve the texture of the soil and make it easier for new roots to grow out from the original root mass. Unless you have heavy clay soil, mix in about one shovelful of organic matter for each shovelful of soil.

If the soil in your garden is heavy, clayey, and sticky, the growing roots will have a hard time penetrating it when they reach the edge of the improved soil in the planting hole. Also, water will drain slowly from the loose soil mixture into the heavier clay, so the soil in the hole may become waterlogged if you water too much. With such soil, you should mix an equal

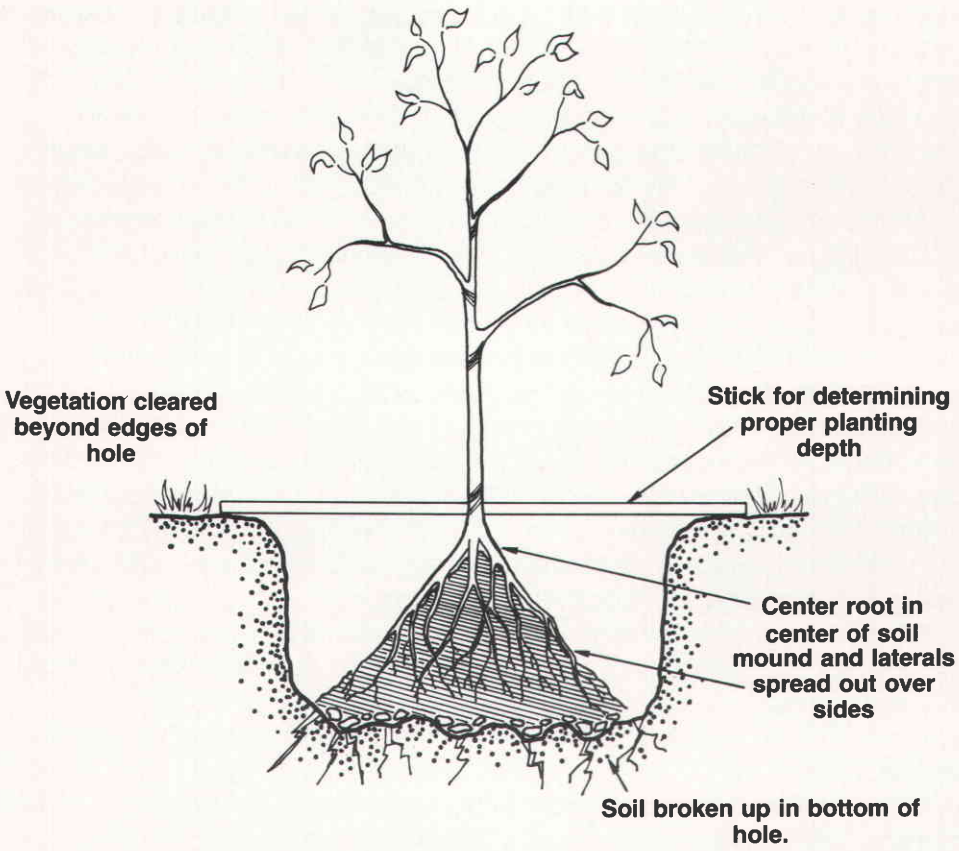


Figure 16.—Planting method for bare-root tree.

amount of organic matter only for the area immediately around the root mass. Then make a transition zone to the heavier soil around the edge of the hole by filling with soil to which you've added only about one shovelful of organic matter for each three to four shovelfuls of soil. A larger planting hole would also give the roots more good soil for their initial growth.

Put enough of the prepared soil mixture into the bottom of the hole to raise the root mass so the tree will be at the same depth in the ground as it was in the container, or in the soil in the nursery. A straight stick or tool handle placed across the top of the hole will make it easy to determine the proper depth (fig. 16). For a bare-root tree, look for a distinct color change in the bark low on the trunk just above the roots. This color change marks the former soil level.

If the tree is bare-root, the roots should be placed in a pail of water or kept covered with moist peatmoss or other material until the moment of planting.

Put the central root straight down through the middle of the mound of soil in the hole, and carefully arrange the lateral roots so they are naturally spread out over the mound in the hole (fig. 16). Cut off broken or damaged roots just inside the break. Then fill in about two-thirds of the prepared soil mixture, carefully distributing it around the roots. Thoroughly soak the soil to eliminate air pockets and get complete contact between soil and roots. When the water has drained away, fill in the rest of the soil and water again.

If the tree is container-grown, carefully remove the container without disturbing the mass of soil and roots. If the container is tapered or has fluted sides, you can probably loosen it by setting the container on its side and rapping the rim sharply several times; the root mass should then slide out easily. If not, or if the container has straight sides, you will have to cut it apart. Using tin snips for cans or plastic pots, make two cuts down opposite sides. Large containers may need three or four cuts. But be very careful with cut cans because the edges are sharp and can inflict a serious cut. Polythene bags can be cut open with a knife. When handling the tree the root mass should always be supported with a hand beneath it or holding the container, not holding only the stem, because the weight of the root mass and growing medium may damage or break the stem or roots.

When the container is removed, you may find that the roots are spiralling around the outside or bottom of the root mass. If so, carefully tease them out and spread them in the planting hole, or cut them back if they are too entangled to be separated. Otherwise they may continue their spiral growth instead of spreading out into the surrounding soil.

Once the tree is out of the container, place it on the soil mound in the planting hole and fill in with the rest of the soil mixture (fig. 17). Then pack the soil firmly around the root mass to make sure there are no air pockets, but don't compact it so hard that air and water can't reach the roots. Finally, water well but do not waterlog the soil, or you may drown the roots.

For both bare-root and container-grown trees, build up a rim of soil around the edge of the planting hole to form a saucer-shaped watering basin (fig. 18). When watering, flood this basin slowly so the water gradually saturates the root zone. On clayey soils or in wet areas, you should make a surface drain through the rim of this basin during the wettest part of the year, so that water doesn't stand in the basin and drown the roots. Covering the bare soil within the basin with a loose mulch helps prevent it from drying out rapidly, and also protects it from direct sun and hard rain.

For certain species, as mentioned in the individual descriptions, it is also possible to dig up and plant natural seedlings (wildlings) that have become established at the edge of the forest or under parent trees. To save and protect as much of the root system as possible, you must dig up these wildlings carefully. If you can dig and lift them with a ball of earth around the

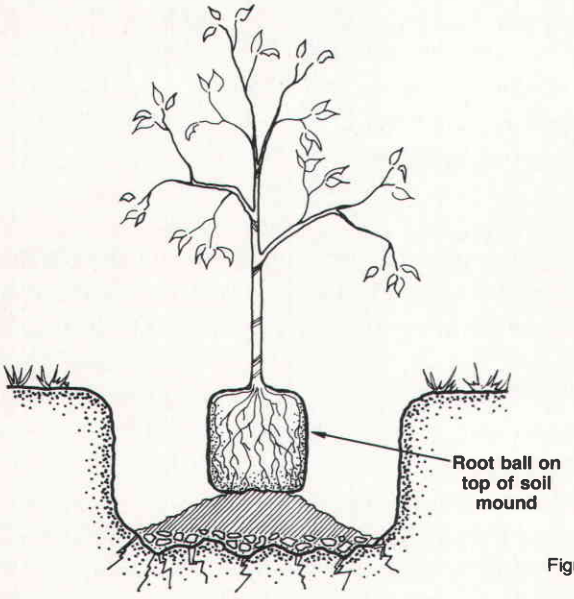


Figure 17.—Planting method for container tree.

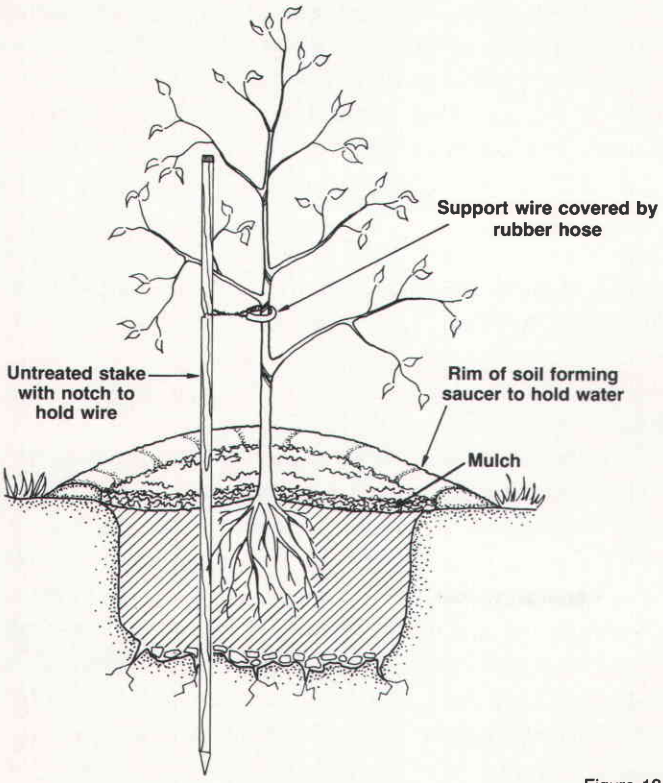


Figure 18.—A tree correctly planted.

roots, plant them like container plants; otherwise, plant them like bare-root plants, but do not let the roots dry out during handling and planting. Tops should be pruned back to reduce water loss until the roots become reestablished (see below). Wildlings, however, are usually inferior to nursery-grown trees because they have not been especially grown to develop strong, transplantable root systems.

Staking

After the tree has been planted, you should stake it for support and protection. For small trees, a single stake on the windward side of the tree is usually enough (fig. 18). Thread the wire around the tree stem through a section of garden hose so that it will not damage the bark. At the stake, place the wire in a notch or otherwise fasten it so it will not slide down the stem. The stake should not be treated with preservatives if it is driven into the ground close to the tree's roots, because the chemicals may injure the roots. Instead, use either a stake made from naturally durable wood or a length of pipe. For trees taller than about 3 feet (90 cm), more than one stake may be needed. A convenient system is to use three stakes spaced equally around the tree (fig. 19). Adjust the support wires so that the tree stem is held upright and tension is equal on all three sides. Treated stakes can be used here if they are driven into the ground outside the area of the planting hole. Inspect the hose-enclosed wires several times a year to make sure the stem has not grown too large for the loops. Also, examine the stakes to be sure they are still solid, especially if untreated wood was used. Staking should be continued until the root system is well established and the trunk is strong enough to hold the crown erect.

If necessary for protection from scratching or gnawing animals, a cylinder of wire fencing or screening at least 2 feet (60 cm) in diameter, slightly sunk into the ground and perhaps supported by a stake, can be placed around the stem.

Pruning Newly Planted Stock

Small container-grown trees usually do not require pruning at planting time unless they have damaged branches. But larger trees, and those planted bare-root, should be pruned or have a number of the leaves removed just after planting. Pruning will reduce water consumption until the root system has reestablished itself. Remove about one-third of the tree's top growth or foliage by thinning out damaged and misshapen branches and any that cross and rub against each other, and by cutting back others such as those that are unusually long. Do not cut back the leader or terminal bud, and try to retain the tree's natural shape as much as possible.

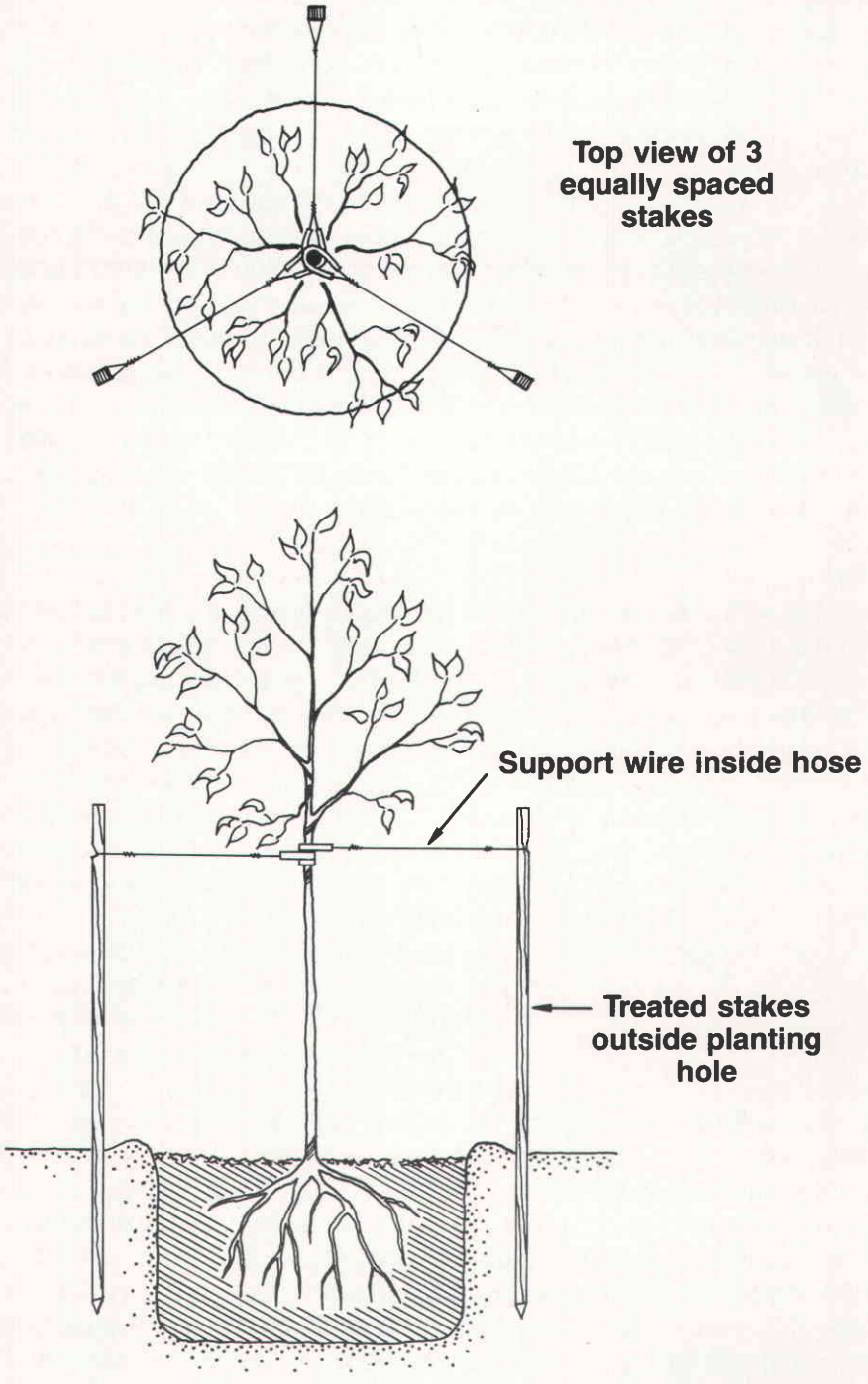


Figure 19.—Method of staking tree over 3 feet tall.

Watering

For about the first 6 months the newly planted tree often needs special watering. During the rainy season, natural rainfall may be sufficient, but during the dry season and in drought periods extra water will be needed. Soak the soil under the tree's crown once or twice a week; trees adapted to dry areas need less moisture than those adapted to wet areas. To be effective, the water must penetrate deeply into the soil, down to and beyond the roots. Frequent light sprinklings only moisten the surface and may result in shallow root development, which makes the tree vulnerable during long droughts. Allow the soil surface to dry between waterings so that air can be absorbed as water drains out of the pore spaces. To allow the roots to develop without competition from the lawn for water or nutrients, keep the area of the planting circle clear of grass for several years. After the tree is well established, it can usually survive with no extra water even during droughts. But for best results it should be watered if the leaves show signs of wilting, especially if it is a tree adapted to wet areas.

Fertilizing

The prepared soil mixture that was placed in the planting hole will furnish an initial supply of nutrients to the young tree. Do not mix ordinary commercial fertilizers with this soil, because they may burn the tender new roots. (Slow release fertilizers are an exception, and can be used if the directions on the label are followed.) However, the tree may need fertilizer periodically to keep it growing well. Ideally, its requirements should be determined by a chemical analysis of the soil, which would show exactly what nutrients are lacking. The local office of the Agricultural Extension Service may be consulted for advice. In the absence of a soil analysis a good general rule to follow, for young trees less than 6 inches (15 cm) in diameter measured at 4½ feet (1.4 m) above the ground, is to use about 1¾ lb (¾ kg) per year of a 15-5-10 (nitrogen-potassium-phosphorus) fertilizer for each inch (2.5 cm) of trunk diameter. For established trees that have a larger diameter, about 3½ lbs (1½ kgs) per inch (2.5 cm) of trunk diameter should be used. Apply half the yearly amount about every 6 months. For flowering and fruit trees, one of these applications should be made at the beginning of the flowering season for maximum flowering and fruiting.

Fertilizer can be sprinkled lightly and evenly over the ground beneath the tree's crown, starting about 1 foot (30 cm) from the trunk and extending out to the edge of the crown. Water the soil thoroughly afterwards so that the fertilizer begins to dissolve and soak in and does not burn the grass beneath the tree. On lawns, a good way to get the fertilizer down to the tree roots without seriously disturbing the grass is to bore holes into the ground in a pattern as in figure 20. Holes should be drilled with a soil auger, because

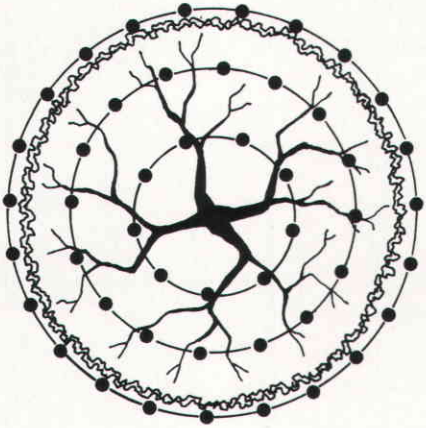


Figure 20.—Pattern for boring holes to fertilize tree. Circles are 2 ft. (60 cm) apart, and the holes in each circle are also 2 ft. (60 cm) apart.

punching them with a crowbar compacts the soil around the edges. Each hole is 1 to 2 inches (2.5-5 cm) across and 10 to 15 inches (25-35 cm) deep. To distribute the fertilizer more widely, drill holes at an angle instead of straight down. To reduce its concentration and make enough to distribute to all the holes, mix the fertilizer with an equal amount of soil or sand. Pour a little of the mixture into each hole; then fill the holes with soil.

Fertilization should not be overdone, because too much fertilizer can build up in the soil and harm the tree. The amounts recommended above should not be exceeded unless a soil analysis has shown a deficiency. Also, if the tree appears to be growing normally with healthy green foliage there is probably no need to fertilize. But trees that are obviously deficient in nutrients, or that have been weakened by defoliating insects or other damage, should be fertilized promptly.

Pruning Established Trees

Start pruning early in the life of a tree, eliminating undesirable growth while leaving only small wounds that will heal quickly. Also, prune gradually so that too many branches are not removed at one time and the tree keeps as much foliage as possible.

Low branches that obstruct the passage of vehicles or pedestrians along streets or in parking lots, or that hang too low in a garden, should be removed as soon as the tree is tall enough. The ultimate aim is to produce a tree that looks as natural as possible (unless formal shaping of a tree adaptable to such treatment is desired).

Figure 21 illustrates branch terms and some types of undesirable growth. Suckers and water sprouts are undesirable, so remove them as soon as they develop. Crotches that are V-shaped split easily and should be cut back

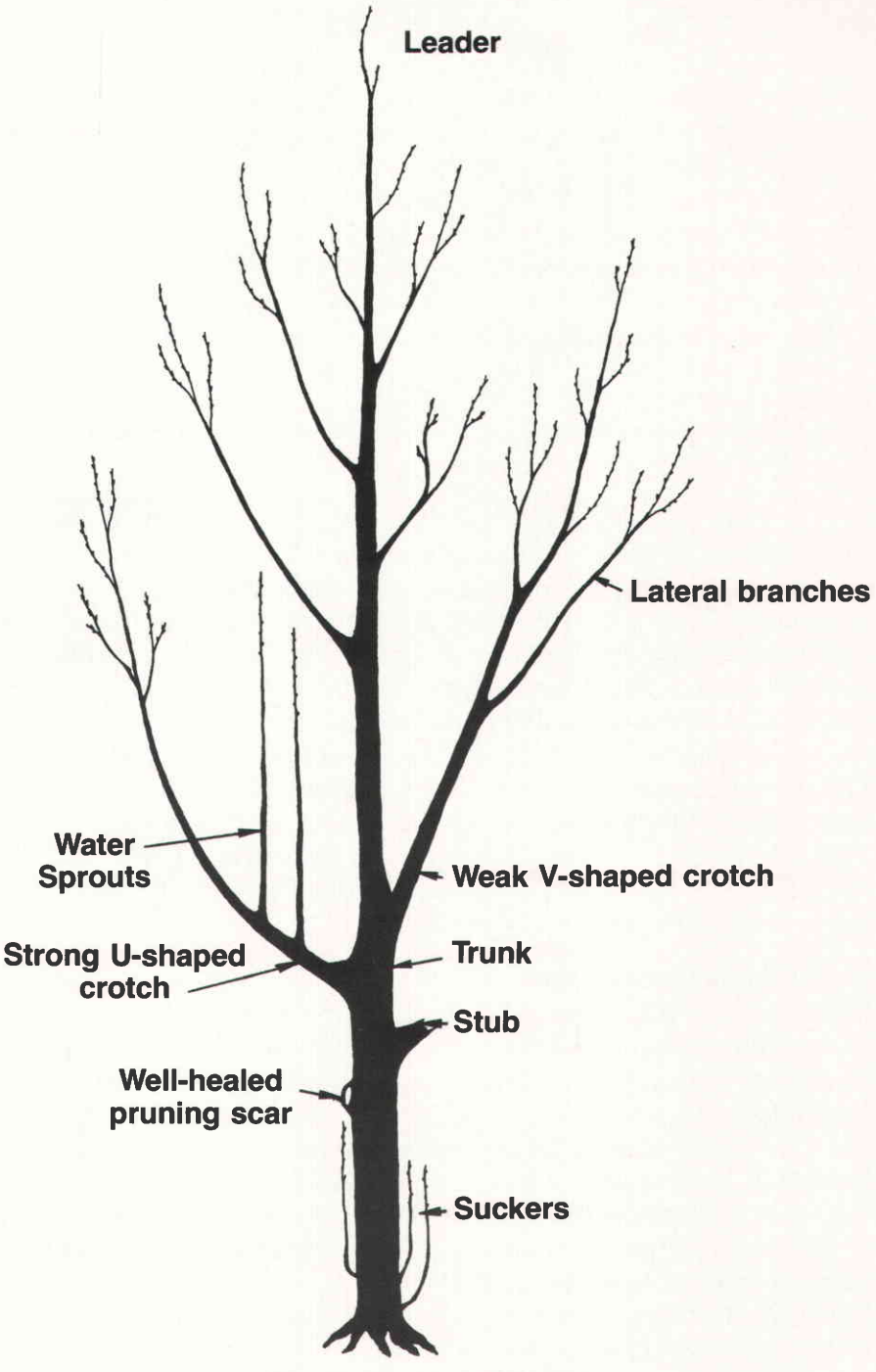


Figure 21.—Branch terms used in pruning.

to one stem when possible. To avoid leaving a stub make the final cut where the two sides join solidly. Cut protruding stubs off flush with the stem, because they usually die back to the stem and serve as an entrance point for decay. Also, remove branches that cross over and rub against another branch or the trunk, because the friction will eventually cause bark damage through which decay can enter. Lateral branches that are too long or are growing in the wrong direction can be cut back to just above a healthy bud or a side branch that is in the right position for further growth. Do not cut the leader or terminal bud unless you want no further height growth. Sometimes, injury to the terminal bud causes multiple leaders to develop. To restore dominance and normal development, cut back all but the strongest leader.

Always remove dead, dying, and diseased branches as soon as possible by cutting back to a healthy crotch or in healthy wood at least 4 inches (10 cm) below any visible signs of infection. To avoid spreading infection when cutting in diseased wood, disinfect tools by dipping them into or wiping them with 70% alcohol between cuts.

Pruning tools should be kept sharp and in good condition. To get a good flush cut when using shears, be sure the cutting edge is next to the stem (fig. 22). For limbs that must be sawed off, cut in three steps as shown in figure 23

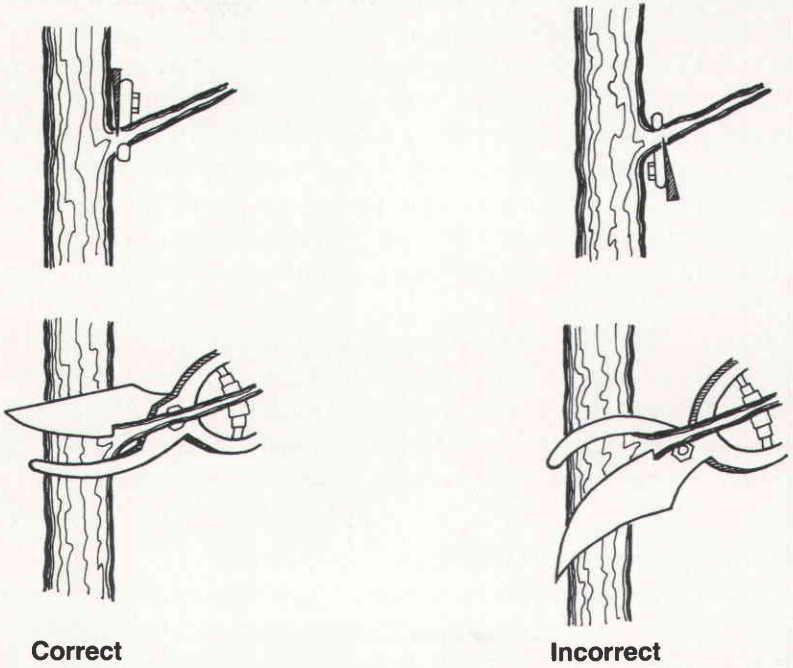


Figure 22.—Use of pruning shears. Correct method on left with blade next to stem produces clean cut. Incorrect method on right leaves stub.

to prevent bark from tearing down the stem and leaving a large wound when the branch falls. Large stem wounds can be shaped into an upright oval that will shed water and heal more quickly by carefully cutting in healthy bark with a sharp knife (fig. 24).

Wounds may be painted with a commercial tree-wound dressing that has an asphalt base, or with orange shellac. Do not use ordinary house paint or other preparations not specified for plants. However, no dressing will always prevent decay. The best results are obtained by pruning properly to leave small wounds in healthy tissue which can heal rapidly.

Avoiding Soil Disturbance

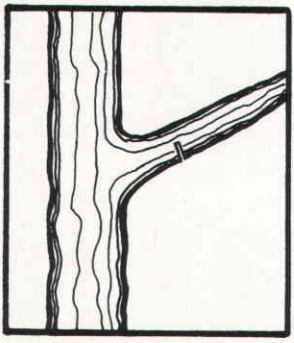
Tree roots need access to moisture and oxygen if the tree is to remain healthy. Changing the soil level above the roots can affect the supply of both water and air. There is not much problem with the addition of up to 4 inches (10 cm) of soil, provided it is fairly porous and not packed down solidly. A thicker covering will require special procedures, including a well around the trunk and gravel or drain tile at the original soil level to allow water and air to reach the roots. This is likely to be very expensive and is not always successful, so avoid such changes if possible, or obtain professional advice before undertaking them.

Soil under established trees should not be covered with a pavement of asphalt, concrete, or other impervious material because such covering cuts off the supply of water and air to the roots. Trees can be planted in openings in such areas, for example in parking lots, but they should be small trees whose root systems can adapt to the confined conditions. Soil compaction from trucks or other heavy equipment driving repeatedly over an area is also bad. When such activities are going to take place, fence off the area under the crown of established trees with sturdy barricades if possible, both to protect the roots and to prevent physical damage to the trunk from the equipment.

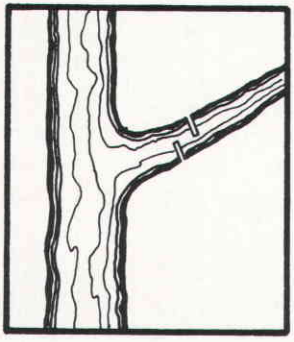
Removing soil from around a tree can also cause problems, because it may remove roots that not only keep the tree alive but also help to anchor it. Again, obtain professional advice for the special procedures needed to safeguard the remainder of the roots. But the likelihood of success is limited if more than a small portion of the root system is affected.

Controlling Insects and Diseases

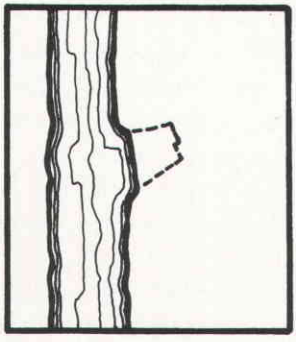
Problems with insects and diseases are a fact of life when growing plants. The best way to avoid these is to choose species that are relatively free from pests in the area where they are to be planted. The individual species descriptions give, under **Limitations**, any major insect or disease problems that affect each one.



First cut, from below and at least one-third of the way through the branch, keeps bark from tearing down stem as branch falls.



Second cut, from above and about 1 inch (2.5 cm) further out, severs main part of branch.



Third cut removes stub flush with stem.

Figure 23.—Procedure for cutting large branches.

Awareness of the need for conservation and environmental protection has brought an emphasis on an overall biological approach to pest control. We now know that broad spectrum pesticides kill not only the target organism, but many beneficial ones as well, and the long-term result may be a more severe problem after the natural enemies that helped keep a pest in

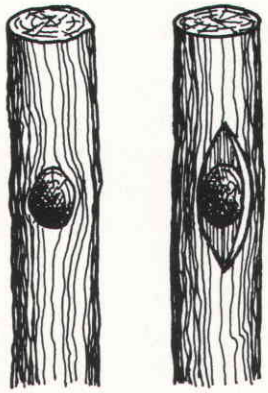


Figure 24.—Wound shaped into upright oval will shed water and promote healing.

check have been eliminated. Thus pesticides are just one component of the system, and should be used only when there is no other alternative to prevent extensive damage.

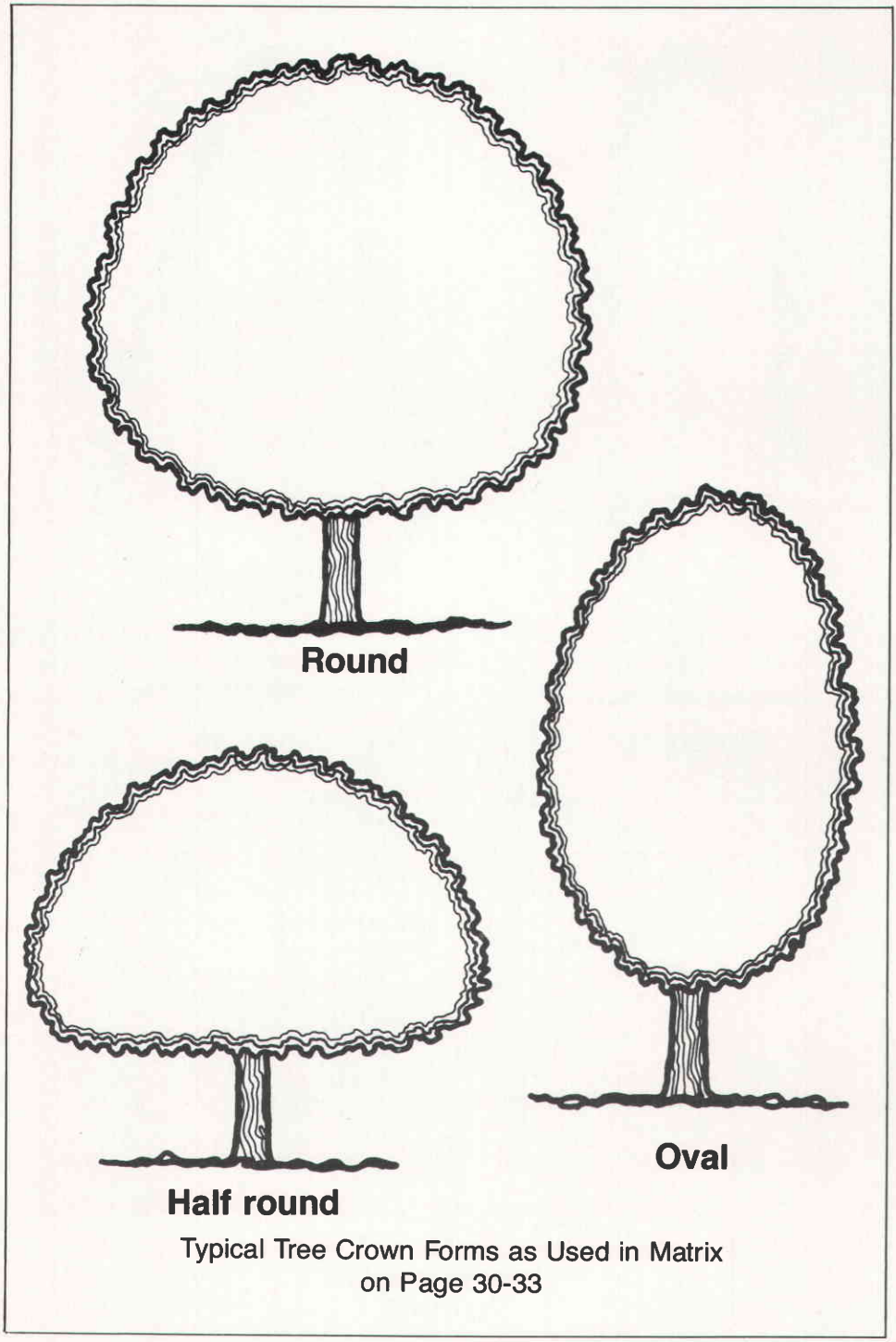
An important part of biological control is prevention. Avoid injury to trunks or roots of trees during lawn mowing and other garden work. Keep your yard free of debris where pests can develop, and burn or dispose of infested material promptly. Use a high curb or barricade to protect trees in parking lots from damage by cars.

When a problem does occur, the first step is to evaluate whether control is really needed. Many insect or disease attacks come in short-lived waves triggered by weather or season. There is no need to treat a problem that will soon go away by itself. Also, it is unrealistic to expect total eradication of most problems. A few chewed leaves will not bother the tree if the pest is not allowed to build up to epidemic proportions.

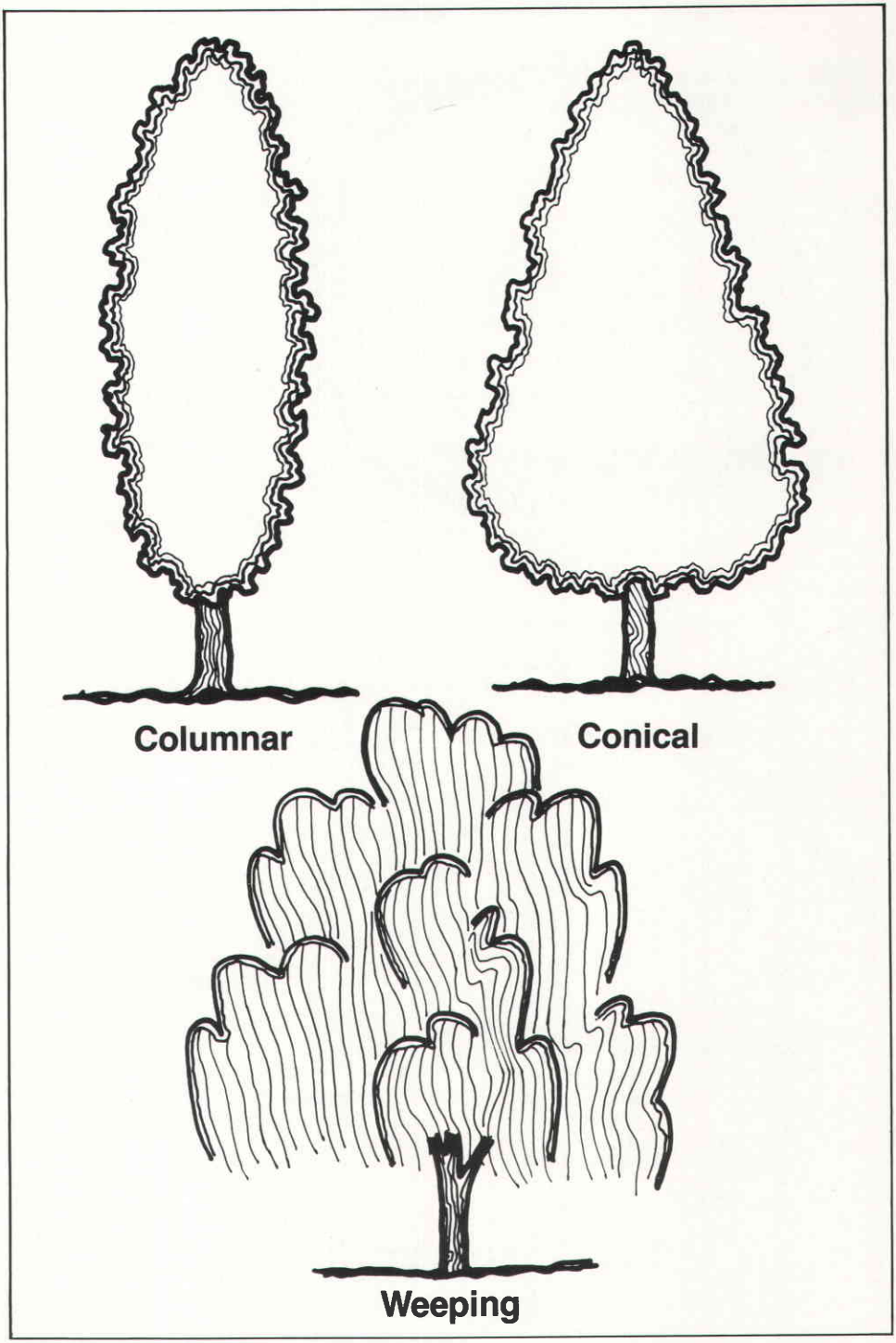
If control is necessary, will simple methods do the job? On small trees, some insects can be picked off by hand and drowned in kerosene. Others can be washed off the leaves or stems with a garden hose. A cloth or an old toothbrush can be used to clean infested leaves or new growth with soapy water. Infected twigs and branches can be pruned off and burned or otherwise disposed of where they will not serve as sources of further infection.

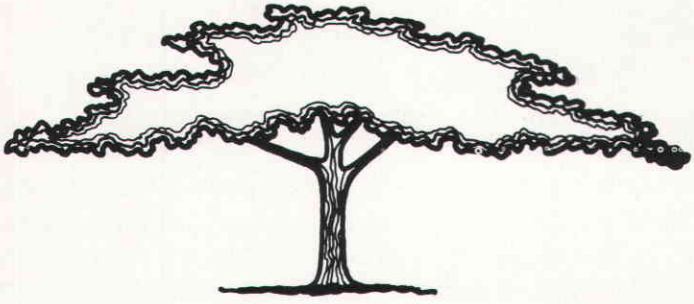
When the above methods fail, or for larger trees, a pesticide may be needed. If so, try by careful inspection to determine the organism responsible. Or ask the local office of the Agricultural Extension Service for help. Then look for a product at a nursery or garden store that is registered for that particular organism, and carefully follow the directions. After treatment, fertilize and water trees that have been damaged by pests.

The ordinary gardener cannot treat large trees. So if you find you have planted a tree that suffers continual pest problems, replace it with a better species before it gets any larger and more difficult to remove.

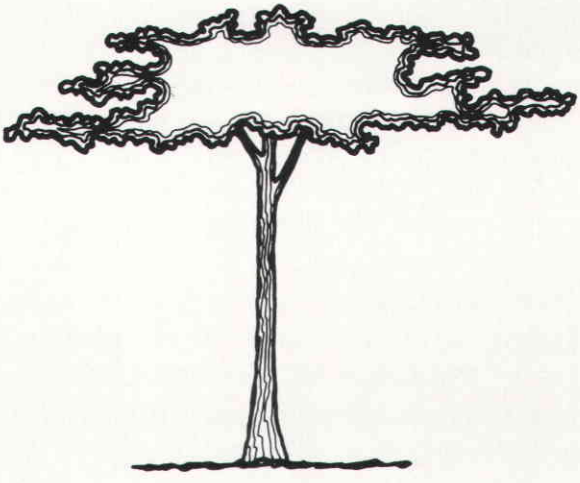


Typical Tree Crown Forms as Used in Matrix on Page 30-33

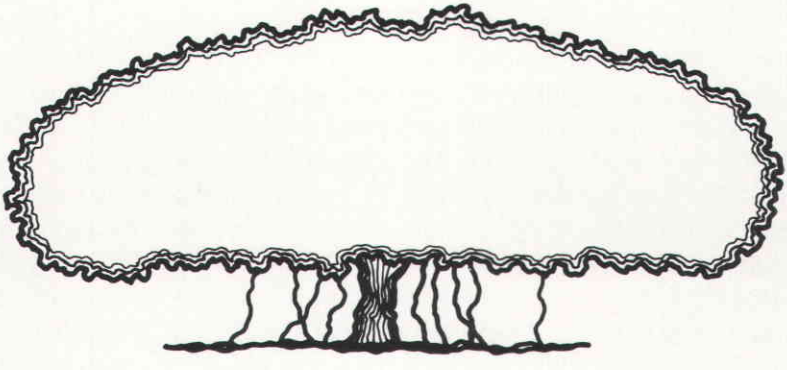

Columnar
Conical
Weeping



Umbrella



Flat-topped



Banyan

Notes for Matrix and Species Descriptions

The matrix on the next several pages lists the species in alphabetical order by scientific name and briefly indicates size, adaptability, and special features. A section of one-page descriptions with illustrations for each species follows. Use the matrix to identify one or more species that seem to be adapted to your situation, then turn to the descriptions to make a definite selection. If you are interested in a particular species for which you know only the common name, look in the index where the common as well as the scientific names of all species are listed with the page number on which each is described or mentioned.

Nomenclature follows Little and Wadsworth (1964) and Little, Woodbury, and Wadsworth (1974). The black and white illustrations of leaves, flowers, and fruit for each species are taken from these two publications.

In the matrix, the size ranges used are:

Height	Crown Spread
Short — less than 30 ft (9 m)	Narrow — less than 25 ft (7.5 m)
Medium — 30 to 60 ft (9-18 m)	Medium — 25 to 50 ft (7.5-15 m)
Tall — more than 60 ft (18 m)	Wide — more than 50 ft (15 m)

Representative crown forms are illustrated on page 25 to 27. The form most typical of each species is indicated; however, individual specimens may vary depending on growth conditions and possible injuries to the crown. *Deciduous* means the species loses all of its leaves for at least a short time during the year, usually during the dry season.

In the descriptions, common names are given in the top right corner, first for Puerto Rico, then for the Virgin Islands or in English. If either one is missing, there is no generally accepted common name. The favorable points about each species are given in the headline and under **Uses** and **Features**. Problems that may be encountered are grouped under **Limitations**. The favorable points for each species should be balanced against the limitations in determining whether the species is appropriate for your situation.

A statement that the roots are not troublesome or do not damage pavement or buildings means that this is true of the species in general. Individual trees, especially on very shallow soil or when they get very large, may still develop surface roots or a large trunk. Species known to have troublesome roots are specifically mentioned.

Under **Rate of growth**, *rapid* means the tree should reach its mature size in 5 to 10 years, *moderate* in about 15 years, and *slow* not for 20 years or more. Trees growing under exceptionally favorable conditions may develop faster, and trees growing under unfavorable conditions may develop more slowly.

The sizes under **Mature height** and **Crown diameter** are representative of mature trees in Puerto Rico. Again, these may vary somewhat depending on growing conditions.

Under **Remarks**, the place of origin and the usual method of propagation are given for each species, along with special notes about use or care. Also mentioned briefly are some closely related species that are less widely used or that have undesirable characteristics.

Scientific and common name	Height	Crown Spread	Crown Form	Tolerance					Uses		
				Deciduous	Poor soil	Dry areas	Wet soil	Salt spray	Screening	Shade	Showy Flowers
Albizia lebbek (p. 34) Acacia amarilla Tibet	Medium	Medium	Round	X	X	X				X	X
Araucaria heterophylla (p. 35) Araucaria Norfolk-Island-pine	Tall	Narrow	Conical					Some			
Bauhinia monandra (p. 36) Mariposa Butterfly Bauhinia	Short	Narrow	Round	X	X	X			X		X
Bucida buceras (p. 37) Ucar Gregre	Medium to tall	Medium	Oval		X	X	X	X		X	
Bursera simaruba (p. 38) Almácigo Turpentine-tree	Medium	Medium	Oval	X	X	X		X		X	
Callistemon citrinus (p. 39) Bottlebrush	Short	Narrow	Oval to round		X			Some	X		X
Calophyllum calaba (p. 40) María Santa-maría	Medium to tall	Narrow	Oval to columnar		X		X	X	X	X	
Cassia javanica (p. 41) Casia rosada Pink cassia	Medium	Medium	Umbrella	X						X	X
Casuarina equisetifolia (p. 42) Casuarina Australian beefwood	Tall	Medium	Columnar		X		X	X	X		
Ceiba pentandra (p. 43) Ceiba Silk-cotton-tree	Tall	Wide	Flat-topped	X	X	X					X
Chrysophyllum cainito (p. 44) Caimito Star-apple	Medium	Medium	Round to oval			X				X	
Clusia rosea (p. 45) Cupey Wild-mammee	Medium	Wide	Banyan		X		X	X	X	X	X
Cnidoscolus aconitifolius (p. 46) Papayuelo	Short	Narrow	Half round		X	X				X	

Scientific and common name	Height	Crown Spread	Crown Form	Tolerance					Uses		
				Deciduous	Poor soil	Dry areas	Wet soil	Salt spray	Screening	Shade	Showy Flowers
Coccoloba uvifera (p. 47) Uva de playa Sea grape	Short	Narrow	Variable		X		X	X	X		
Cocos nucifera (p. 48) Palma de coco Coconut	Medium	Medium	Palm				X	X			
Conocarpus erecta var. *sericea* (p. 49) Mangle botón Silver buttonwood	Short	Narrow	Prune to shape		X		X	X	X		
Cordia alba (p. 50) Cereza blanca White manjack	Short	Narrow	Round		X	X			X		X
Cordia sebestena (p. 51) Vomitel colorado Geiger-tree	Short	Narrow	Round to oval		X	X		X			X
Crescentia cujete (p. 52) Higüero Calabash-tree	Short	Narrow	Round	X	X	X					
Delonix regia (p. 53) Flamboyán Flamboyant-tree	Medium	Medium	Umbrella	X	X	X				X	X
Eugenia malaccensis (p. 54) Manzana malaya Malay-apple	Medium	Narrow	Columnar to oval				X		X		X
Ficus benjamina (p. 55) Laurel de Benjamina Benjamin Fig	Medium	Wide	Banyan		X		X			X	
Ficus nekbuda (p. 56) African cloth-bark tree	Medium	Wide	Banyan	X	X		X	Some		X	
Guaiacum officinale (p. 57) Guayacán Common lignum-vitae	Short	Narrow	Round		X	X			X	X	X
Guazuma ulmifolia (p. 58) Guácima Jacocalalu	Medium	Medium	Half-round		X	X			X	X	
Lagerstroemia speciosa (p. 59) Reina de las flores Queen-of-flowers	Medium	Medium	Round						X	X	X

Scientific and common name	Height	Crown Spread	Crown Form	Tolerance					Uses		
				Deciduous	Poor soil	Dry areas	Wet soil	Salt spray	Screening	Shade	Showy Flowers
Mammea americana (p. 60) Mamey Mammee-apple	Medium	Narrow	Columnar to oval		X				X		X
Mangifera indica (p. 61) Mango	Medium to tall	Medium	Round		X	X	X		X	X	
Manilkara zapota (p. 62) Nispero Sapodilla	Medium	Narrow	Conical to oval			X			X		
Montezuma speciosissima (p.63) Maga	Medium	Narrow	Irregular to oval				X		X	X	X
Muntingia calabura (p. 64) Capulín	Short	Medium	Umbrella			X				X	
Parkinsonia aculeata (p. 65) Palo de rayo Jerusalem-thorn	Short	Narrow	Round		X	X		X	X		X
Peltophorum inerme (p. 66) Flamboyán amarillo Yellow flamboyant	Medium to tall	Medium	Round	X		X	X			X	X
Pithecellobium arboreum (p. 67) Cojoba	Medium	Narrow	Columnar	X						X	
Plumeria rubra (p. 68) Frangipani	Short	Narrow	Irregular to flattened round	X	X	X		Some	X		X
Pterocarpus indicus (p. 69) Pterocarpus India padauk	Tall	Medium	Round to weeping				X			X	X
Roystonea borinquena (p. 70) Palma real Puerto Rico royalpalm	Medium to tall	Medium	Palm		X		X				
Salix babylonica (p. 71) Sauce llorón Weeping willow	Short	Narrow	Weeping				X		X		
Sterculia apetala (p. 72) Anacagüita Panama-tree	Tall	Medium	Round to flat-topped			X				X	

Scientific and common name	Height	Crown Spread	Crown Form	Tolerance					Uses		
				Deciduous	Poor soil	Dry areas	Wet soil	Salt spray	Screening	Shade	Showy Flowers
Swietenia macrophylla (p. 73) Caoba hondureña Broadleaf mahogany	Tall	Medium	Oval	X			X			X	
Swietenia mahagoni (p. 74) Caoba dominicana West Indies mahogany	Medium	Medium	Round	X	X	X		Some	X	X	
Tabebuia heterophylla (p. 75) Roble blanco White-cedar	Medium	Narrow	Columnar to oval	X	X	X			X		X
Tamarindus indica (p. 76) Tamarindo Tamarind	Medium	Medium	Round		X	X			X	X	
Tecoma stans (p. 77) Roble amarillo Ginger-thomas	Short	Narrow	Oval to round	X	X	X			X		X
Terminalia catappa (p. 78) Almendra Indian-almond	Medium	Medium	Broadly columnar		X		X	X	X	X	
Thespesia populnea (p. 79) Emajagüilla Otaheita	Short	Narrow	Round		X		X	X	X		X

***Albizia lebbek* (L.) Benth.**
Family: Leguminosae

Acacia amarilla
Tibet

Quick shade for difficult sites.

Uses: Shade and ornament along roads, in pastures, and in gardens.

Features: Grows rapidly in dry areas and on poor soils. Provides medium shade except during the dry season when the leaves fall. Fragrant, yellowish-white powder-puff flowers are produced for about 4 weeks. Clusters of straw-colored pods remain on the tree almost all year and are especially conspicuous rattling in the wind while the tree is leafless.

Limitations: Tends to have surface roots, especially in shallow soils, so should not be planted close to buildings or pavement. May seed into gardens and pastures. Often has termite nests and tunnels on its branches. A fungal disease sometimes attacks the roots and eventually kills the tree.

Description: Leaves doubly compound with numerous small, pale-green leaflets. Flowers in rounded clusters across the crown. Fruit a flat, broad pod. Flowering from April to September.

Rate of growth: Rapid.

Mature height: 20 to 40 ft (6 to 12 m).

Crown diameter: 25 ft (7.5 m).

Remarks: Native to southeast Asia. Easily propagated by seeds or cuttings. A related species, *Albizia procera* (Roxb.) Benth. (albizia, tall albizia), with smaller and more numerous leaflets and narrower pods that are reddish-brown, is extremely susceptible to root fungus, and should not be planted.

***Araucaria heterophylla* (Salisb.) Franco** **Araucaria**
Family: Araucariaceae **Norfolk-Island-pine**

Symmetrical Christmas tree for lawn or yard.

Uses: Single accent tree.

Features: Erect, conical, symmetrical conifer with horizontal branches in regular whorls of 4 to 7. Grows best in good, well-drained soil with adequate moisture, tolerates salt spray.

Limitations: Trunk often has a curve at the base before growing straight up, and some trees are spiral rather than completely vertical. Older trees become less symmetrical as they lose some of their lower branches. Should not be planted close to buildings because some of the large roots are relatively shallow. A fungus frequently discolors older needles, and a disease sometimes causes bleeding of resin from the trunk.

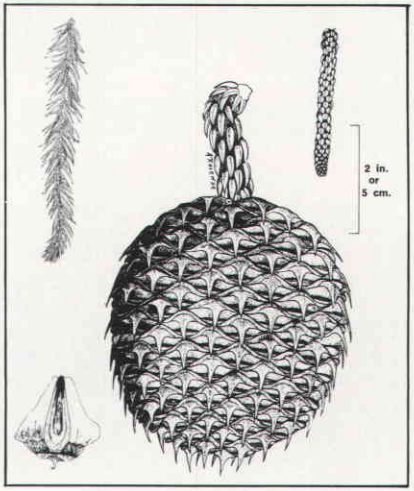
Description: Leaves either needlelike or scaly on ropelike twigs arranged in a horizontal plane on the branches. Flowers inconspicuous. Fruit a rounded cone, rarely maturing in Puerto Rico.

Rate of growth: Moderate.

Mature height: Probably 80 to 100 ft (24 to 31 m).

Crown diameter: 20 ft (6 m).

Remarks: Native to Norfolk Island in the South Pacific. Propagated by seeds (which lose their viability quickly) or young tip cuttings. Several related species, which are not as symmetrical, are sometimes seen in Puerto Rico.



***Bauhinia monandra* Kurz**
Family: Leguminosae

Mariposa
Butterfly bauhinia
Pink orchidtree

Flowering tree for confined areas.

Uses: In gardens, along roads and sidewalks, or wherever a small flowering tree is needed.

Features: Covered with large pink, red-spotted, orchid-like flowers for about 2 months. Grows in most soils but does best with good drainage. Roots and trunk do not cause problems with waterlines or pavement.

Limitations: Nothing serious.

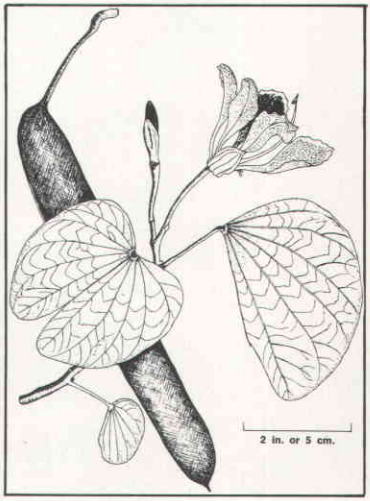
Description: Leaves light green, split about ⅓ of their length into 2 lobes resembling a cow's hoof. Flowers in short terminal clusters. Fruit a narrow, reddish-brown pod. Flowering and fruiting almost throughout the year, but with peak flowering between May and September.

Rate of growth: Rapid. Tree lasts about 30 years.

Mature height: 10 to 30 ft (3 to 9 m).

Crown diameter: 15 ft (4.5 m).

Remarks: Native to southeast Asia. Propagated by seeds; needs careful transplanting so roots are not disturbed. Can be pruned after flowering, but only lightly because the flowers are produced on the twigs from the previous year. *Bauhinia variegata* L. (palo de orquídeas, poor-man's-orchid), with flowers varying from pink to purple, and *Bauhinia blakeana* S.T. Dunn. (Hong Kong orchidtree), with large clusters of fragrant deep crimson red flowers, are also becoming popular in Puerto Rico.



***Bucida buceras* L.**
Family: Combretaceae

Ucar
Gregre
Oxhorn bucida

Excellent shade tree for confined areas and adverse conditions.

Uses: Shade, windbreaks, and ornament for gardens, roadsides, and areas near the shore.

Features: Grows well in sandy soils, calcareous soils, or shallow volcanic soils, and resists wind, salt spray, and drought. Evergreen except in very dry areas, therefore provides shade and protection throughout the year. Deep root system does not damage buildings or pavement. Said to be hurricane resistant.

Limitations: Fruits may cause tannin stains on parked cars. One variety of this tree, susceptible to mites that cause continuous leaf fall, should not be propagated.

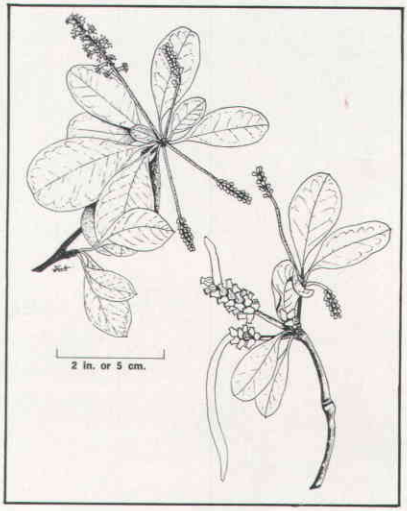
Description: Leaves yellowish-green, clustered at ends of short twigs along the branches. Flowers inconspicuous. Fruit brownish, clustered in long spikes with some fruits deformed into horn-like galls. Flowering and fruiting irregularly throughout the year.

Rate of growth: Moderate, but slow if root system is restricted.

Mature height: 30 to 60 ft (9-18 m) or more.

Crown diameter: 40 ft (12 m).

Remarks: Native to Puerto Rico and the Virgin Islands. Propagated by cuttings or air layers from plants selected for small leaves and symmetrical form. Grows best in full sunlight and with good drainage. Responds well to pruning and fertilization.



***Bursera simaruba* (L.) Sarg.** **Almácigo**
Family: Burseraceae **Turpentine-tree**

Living fence post with smooth, flaking, reddish-brown bark.

Uses: Open shade along streets or beach, but loses its leaves in the dry season. Single accented or background tree in gardens or parks.

Features: Adapted to limestone soils, grows best in dry or well-drained areas. Tolerant of drought, wind, and salt spray. Branches up to 4 inches (10 cm) in diameter will root and grow when stuck in the ground.

Limitations: Nothing serious.

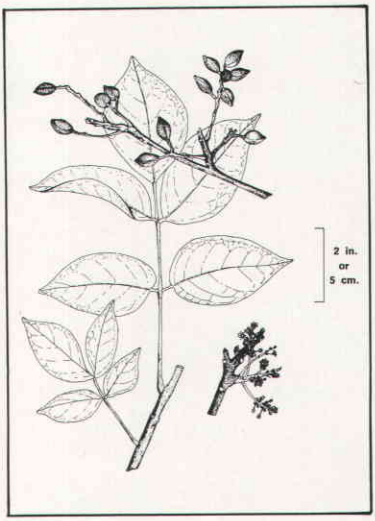
Description: Leaves composed of 3 to 7 leaflets with aromatic odor when crushed. Flowers yellowish-green, inconspicuous. Fruit reddish and diamond-shaped. Flowering and fruiting usually in spring before or with the new leaves. Crown composed of large, crooked, spreading branches arising from a stout trunk.

Rate of growth: Moderate.

Mature height: 20 to 40 ft (6 to 12 m).

Crown diameter: 25 ft (7.5 m).

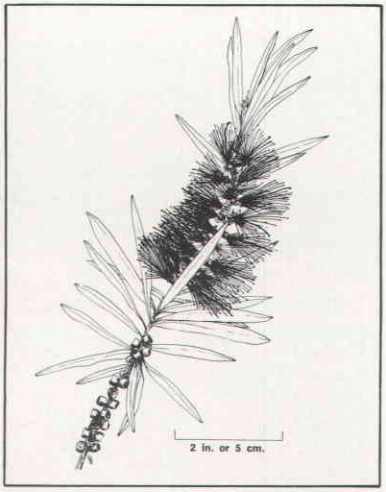
Remarks: Native to Puerto Rico and the Virgin Islands. Can also be propagated by seeds.



***Callistemon citrinus* (Curtis) Skeels** **Bottlebrush**
Family: Myrtaceae

Small tree with brilliant red flowers; good for confined areas.

Uses: Ornament in patios, along sidewalks and median strips, and in parking lots and other areas where space is limited.
Features: Grows under widely varying conditions. Tolerates poor soil, drought, and some salt spray.
Limitations: Nothing serious.
Description: Leaves narrow and pointed, spread all around twig, with a lemon odor when crushed. Flowers in bottle-brush-like masses near the ends of slender, drooping twigs. Fruit a hard, rounded, brown woody capsule, surrounding twigs in clusters and persisting for several years. Flowering and fruiting irregularly throughout the year. May be shrubby with several stems.
Rate of growth: Moderate.
Mature height: 20 ft (6 m).
Crown diameter: 15 ft (4.5 m).
Remarks: Native to Australia. Propagated by seeds.



***Calophyllum calaba* L.**
Family: Guttiferae

María
Santa-maría
False-mamey

Beautiful, dense, dark-green shade for street borders and poor soils.

Uses: Shade, ornament, and in dense hedges as a windbreak or to protect from salt spray near the ocean.

Features: Grows well in almost all soils, especially adapted to degraded sites, and resistant to salt spray. The dark, shiny green crown can be shaped into a hedge or other form, and the tree can be used in confined areas if controlled by pruning.

Limitations: Grows slowly, especially on poor sites.

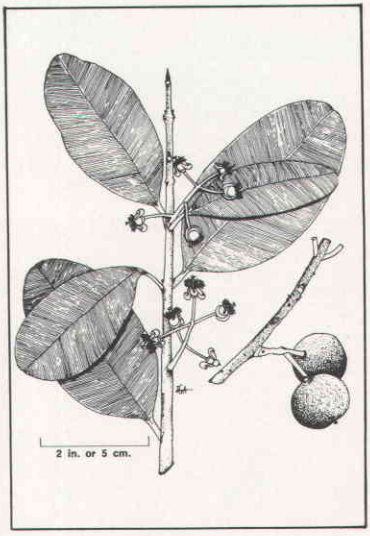
Description: Leaves stiff and dark green. Flowers numerous, small, white, fragrant, in clusters. Fruit light brown, hard and dry. Flowering mostly in spring and summer, with fruits maturing mainly in fall.

Rate of growth: Slow.

Mature height: 40 to 65 ft (12-20 m).

Crown diameter: 20 ft (6 m).

Remarks: Native to Puerto Rico and the Virgin Islands. Easily propagated by seeds, but the young seedlings must be transplanted with a ball of earth for good survival. If the tree is to be shaped by pruning, this should be started while it is still young, especially if used to line sidewalks or roadsides. This species is long-lived and develops a large trunk, which may eventually cause problems to sidewalks.



***Cassia javanica* L.** **Casia rosada**
Family: Leguminosae **Pink cassia**

Spectacular masses of fragrant, long-lasting pink flowers.

Uses: Single accented or background tree in gardens or parks where litter will not be a problem.

Features: Flowers completely cover the outer ends of the spreading branches for 2 to 3 months. Grows and flowers best in good, well-drained soil with adequate moisture.

Limitations: Loses its leaves during the dry season, and is not particularly attractive then because it has many long hanging pods and dead branches. The falling leaves, flower parts, and pods (which have a bad odor when green) make it a poor choice for streets or parking lots. Also, it should not be planted close to buildings because of the spreading crown, and it has a shallow root system so may be blown over by hurricane-force winds.

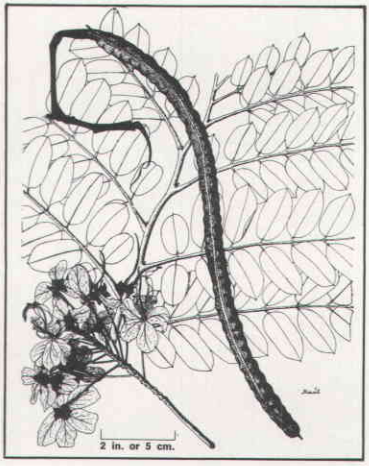
Description: Leaves composed of about 16 to 20 pairs of leaflets, the new ones appearing just before the flowers. Flowers rose-scented, numerous in lateral clusters. Fruit a slender cylindrical, dark-brown pod 16 to 20 inches (21 to 51 cm) long. Flowering mainly from May to July.

Rate of growth: Rapid. Tree seldom lasts more than 30 years.

Mature height: 40 ft (12 m).

Crown diameter: 30 ft (9 m).

Remarks: Native to India and southeast Asia. Propagated by seeds. Will flower within about 5 years of planting, with maximum flowering after a long dry season. Needs early pruning because it tends to fork near ground, and dead branches should be pruned out of the top periodically for best appearance.



***Casuarina equisetifolia* L.** **Casuarina**
Family: Casuarinaceae **Australian beefwood**

Outstanding for beaches and windbreaks.

Uses: Windbreaks, screens, and hedges in coastal areas, and for binding and building soil on beach sands.

Features: Grows on acid and alkaline soils, muck, calcareous rocky soils, and sand dunes. Withstands drought and heavy salt blast.

Limitations: Spreading superficial root system may cause trouble if there is not plenty of room, and very tall trees may be blown over by hurricane-force winds. Little other vegetation will grow under the crown because the fallen "needles" decay slowly. A disease that causes stem cankers, dieback, and sometimes death of large old trees has been reported in several areas of Puerto Rico, so this species should not be planted for permanent use near buildings. It should be used only for beach plantings, windbreaks, and sheared hedges or screens.

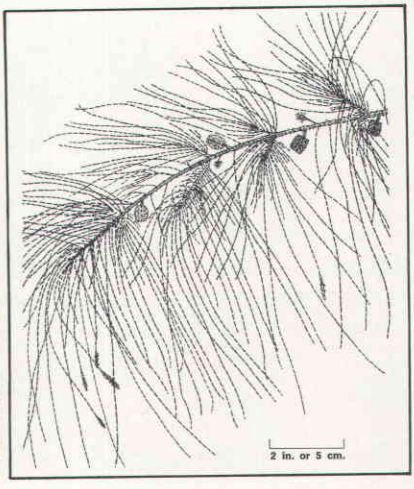
Description: Needle-like leaves are actually green modified twigs with tiny scale-like true leaves at the joints. Flowers inconspicuous. Fruit a light-brown, warty, conelike ball. Flowering and fruiting throughout the year.

Rate of growth: Very rapid.

Mature height: Up to 100 ft (31 m).

Crown diameter: 25 ft (7.5 m).

Remarks: Native to Australia and tropical Asia. Propagated by seeds or cuttings, does not produce root sprouts. Has thin open crown but can be sheared to control height and form a dense hedge or screen, or can be planted in a belt several trees thick to form a windbreak.



***Ceiba pentandra* (L.) Gaertn.** **Ceiba**
Family: Bombacaceae **Silk-cotton-tree**

Giant tree with large buttresses.

Uses: Centerpiece for park or plaza, or along rural highway.

Features: Massive, gray, smooth trunk up to 8 ft (2.5 m) in diameter above narrow buttresses that may be up to 6 ft (1.8 m) high and extend to 10 ft (3 m) out over the wide-spreading, shallow roots. Broad, flat-topped crown of spreading horizontal branches. Grows on poor soils in both moist and dry areas.

Limitations: Large trunk, buttresses, and surface roots make it difficult to grow anything else under it.

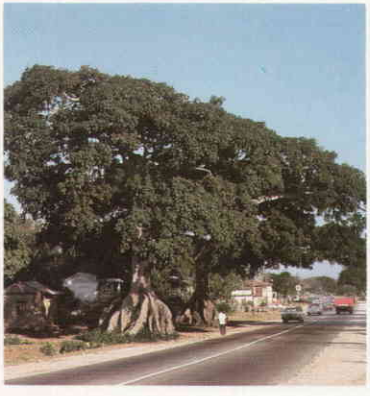
Description: Leaves composed of 5 to 8 palmately arranged leaflets. Flowers white to pinkish, in clusters near the ends of the twigs. Fruit a pod-like hanging capsule containing gray floss (the kapok of commerce) with embedded seeds. Flowering from December to February, not every year and often while the tree is leafless, and with fruits maturing about 2 months later.

Rate of growth: Moderate. May take 50 years to reach mature size and form.

Mature height: 80 ft (25 m) or more.

Crown diameter: 80 ft (25 m).

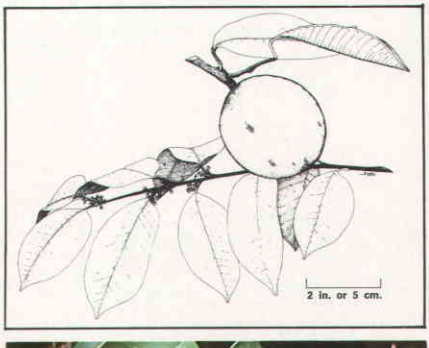
Remarks: Native to Puerto Rico and the Virgin Islands. Propagated by cuttings or by seedlings with the tops cut back. Young trees have spines on the bark, and have open, irregular crowns.



***Chrysophyllum cainito* L.** **Caimito**
Family: Sapotaceae **Star-apple**

Evergreen shade tree with attractive reddish-brown leaves and edible fruit.

Uses: Shade, ornament, and fruit in yards and gardens.
Features: Dense, spreading crown with slightly drooping branches. Grows best on moist, well-drained soil. Fruit can be eaten fresh or used in salads, and production starts in about 5 years.
Limitations: Nothing serious.
Description: Leaves dark green and slightly shiny above; silky, reddish-golden-brown below and on petioles and young twigs. Flowers tiny, purplish-white, clustered at base of leaves. Fruit greenish to purplish when ripe, with a thick, leathery rind containing gummy latex; the white jellylike flesh and brown seeds make a star-shaped pattern when cut. Flowering in summer and fall and fruiting from late fall to summer. Reputedly does not fruit in the Virgin Islands.
Rate of growth: Slow.
Mature height: 20 to 40 ft (6 to 12 m).
Crown diameter: 25 ft (7.5 m).
Remarks: Native to Greater Antilles, possibly including Puerto Rico. Propagated by seeds, which should be selected from trees with good fruit. Tree contains milky sap.



***Clusia rosea* Jacq.** **Cupey**
Family: Guttiferae **Wild-mammee**

Broad, spreading evergreen with stiff leaves resistant to salt spray.

Uses: Along seacoast, and in parks or large gardens where there is room for a wide-spreading tropical tree.

Features: Grows on most soils and tolerates salt spray and drought. Forms prop roots at base and aerial roots from branches, so may completely take over area where it is growing. Can be pruned to shape.

Limitations: Falling leaves and fruits may cause a litter problem.

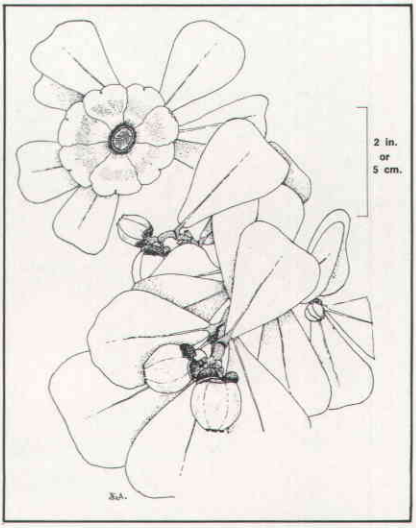
Description: Leaves thick and leathery. Flowers pink to light rose, terminal at ends of twigs but not enough blooming at one time to create a display. Fruit considered to be poisonous, ball-like and fleshy, yellow-green turning to brown and splitting at maturity to reveal several yellow seeds in orange-red pulp. Flowering and fruiting throughout the year.

Rate of growth: Moderate.

Mature height: Up to 60 ft (18 m).

Crown diameter: 75 ft (23 m).

Remarks: Native to Puerto Rico and the Virgin Islands. Propagated by seeds and cuttings. Seeds may stick to other plants and germinate as epiphytes. Messages have been written on the leaves. Dried fruits are used in floral arrangements. Tree contains a yellow, resinous latex.



***Cnidoscolus aconitifolius* (Mill.) I.M. Johnst.** **Papayuelo**
Family: Euphorbiaceae

Small tree for quick shade and ornament in dry areas.

Uses: Shade and ornament in gardens and patios.

Features: Compact, dense, half-round crown on short, stout trunk; numerous small, white flowers. Grows well on any soil in dry areas.

Limitations: Sometimes attacked by insect that causes leaves to turn yellow and fall off. Not well suited for planting along roads because branches are easily broken.

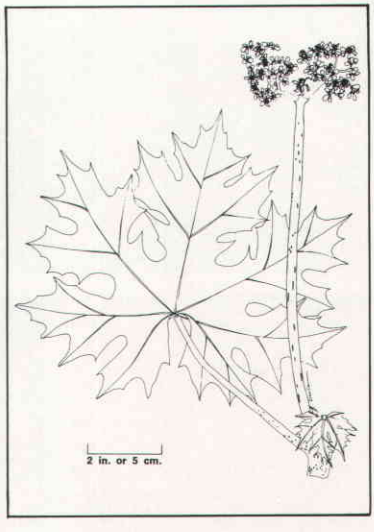
Description: Leaves palmately lobed, dull dark green with many light-green veins. Flowers fragrant in clusters across the crown. Flowering throughout the year but not producing fruit in Puerto Rico.

Rate of growth: Very rapid. Tree lasts only about 10 years.

Mature height: 20 ft (6 m).

Crown diameter: 20 ft (6 m).

Remarks: Native to Mexico. Propagated by cuttings (and seeds). Stout green twigs have scattered stinging hairs and yield abundant white latex when cut.



***Coccoloba uvifera* (L.) L.** **Uva de playa**

Family: Polygonaceae **Sea grape**

Excellent small tree, hedge, or ground cover for beach areas; edible fruit.

Uses: Tree or hedge where salt spray is a problem; highway median strips; in sheltered locations as an unusual tree with wide-spreading branches.

Features: Grows with little or no care on sandy and rocky seashores, withstands heavy salt blast and wind and grows well in both full sun and partial shade. Can be pruned to form a windbreak or privacy screen. Also grows well on good soils and under sheltered conditions.

Limitations: Leaves sometimes attacked by insects, causing bad appearance and leaf fall.

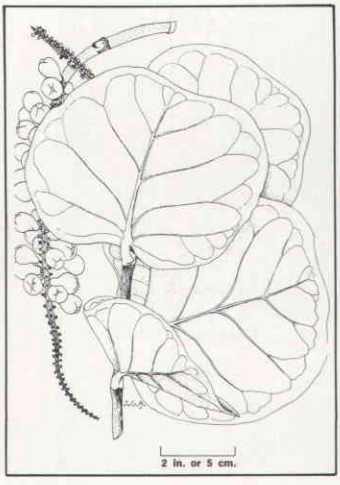
Description: Leaves thick and leathery, bluish-green with red veins, young and very old leaves often reddish. Flowers fragrant and very small in long, narrow clusters. Fruit grapelike in drooping clusters, purple when mature. Flowering and fruiting throughout the year.

Rate of growth: Moderate.

Mature height: Highly variable, up to 25 ft (7.5 m) under optimum conditions.

Crown diameter: 20 ft (6 m).

Remarks: Native to Puerto Rico and the Virgin Islands. Propagated by seeds and cuttings. Male and female flowers are on different trees, so a female cutting should be used if fruit is desired. Fruit is used in salads and makes good jelly.



***Cocos nucifera* L.** **Palma de coco**
Family: Palmae **Coconut**

Graceful palm that is one of man's most useful plants.

Uses: Beach areas, rural highways, for tropical effect in gardens and parks, and possibly along streets if the leaves and nuts are kept trimmed. Most effective when planted in groups.

Features: Grows on most soils but does best on sandy soil with good drainage, withstands salt spray and strong winds and even inundation by salt water for short periods. Also grows inland and in dry areas if irrigated. Can often withstand hurricanes although it loses its leaves.

Limitations: Mature leaves and nuts must be kept trimmed for safety of passersby, and trimming can be a problem when the palm is tall. A scale insect damages the leaves and is difficult to control after the palm is tall. Lethal yellowing, for which no cure is yet known, has decimated palms in Florida and Jamaica. It has not yet reached Puerto Rico, but it is advisable to plant the disease-resistant Malayan dwarf variety, which also is shorter and has smaller nuts.

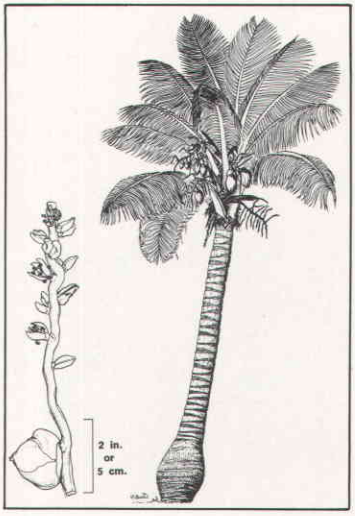
Description: Usually slender, leaning trunk with enlarged base, topped with a crown of feathery leaves at the base of which are long ivory-colored inflorescences and the familiar coconuts. Flowering and fruiting throughout the year.

Rate of growth: Moderate.

Mature height: 30 to 60 ft (9 to 18 m) or more.

Crown diameter: 25 ft (7.5 m).

Remarks: Probably native to the Indo-Malayan region. Propagated by planting the nuts.



***Conocarpus erecta* L. var. *sericea* Forst. ex DC.** **Mangle botón**
Family: Combretaceae **Silver buttonwood**

Small, silver-leaved, salt-resistant tree for confined areas.

Uses: Beach areas; patios, sidewalks, and other areas where space is limited; also as a hedge or screen if pruned.

Features: Grows in sand, on poor soils or those high in calcium, and on brackish swampy ground, withstands heavy salt blast but can also be grown inland. Considered a shore-builder and grows best in full sun.

Limitations: Nothing serious.

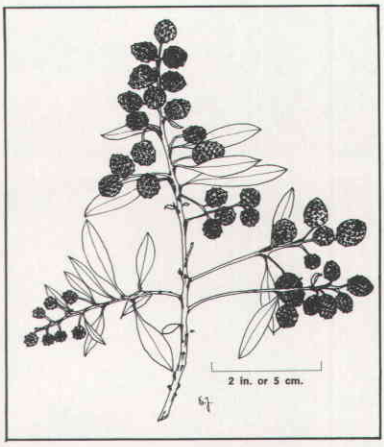
Description: Leaves leathery and slightly fleshy, covered with pale, silky down that causes the silvery appearance of this variety. (The typical species has hairless, yellow-green leaves and grows on the landward side of tidal mangrove swamp forests throughout Puerto Rico and the Virgin Islands). Flowers minute in small clustered greenish balls. Fruit purplish-brown, small, rounded, and conelike. Flowering and fruiting throughout the year.

Rate of growth: Moderate.

Mature height: Varies from small shrub to 20 ft (6 m).

Crown diameter: 10 ft (3 m).

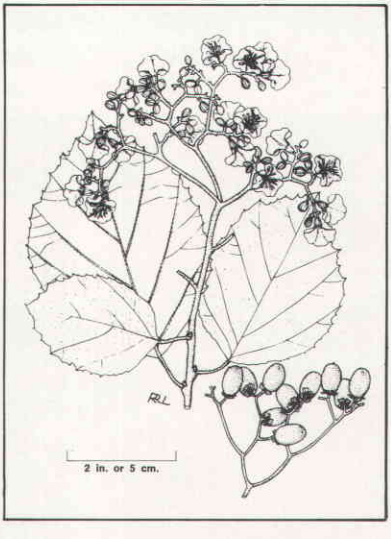
Remarks: The typical species is native to Puerto Rico and the Virgin Islands, and the silver-leaved variety was developed in Florida. Propagated by hardwood cuttings or air layers. For best appearance should be pruned about 3 times a year to a height of about 15 ft (4.5 m) and a crown diameter of about 10 ft (3 m). Should be fertilized after pruning.



***Cordia alba* (Jacq.) Roem. & Schult.** **Cereza blanca**
Family: Boraginaceae **White manjack**

Small, flowering tree for dry areas.

Uses: Ornament and some shade around houses, also for living fences if planted close together.
Features: Grows in dry, rocky areas; has showy whitish to pale-yellow flowers; fruits are good for wildlife.
Limitations: Fleshy fruits may be messy when they fall.
Description: Leaves and twigs hairy. Flowers in erect terminal clusters up to 10 inches (25 cm) wide. Fruit whitish and containing a whitish pulp. Flowering and fruiting throughout the year.
Rate of growth: Moderate.
Mature height: 20 ft (6 m).
Crown diameter: 20 ft (6 m).
Remarks: Native to the Virgin Islands and probably also Puerto Rico. Propagated by seeds. A related species, *Cordia obliqua* Willd. (cereza blanca, manjack), with leaves only slightly toothed and fruit pinkish, has been introduced and is more commonly used as an ornamental in the dry areas of northeastern Puerto Rico.



***Cordia sebestena* L.** **Vomitel colorado**
Family: Boraginaceae **Geiger-tree**

Small tree with showy flowers for dry areas and near the shore.

Uses: Gardens and patios; along streets and in parking lots if the lower branches are pruned; seashore planting.

Features: Dense, compact, rounded crown and clusters of orange or red flowers. Grows on brackish and sandy or alkaline soils as well as on coral rock and marl, but does best in dry areas with good drainage. Withstands wind and salt spray. Produces flowers when still small and, after long dry spells, may produce a flush of bloom lasting up to a month. Requires little care once established.

Limitations: May lose its leaves during extremely dry periods.

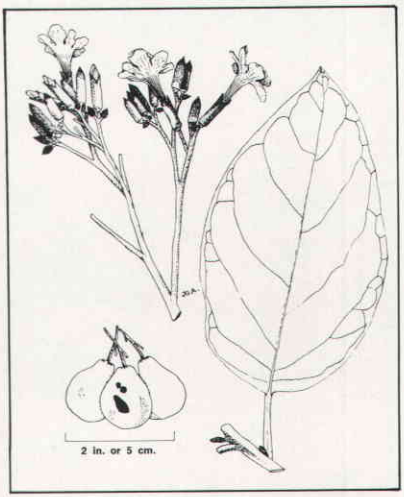
Description: Leaves deep green, coarse, and somewhat hairy. Flowers trumpet-shaped in terminal clusters. Fruit egg-shaped and whitish. Flowering and fruiting throughout the year.

Rate of growth: Moderate.

Mature height: 20 ft (6 m).

Crown diameter: 15 ft (4.5 m).

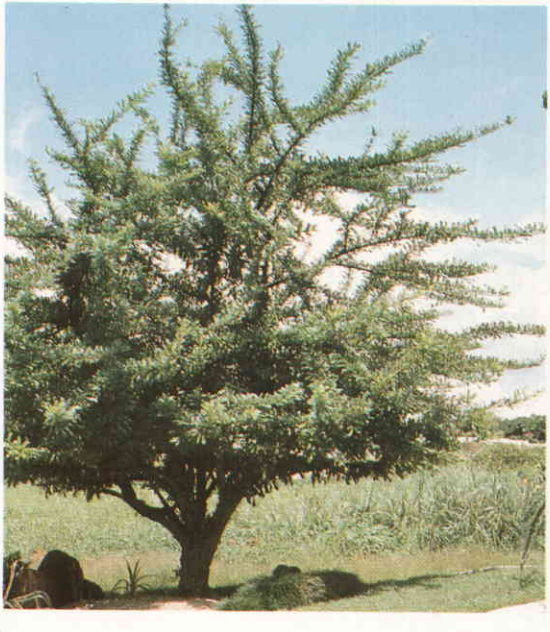
Remarks: Native to the Caribbean area including Central America and northern South America, but not to Puerto Rico. A similar species, *Cordia rickseckeri* Millsp. (San Bartolomé, manjack), is native to Puerto Rico and the Virgin Islands. Propagated by seeds, cuttings, and air layering.

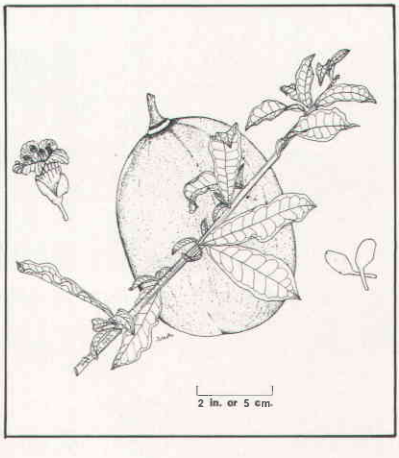


***Crescentia cujete* L.** **Higüero**
Family: Bignoniaceae **Calabash-tree**

Small spreading tree with large gourd fruit.

Uses: For decorative effect in yard.
Features: Grows in dry areas and on poor soils but does best in moist areas. Open foliage makes it good for growing hanging orchids and other epiphytes. Roots will not damage sidewalks.
Limitations: Flowers have bad odor, and pulp of fruit is poisonous. Sometimes attacked by a leaf-webbing caterpillar.
Description: Leaves mostly in clusters of 3 to 5 towards the ends of the stout twigs. Flowers bell-shaped, light green streaked with purple. Fruit green to brown with hard shell that does not split open. Flowers and fruit borne singly directly on trunk and branches. Flowering and fruiting throughout the year.
Rate of growth: Moderate.
Mature height: 20 ft (6 m).
Crown diameter: 20 ft (6 m).
Remarks: Native to Puerto Rico and the Virgin Islands. Propagated by seeds and cuttings. String tied around the fruits while they are maturing can force them to grow into various shapes.





***Delonix regia* (Bojer) Raf.** **Flamboyán**
Family: Leguminosae **Flamboyant-tree**
Royal poinciana

Brilliant masses of long-lasting, orange-red flowers on spreading crown.

Uses: Ornament and shade in parks and gardens where there is room for such a spreading tree, often planted along highways.

Features: One of the world's most beautiful flowering trees. Grows on most soils, does best with full sunlight and a dry period to induce maximum flowering.

Limitations: Trunk develops buttresses, and shallow root system may damage sidewalks, walls, or buildings. Usually has termite tunnels and nests on trunk and branches, and wounded trees are susceptible to termite attack, which makes them more liable to wind damage. Sometimes attacked by a root fungus that kills the tree. Also, occasionally defoliated by a caterpillar.

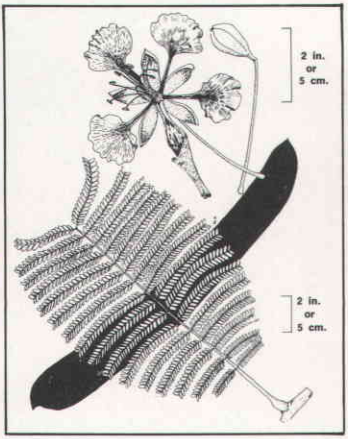
Description: Leaves doubly compound with many small, paired leaflets; leafless for about a month in the dry season until shortly before the flowers appear. Flowers in 6- to 10-inch (15-25 cm) clusters, lasting at least 2 months. Fruit a flat, black, woody pod. Flowering from May to August and with hanging pods most of the year.

Rate of growth: Rapid.

Mature height: 20 to 50 ft (6 to 15 m).

Crown diameter: 50 ft (15 m).

Remarks: Native to Madagascar but widely planted throughout the tropics. Propagated by seeds. Dead branches should be pruned for best appearance, and trees along highways are often trimmed to arch over the road. A less common yellow-flowered variety exists.



Eugenia malaccensis **L.** **Manzana malaya**
Family: Myrtaceae **Malay-apple**

Columnar evergreen for ornament, screening, and shade.

Uses: Good for confined areas because crown is small and roots not troublesome.

Features: Grows on most soils but does best on good, moist soil. Crown is dense, with purplish-red flowers and reddish fruits borne behind the leaves.

Limitations: Nothing serious.

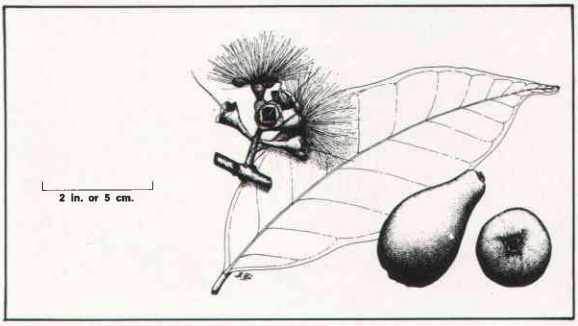
Description: Leaves dark green and leathery. Flowers in clusters, composed of a mass of red stamens that carpet the ground when they fall. Fruit pear-shaped with thin, soft skin; edible but with rather insipid flavor. Flowering and fruiting throughout the year.

Rate of growth: Moderate.

Mature height: 15 to 40 ft (4.5 to 12 m).

Crown diameter: 15 ft (4.5 m).

Remarks: Native to Malaysian area. Propagated by seeds.



***Ficus benjamina* L.** **Laurel de Benjamina**
Family: Moraceae **Benjamin fig**

Banyan-type fig with small leaves and evergreen crown spreading more than twice as wide and tall.

Uses: Parks, school grounds, wide lawns, and similar areas where a dense, spreading shade tree is appropriate.

Features: Short trunk supporting many stout, wide-spreading, almost horizontal branches that curve nearly back toward the ground, with wirelike air roots. Air roots also run down the main trunk to form a mass 5 ft (1.5 m) or more across and sometimes extend across the ground. Does best in moist areas.

Limitations: Needs much room for the roots, and most other plants or grass will not grow under it because of the dense shade. Roots may interfere with walks and other structures, and will grow into sewer pipes and septic systems.

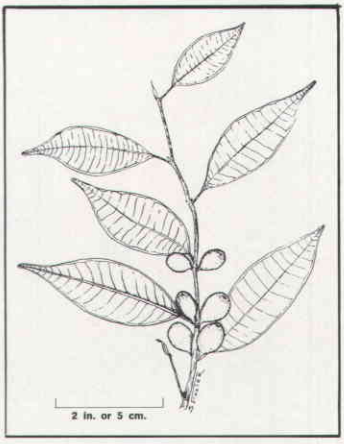
Description: Leaves dark green and shiny. Flowers are inside the fruits, which are dark red to purplish at maturity. Fruiting in spring and fall. Milky latex exudes from cut parts.

Rate of growth: Rapid to moderate.

Mature height: 30 ft (9 m) or more.

Crown diameter: 80 ft (24.5 m).

Remarks: Native to southeast Asia. Propagated by air layers. Spread of branches and roots can be controlled by pruning, to which it responds better than *Ficus nekbuda*.



***Ficus nekbuda* Warb.** **African cloth-bark tree**

Family: Moraceae

Banyan-type fig with large leaves and dense crown wider than tall.

Uses: Shade and ornament along streets and highways where there is enough room.

Features: Trunk and surrounding air roots may form mass 5 ft (1.5 m) or more in diameter, forking at 5 to 10 ft (1.5 to 3 m) into several stout, wide-spreading branches that often have air roots hanging from them. Grows in most soils if moisture is available. Tolerates some salt spray.

Limitations: Needs large space for trunk and roots. Loses its leaves in April, and this plus the falling fruits in May and June may cause a litter problem. Sometimes attacked by mealy bugs. Roots may interfere with walks and structures, and will grow into sewer pipes and septic systems.

Description: Leaves crowded at ends of twigs, dark green, stiff, leathery, and much larger than those of *Ficus benjamina*. Flowers are inside the yellow-green fruits, which are clustered near twig ends behind the leaves. Milky latex exudes from cut parts.

Rate of growth: Moderate.

Mature height: 40 ft (12 m).

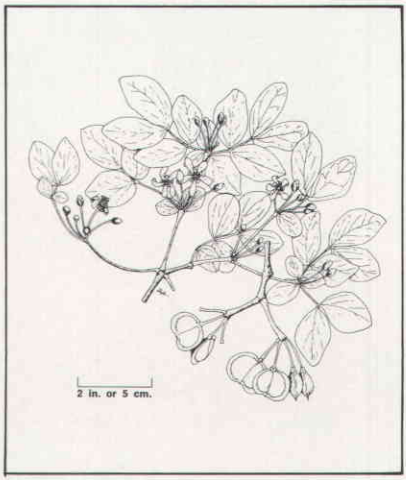
Crown diameter: 60 ft (18 m).

Remarks: Native to tropical East Africa. Propagated by air layers. Size can be controlled by pruning. A related tree, the "decora" cultivar of *Ficus elastica* Roxb. ex Hornem (palo de goma, India-rubber fig), with many parallel veins in the leaves and long, red terminal buds, has many of the same attributes but is not as widely suitable.

***Guaiacum officinale* L.** **Guayacán**
Family: Zygophyllaceae **Common lignumvitae**

Dense green foliage and blue flowers on a tree for confined areas.

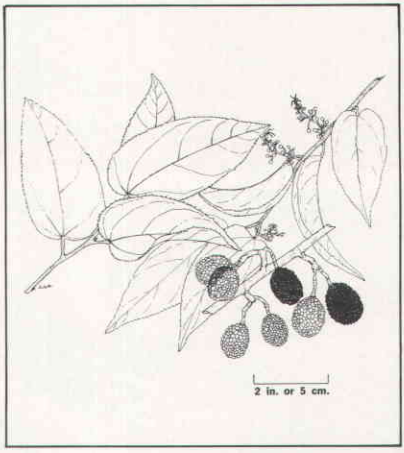
Uses: Ornament and screening in limited spaces.
Features: Grows naturally on dry south coast of Puerto Rico, and does well in both dry and moist areas, but needs dry season for best flowering. Dense, rounded crown and evergreen habit make it good for screening or small windbreaks.
Limitations: Nothing serious except for slow growth rate.
Description: Leaves composed of 2 to 3 pairs of dark-green leaflets. Flowers in showy clusters, slightly fragrant. Fruit orange-brown, flattened, and heart-shaped. Flowering and fruiting from spring to fall, often with 1 or 2 heavy blooming periods each lasting about 1 month.
Rate of growth: Slow.
Mature height: 15 to 30 ft (4.5 to 9 m).
Crown diameter: 20 ft (6 m).
Remarks: Native to Puerto Rico and the Virgin Islands. Propagated by seeds, or by wildlings that require extreme care in transplanting. Because of slow growth rate, seedlings should be grown in nursery for several years before planting.



***Guazuma ulmifolia* Lam.** **Guácima**
Family: Sterculiaceae **Jacocalalu**

Fast-growing shade tree for dry areas.

Uses: Shade around houses, along streets, and in pastures.
Features: Hardy in both dry and moist areas, but grows best in full sunlight where moisture is available in dry areas. Can be used in confined areas because roots are not troublesome. Has spreading, rounded crown of long, horizontal, wide-spreading branches.
Limitations: Fruits may be a temporary litter problem in lawns.
Description: Leaves finely saw-toothed, hanging vertically at night, evergreen except where dry season is severe. Flowers inconspicuous in clusters at base of leaves. Fruit rounded, black, hard, and warty. Flowering from March to October and with fruit throughout the year.
Rate of growth: Moderate.
Mature height: 50 ft (15 m).
Crown diameter: 30 ft (9 m).
Remarks: Native to Puerto Rico and the Virgin Islands. Propagated by seeds or wildlings. Good tree for dry areas because it grows slowly and develops a dense crown. In wet areas it becomes straggly.



***Lagerstroemia speciosa* (L.) Pers.** **Reina de las flores**
Family: Lythraceae **Queen-of-flowers**

Brilliant masses of long-lasting, purple or pink flowers.

Uses: Shade and ornament in parks, gardens, and along streets.

Features: Numerous showy flowers cover the crown for about 2 months. Grows in most soils but does best in moist, well-drained soil, although it withstands short periods of flooding. May be pruned to keep it small.

Limitations: Loses some of its leaves during dry season (or all of them where drought is severe) and looks rather ragged, especially with the dry fruit capsules remaining on the tree.

Description: Leaves appear to be in 2 rows on twigs. Flowers in large terminal clusters above the leaves, usually purple or lavender, but pink on some trees. Fruit rounded and gray-brown. Flowering from May through October and with fruits maturing from winter to summer.

Rate of growth: Moderate.

Mature height: 20 to 50 ft (6 to 15 m).

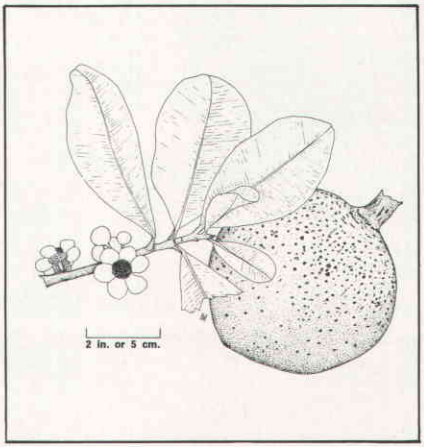
Crown diameter: 25 ft (7.5 m).

Remarks: Native to Far Eastern area. Propagated by seeds or cuttings. Seedlings should be pruned and staked to develop erect stem. They start flowering the year after planting. Fruit capsules can be pruned off after flowering to improve appearance and enhance flowering in the next year.

***Mammea americana* L.** **Mamey**
Family: Guttiferae **Mammee-apple**

Handsome, columnar evergreen with white flowers and edible fruit.

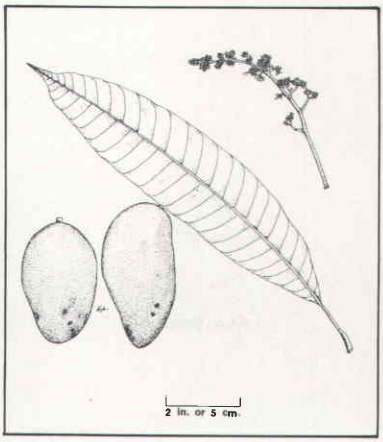
Uses: Shade, ornament, and fruit in gardens and parks.
Features: Grows in poor soils if moisture is available. Has erect trunk with dense crown. Also withstands wind.
Limitations: May become too large.
Description: Leaves glossy green, thick, and leathery. Flowers large and fragrant, borne on twigs mostly in back of the leaves and lasting 1 to 2 weeks. Fruit with thick skin and firm bright yellow or reddish flesh with white sap. Flowering from May to October and with fruit during most of the year. Bark contains pale yellow latex.
Rate of growth: Slow.
Mature height: 20 to 65 ft (6 to 20 m).
Crown diameter: 20 ft (6 m).
Remarks: Native to Puerto Rico. Propagated by seeds or wildlings. Fruit can be eaten raw or in pies and preserves, but should be used in moderation because various parts of the plant are poisonous to guinea pigs or insects. Flowers attract bees.



***Mangifera indica* L.** **Mango**
Family: Anacardiaceae

Evergreen shade tree bearing delicious tropical fruit.

Uses: Shade and fruit tree around houses and along highways.
Features: Has stout trunk and dense, round crown. Flowers and young leaves are attractive. Grows on any soil and withstands wind.
Limitations: Fruit flies and a rust fungus on the flowering branches are a problem in wet areas. Fallen fruit causes litter if not picked up. Some people are allergic to the sap and break out with a rash around the mouth and on the face, sometimes just from being near the tree.
Description: Leaves dark green, drooping in conspicuous red-brown clusters when first produced. Flowers fragrant, yellow-green to pink; in large, showy terminal clusters. Fruit on hanging stalks, varying in size and color and quality of flesh. Flowering mainly from winter to spring and with fruits maturing from May to September.
Rate of growth: Moderate.
Mature height: 20 to 65 ft (6 to 20 m).
Crown diameter: 40 ft (12 m).
Remarks: Native to tropical Asia. Can be propagated by seed, but budding or grafting is recommended to get superior varieties and varieties resistant to diseases and insects. Around houses should be planted in backyard to avoid stone throwing and pilferage of fruit. Should not be used as a street tree unless arrangements are made to pick up the fruit.



***Manilkara zapota* (L.) v. Royen** **Nispero**
Family: Sapotaceae **Sapodilla**

Evergreen with dense crown and delicious fruit; good for dry areas.

Uses: Shade, ornament, and fruit in gardens and along streets.

Features: Grows in most soils including alkaline soils and marl hardpans, but grows best on sandy loam with moderate moisture. Withstands drought and strong winds.

Limitations: Root system may spread over ground in shallow soils. Bats relish the fruit and stain building walls with their urine when they come in groups to feed. So near limestone hills or other areas where bats are common, trees should not be planted close to buildings.

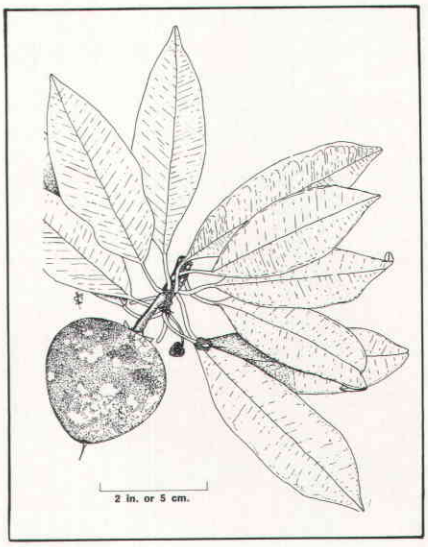
Description: Leaves shiny green, clustered at ends of twigs. Flowers inconspicuous. Fruit brown and rough-skinned, containing sweet, juicy pulp that is eaten raw or made into syrup and preserves. Flowering and fruiting nearly throughout the year. The bark yields a white latex that is the chief source of chewing gum.

Rate of growth: Slow.

Mature height: 50 ft (15 m).

Crown diameter: 20 ft (6 m).

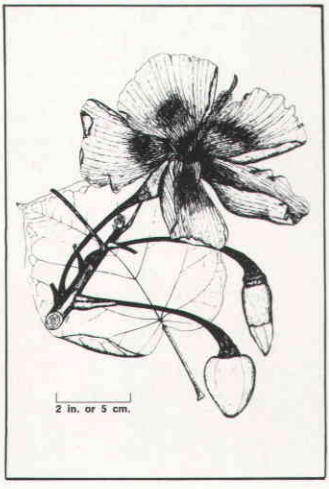
Remarks: Native to southern Mexico and Central America. Propagated by seeds, or by grafting and budding to get superior varieties. Responds well to pruning, so crown can be shaped to keep it low for easy fruitpicking.



***Montezuma speciosissima* Sessé + Moc.** **Maga**
Family: Malvaceae

Large, red, bell-shaped flowers on evergreen that is Puerto Rico's own.

Uses: Shade and ornament in gardens.
Features: Grows in most zones and on most soils in Puerto Rico if moisture is available.
Limitations: Large leaves and flowers create some litter. Branches may break in strong winds but grow back quickly.
Description: Leaves slightly thickened and yellow-green. Flowers solitary at leaf bases, only one at a time opening on a twig. Fruit green, fleshy or leathery, rounded and pointed at tip. Flowering and fruiting throughout the year.
Rate of growth: Moderate.
Mature height: 30 to 50 ft (9 to 15 m).
Crown diameter: 20 ft (6 m).
Remarks: Native only to Puerto Rico. Propagated by seeds (which lose their viability quickly) and cuttings. Should be pruned to develop a regular crown; pruning also enhances flowering.



***Muntingia calabura* L.** **Capulín**
Family: Elaeocarpaceae

Fast-growing tree for ornament and shade in new subdivisions.

Uses: Rapid fill-in and quick shade for new or open areas, should be replaced eventually with something that grows more slowly but is more permanent.

Features: Grows rapidly in full sunlight, adaptable to dry soils but does best where moisture is available. Evergreen with long, slender, spreading branches and many lateral twigs.

Limitations: Roots will grow into septic systems if planted too close. The many fruits may be a litter problem and will stain tile or cement patios. Strong winds may break branches or uproot the tree.

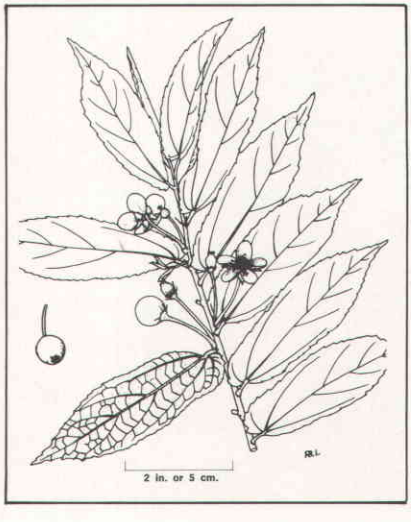
Description: Leaves alternate in 2 rows on twigs. Flowers white, 1 to 3 on stalks at base of leaves. Fruit fleshy, edible, reddish to yellowish. Flowering and fruiting throughout the year.

Rate of growth: Rapid. Tree only lasts about 10 years.

Mature height: 25 ft (7.5 m).

Crown diameter: 25 ft (7.5 m).

Remarks: Native to southern Mexico, Central America, and part of the West Indies, but not to Puerto Rico. Propagated by cuttings. A 6-ft (2 m) branch about 1 inch (2.5 cm) in diameter will grow to be a 20 by 20 ft (6 by 6 m) tree covered with fruit within 2 years.



***Parkinsonia aculeata* L.** **Palo de rayo**
Family: Leguminosae **Jerusalem-thorn**

Small, spiny tree with yellow flowers.

Uses: Special effects where a small tree is needed, especially in dry and coastal areas. Often planted along roads or as a spiny living hedge or fence.

Features: Withstands salt spray and wind, and grows well on poor, dry, or sandy soil if soil is well-drained. Open growth, feathery drooping foliage, and yellow flowers make striking contrast.

Limitations: Thorns on stem at base of leaves. Pods may cause litter problem.

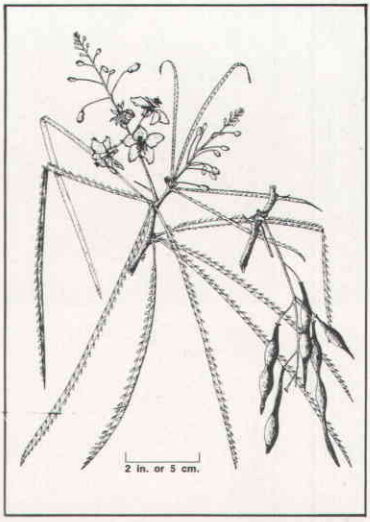
Description: Leaves consist of long, yellow or blue-green strips bearing tiny leaflets that soon fall off, but the strips and green bark keep tree looking fresh and green. Flowers fragrant and showy in loose clusters. Fruit a brown pod narrowed between the seeds. Flowering and fruiting throughout the year.

Rate of growth: Rapid. Tree lasts only about 15 years.

Mature height: 10 to 20 ft (3 to 6 m).

Crown diameter: 10 ft (3 m).

Remarks: Native to Mexico and southwest United States. Propagated by seeds or cuttings. Pruning after flowering reduces litter from pods and improves appearance.



***Peltophorum inerme* (Roxb.) Naves** **Flamboyán amarillo**
Family: Leguminosae **Yellow flamboyant**

Handsome, spreading tree with dense, dark-green, feathery foliage and showy, rusty-yellow flowers.

Uses: Shade and ornament for gardens and lawns and along roadsides.

Features: Grows on both moist and dry soils. Provides good shade except in dry season when the leaves fall.

Limitations: Root system deep, but tree is so large that it may be blown over by hurricane-force winds. Also, because of spreading crown, should not be planted close to structures.

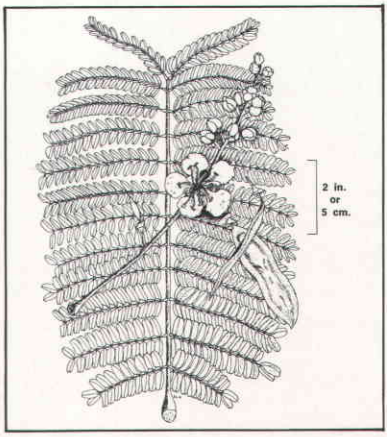
Description: Leaves doubly compound with many small leaflets that do not produce much litter. Flowers fragrant, in branched terminal clusters, with rusty-brown hairs on twigs. Fruit a flat reddish-brown pod. Flowering from April to September, usually at least twice and with flowers lasting 3 to 4 weeks each time, and with pods on tree most of year.

Rate of growth: Rapid.

Mature height: 30 to 65 ft (9 to 20 m).

Crown diameter: 40 ft (12 m).

Remarks: Native to tropical southeast Asia. Propagated by seeds. Flowers can be cut for indoor decoration. Appearance of tree can be improved by light pruning to remove old pods.



***Pithecellobium arboreum* (L.) Urban** **Cojoba**

Family: Leguminosae

Upright tree with spreading crown of dark-green, feathery foliage.

Uses: Shade and ornament in gardens and along roads.

Features: Grows in good, moist soil but not in wet, heavy soils or in very dry areas. Provides medium shade except during the dry season when it loses leaves for a brief period.

Limitations: Should not be planted close to structures because roots close to the surface may cause problems.

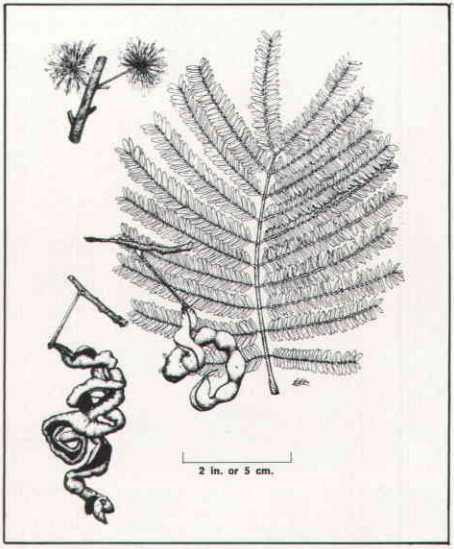
Description: Leaves doubly compound with many pairs of small shiny leaflets that do not produce much litter. Flowers in whitish puffballs at leaf bases. Fruit a coiled or curved red pod, splitting open to expose black seeds hanging on short threads. Flowering in spring with pods maturing in summer and flowering and fruiting again in fall.

Rate of growth: Moderate.

Mature height: 30 to 50 ft (9 to 15 m).

Crown diameter: 20 ft (6 m).

Remarks: Native to Puerto Rico. Propagated by seeds, which must be collected and sown promptly because they are rapidly destroyed by weevils.



***Plumeria rubra* L.** **Frangipani**

Family: Apocynaceae

Fragrant, waxy, long-lasting red or white flowers, used for garlands and decorations.

Uses: For decorative flowers in gardens, courtyards, patios, cemeteries, planting boxes, and other restricted areas.

Features: Grows in poor soils and dry conditions, but does not do well in poorly drained or wet areas. Tolerates some salt spray. Has very open crown of few stout, fleshy, spreading branches. Flowers when very young, and often flowers almost all year long except between March and May.

Limitations: May lose its leaves for up to 2 months during dry seasons. Milky juice is reported to be poisonous in large quantities. A large caterpillar sometimes repeatedly defoliates this tree, and a yellow rust on the leaves may also cause them to fall prematurely.

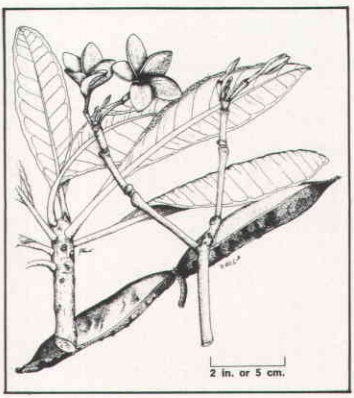
Description: Leaves shiny green, crowded at apex of twigs. Flowers large and tubular, in flat-topped terminal clusters with center flowers opening first. Fruit a paired, brown, leathery pod. Flowering and fruiting nearly throughout the year. Milky juice flows freely from cut or broken stems.

Rate of growth: Rapid. Tree lasts about 30 years.

Mature height: 15 to 25 ft (4.5 to 7.5 m).

Crown diameter: 15 ft (4.5 m).

Remarks: Native to southern Mexico and Central America, but widely cultivated in the tropics. Propagated by cuttings, which should be left in a dark, cool spot for at least 48 hours before planting. There are many hybrids and varieties of this species; in Puerto Rico, trees with reddish flowers or with white flowers having yellow centers, are most common.



***Pterocarpus indicus* Willd.** **Pterocarpus**

Family: Leguminosae **India padauk**

Large ornamental and shade tree with a dense, broad crown of drooping branches.

Uses: Parks, gardens, and avenues where there is room for the roots.

Features: Grows well in most soils but does best in deep, well-drained soils in humid areas. Nearly evergreen, but sheds most of its leaves for a short time in the spring.

Limitations: Although it has a deep root system and is relatively wind firm, it often develops superficial roots that can damage sidewalks. The dense shade keeps most other plants from growing beneath it. The falling leaves and pods may cause a litter problem.

Description: Leaves composed of 7 to 11 leaflets, shiny green to yellow-green. Flowers yellow, pea-shaped, fragrant, in showy lateral clusters but lasting less than a week. Fruit a round, flattened pod surrounded by a wing; green at first but turning brown as it matures. Flowering in June and July, often several times, with fruits maturing in late summer but remaining on tree most of year.

Rate of growth: Rapid.

Mature height: 60 ft (18 m) or more.

Crown diameter: 45 ft (13.5 m).

Remarks: Native to southeast Asia. Propagated by seeds and cuttings. Flowers attract bees. Young plants often have poor form and need staking and pruning until a crown develops. A related species, *Pterocarpus macrocarpus* Kurz (pterocarpus, Burma padauk), which is larger and has larger pods, is occasionally planted in Puerto Rico.

***Roystonea borinquena* O. F. Cook** **Palma real**
Family: Palmae **Puerto Rico royalpalm**

Puerto Rico's own royalpalm for stately effects.

Uses: Street planting, gardens, parks, and roadsides. Most effective when several are planted in a row or group.

Features: Grows throughout Puerto Rico on most soils including poorly drained ones, but needs moisture.

Limitations: Old leaves, which fall off complete with basal sheath 3 or 4 times a year, can be dangerous for passersby and cars in public areas and may present a disposal problem.

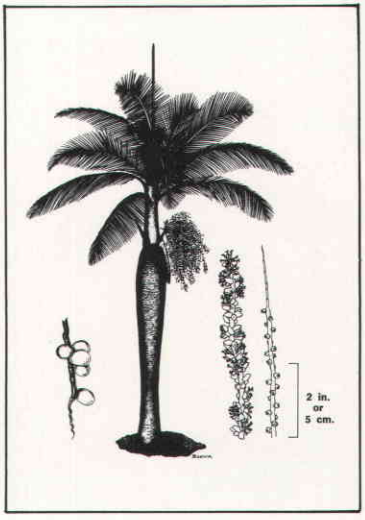
Description: Tall palm with smooth, gray trunk constricted above base but swollen again higher up, with narrow, light-green column of leaf sheaths below spreading crown of feathery leaves. Much branched inflorescence arises at base of green column and bears whitish flowers and small, brown fruits. Flowering and fruiting throughout the year.

Rate of growth: Moderate.

Mature height: 30 to 60 ft (9-18 m).

Crown diameter: 25 ft (7.5 m).

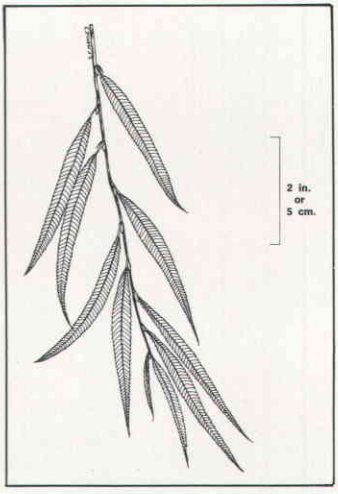
Remarks: Native to Puerto Rico and St. Croix. Propagated by seeds. A related species, *Roystonea regia* (H.B.K.) O. F. Cook (palma real cubana, Cuban royalpalm) from Cuba has a tall but not swollen trunk and is also sometimes planted in Puerto Rico. Another palm with a bulging trunk, *Acrocomia media* O. F. Cook (corozo, prickly palm, Puerto Rico acrocomia), is shorter and has a spine-covered trunk and no sheaths below the leaves.



***Salix babylonica* L.** **Sauce llorón**
Family: Salicaceae **Weeping willow**

Fast-growing, small tree with weeping effect for wet areas.

Uses: Around pools and streams and as a graceful accent in gardens.
Features: Grows best in low, wet areas; withstands periodic flooding and will grow in dry areas if watered regularly. Evergreen except under very dry conditions.
Limitations: Root system is shallow and will clog sewers and water pipes. Branches easily broken by wind.
Description: Leaves narrow, with slight but distinctive odor when crushed; on long, slender drooping twigs. Male and female flowers in catkins on different trees, but apparently not flowering in Puerto Rico.
Rate of growth: Rapid. Tree lasts only about 15 years.
Mature height: 25 ft (7.5 m).
Crown diameter: 20 ft (6 m).
Remarks: Native to China. Propagated by stem cuttings, easily rooted and transplanted.



***Sterculia apetala* (Jacq.) Karst.** **Anacagüita**
Family: Sterculiaceae **Panama-tree**

Tall tree with large trunk and dense, wide-spreading crown.

Uses: Shade and ornament in large areas and along roadsides.

Features: Grows in dry climates if soil is deep and has moisture. Provides good shade and crown is high enough to let breezes blow through underneath.

Limitations: Needs large area to grow in, and develops large root system and buttresses. Pods contain irritating hairs when they mature. Branches are somewhat brittle but recover quickly after wind damage.

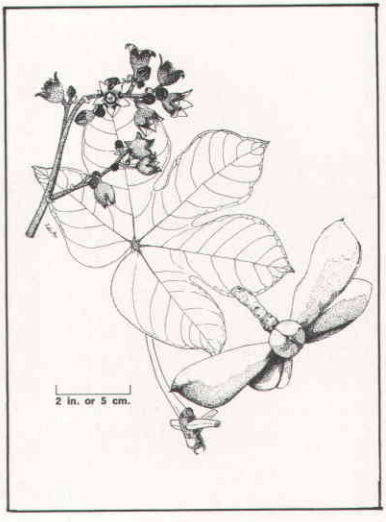
Description: Leaves palmately lobed, leathery and pleated, densely wooly on underside. Flowers in long, branched clusters; bell-shaped and yellow tinged with red or purple. Fruit composed of 5 or fewer hard, brown, spreading pods. Flowering in spring and often again in summer or fall for about 1 month each time, pods usually maturing in spring.

Rate of growth: Moderate.

Mature height: 60 ft (18 m) or more.

Crown diameter: 40 ft (12 m) or more.

Remarks: Native from southern Mexico to northern South America. Propagated by seeds. A related species, *Sterculia foetida* L. (anacagüita, hazel sterculia), has 5 to 11 long-pointed, palmately-arranged leaflets and reddish or purplish flowers whose unpleasant odor makes it undesirable as an ornamental.



***Swietenia macrophylla* King** **Caoba hondureña**
Family: Meliaceae **Broadleaf mahogany**

Straight trunk and dense crown for shade and ornament.

Uses: Gardens, parks, and roadsides.

Features: Grows on most soils if moisture is available, and will withstand drought once it has become established.

Limitations: Trunk develops buttresses and surface roots, so should not be planted close to buildings or sidewalks. Also suffers windthrow or breakage from hurricane-force winds. A boring insect kills the leading shoots of young trees, but the damage can be minimized by pruning to develop crowns that are bushier and better for shade.

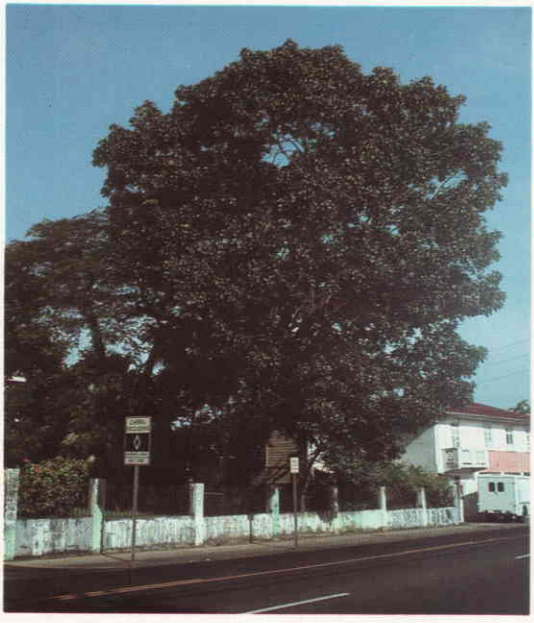
Description: Leaves with 6 to 12 pairs of dark-green, shiny leaflets. Trees leafless for a short period in the spring. Flowers fragrant but inconspicuous. Fruit a brown, woody, erect, pear-shaped capsule. Flowering in May and June with fruit maturing in late fall.

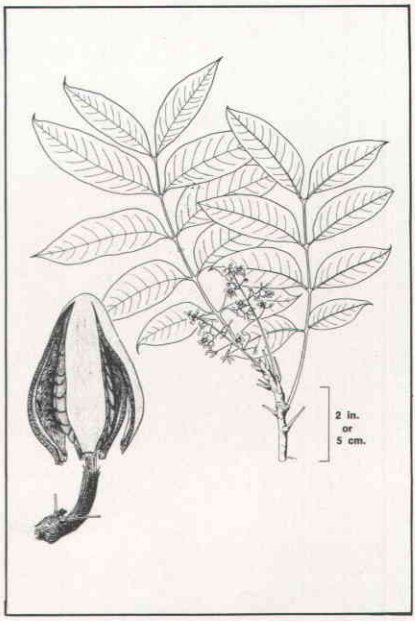
Rate of growth: Rapid.

Mature height: 60 ft (18 m) or more.

Crown diameter: 40 ft (12 m).

Remarks: Native to tropical Central and South America. Propagated by seeds or wildlings. Produces a valuable wood for furniture, veneer, and turned articles.





***Swietenia mahagoni* Jacq.** **Caoba dominicana**
Family: Meliaceae **West Indies mahogany**

Dense-crowned tree for dry and coastal areas.

Uses: Shade and ornament in gardens and along roads.

Features: Grows on a wide variety of soils from coral rock to sand. Withstands drought, wind, and salt spray. Usually has a short trunk and spreading crown.

Limitations: Although it does not grow rapidly, the trunk tends to develop buttresses and surface roots, so should not be planted close to buildings or sidewalks. A shootborer damages young trees, but is not a serious problem in Puerto Rico and the Virgin Islands, although it is in Hispaniola.

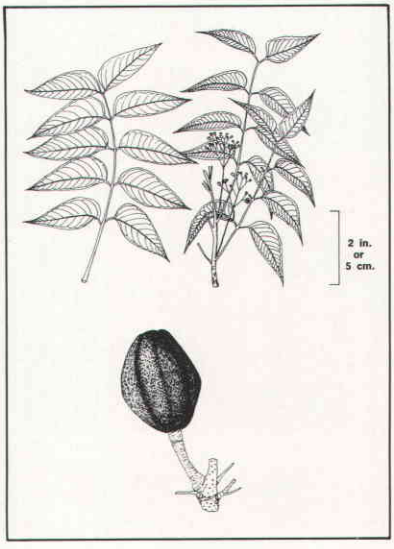
Description: Leaves with 4 to 10 pairs of shiny green leaflets. Trees leafless for a short time in the spring. Flowers inconspicuous. Fruit a dark brown, woody, erect, pear-shaped capsule. Flowering from January to March.

Rate of growth: Moderate.

Mature height: 40 to 60 ft (12 to 18 m).

Crown diameter: 40 ft (12 m).

Remarks: Native from southern Florida to Cuba, Jamaica, and Hispaniola. Propagated by seeds. Produces one of the world's premier cabinet woods. A natural hybrid between this species and *Swietenia macrophylla*, discovered on St. Croix and known as "medium-leaf" mahogany, is faster-growing and therefore a better choice for planting except in very dry areas.



***Tabebuia heterophylla* (DC.) Britton** **Roble blanco**
Family: Bignoniaceae **White-cedar**

Profuse, showy, pink flowers on widely adapted native species.

Uses: Ornament around houses and along roads.

Features: Grows on any soil type and is particularly well adapted to poor or degraded soils if moisture is available. Covered for 2 to 4 weeks with masses of flowers in the spring while the tree is leafless and sometimes again in the fall. Root system not troublesome so tree can be planted in confined areas.

Limitations: Branches often deformed to a "witches-broom" appearance by a virus transmitted by a leaf hopper. This insect also causes the leaves to turn yellow and fall prematurely during long dry spells.

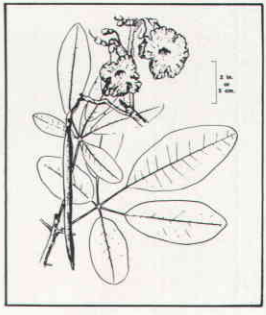
Description: Leaves with 5 or fewer large, palmately arranged leaflets that are usually smaller in dry areas. Flowers abundant over the crown in small clusters, each only lasting a few days and carpeting the ground when they fall, usually pink but white or purple on some trees. Fruit a dark-brown, cigar-shaped pod. Flowering in spring, often again in fall, and sporadically throughout the year, and with fruit all year.

Rate of growth: Slow.

Mature height: 60 ft (18 m).

Crown diameter: 20 ft (6 m).

Remarks: Native to Puerto Rico and the Virgin Islands. Propagated by seeds or wildlings. Young trees often flower within 1 or 2 years after planting. The wood has been used for construction and furniture. Because of the witches-broom disease, *Tabebuia rosea* (Bertol.) DC. (roble venezolano, pink trumpet-tree), which has pink to reddish flowers, or *Tabebuia glomerata* Urban (roble amarillo, yellow poui), which has yellow flowers, may be preferable if they are available. However, they are not as well adapted to poor soils.



***Tamarindus indica* L.** **Tamarindo**
Family: Leguminosae **Tamarind**

Dense, feathery foliage, with fruit for refreshing drink.

Uses: Shade, ornament, and fruit in gardens and parks.

Features: Grows on poor soils and in dry areas, also in wetter areas if the soil is well drained. Has wide crown that casts dense shade, although the tree may lose many of its leaves during severe dry seasons. The pulp in the pods makes a refreshing drink. Highly resistant to wind.

Limitations: Pods may create messy litter. The dense shade keeps most other plants from growing beneath it. Should not be planted close to buildings or pavements because of the spreading crown and the trunk, which eventually gets quite large.

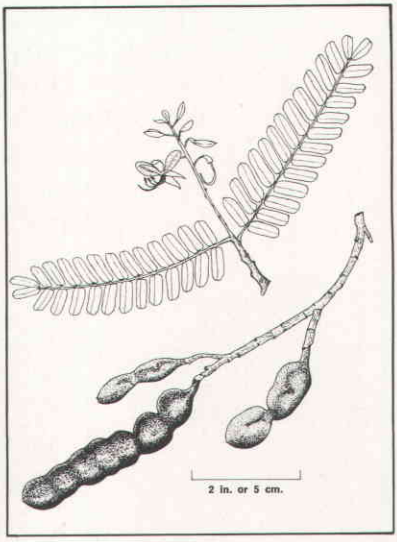
Description: Leaves with 10 to 18 pairs of blue-green leaflets. Flowers in small clusters, pale yellow, and not showy except from close by. Fruit a dark-brown pod constricted between the seeds. Flowering from spring to fall and fruiting from winter to spring.

Rate of growth: Slow.

Mature height: 40 ft (12 m).

Crown diameter: 30 ft (9 m).

Remarks: Native to Old World tropics. Propagated by seeds. Growth of seedlings often rapid for first 8 to 10 ft (2.5 to 3 m).



***Tecoma stans* (L.) H.B.K.** **Roble amarillo**
Family: Bignoniaceae **Ginger-thomas**

Showy yellow flowers on small tree for dry areas.

Uses: Along roadsides, in fences and privacy screens, and similar places where a small tree is needed.

Features: Grows almost anywhere, including poor soils, but does best in well-drained soils in dry areas and with full sun. Often more of a bush than a tree, with small clusters of long-lasting flowers.

Limitations: Should not be planted close to buildings, sidewalks, or underground utilities because the roots and crown spread very quickly. Should be pruned after flowering to restrain the spread and to maintain dense foliage and induce further flowering. Branches somewhat brittle but tree recovers quickly after wind damage.

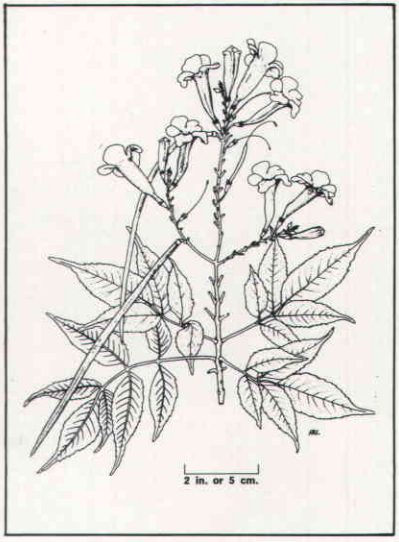
Description: Leaves with 5 to 13 saw-toothed leaflets. Flowers trumpet-shaped and slightly fragrant. Fruit a narrow, dark-brown, cigar-shaped pod. Flowering and fruiting nearly throughout the year.

Rate of growth: Rapid.

Mature height: 10 to 25 ft (3 to 7.5 m).

Crown diameter: 10 ft (3 m).

Remarks: Native to Puerto Rico and the Virgin Islands; official flower of the U. S. Virgin Islands. Propagated by seeds or soft greenwood cuttings. Grows best when young and should be replanted after 10 to 15 years.



***Terminalia catappa* L.** **Almendra**
Family: Combretaceae **Indian-almond**

Large leaves, pagoda-like branching, and edible seeds.

Uses: Shade and ornament along roads and in beach areas.

Features: Grows in most soils, both acid and alkaline, as long as moisture is available, and withstands salt spray. Leaves turn red before falling. Because the tree loses some leaves throughout the year and nearly all in March or April, it usually has at least some colored leaves. Erect trunk has horizontal branches in whorls at different levels.

Limitations: Should not be planted close to buildings or sidewalks because the trunk becomes buttressed. Falling leaves and fruit may create litter problem. Strong winds may damage branches, but tree recovers quickly. Insects attack the leaves during dry weather, causing them to look grayish or silvery and to fall prematurely.

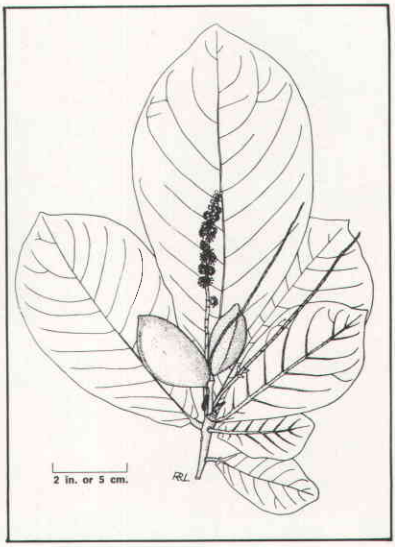
Description: Leaves leathery and somewhat shiny, crowded close together near ends of twigs. Flowers small and slightly fragrant in long, narrow clusters. Fruit light brown and slightly flattened, with fibrous husk containing edible kernel that tastes like almond. Flowering and fruiting nearly throughout the year.

Rate of growth: Rapid.

Mature height: 50 ft (15 m).

Crown diameter: 30 ft (9 m).

Remarks: Native to East Indies. Propagated by seeds.



***Thespesia populnea* (L.) Soland.** **Emajagüilla**
Family: Malvaceae **Otaheita**

Small, yellow-flowered tree for beaches and poor soils.

Uses: Ornament, some shade, and screening, especially near the ocean but also in gardens and along streets.

Features: Highly salt-resistant. Will grow on marl, coral rock or sand, and on sand dunes, pumped-in fills, and swampy areas. Makes a good screen.

Limitations: Sometimes develops, especially in dry areas, sprawling lower branches that should be pruned unless the tree is being grown as a hedge.

Description: Leaves heart-shaped and dark shiny green. Flowers pale yellow with purplish base, lasting only 1 day and turning all purple. Fruit hard and dry, gray, rounded, 5-ridged, and flattened. Flowering and fruiting from spring to fall.

Rate of growth: Rapid to moderate. Tree lasts about 20 years.

Mature height: 30 ft (9 m).

Crown diameter: 15 ft (4.5 m).

Remarks: Probably native to Old World, but now widely planted and naturalized throughout the tropics. Propagated by seeds, or cuttings of semimature wood. Bark is very fibrous and will peel down in strips if pruning is not done carefully.

References

Angleró, José A.
[n.d.] Información sobre árboles ornamentales y de sombra. (Information about ornamental and shade trees.) 110 p. Servicio de Extensión Agrícola, Universidad de Puerto Rico, Río Piedras.

Aristeguieta, Leandro.
1962. Arboles ornamentales de Caracas. (Ornamental trees of Caracas.) 218 p. illus. Consejo de Desarrollo Científico y Humanístico, Universidad Central de Venezuela, Caracas.

Balmer, William E., and José A. Zambrana.
1977. Planting trees in urban areas. U.S. Dep. Agric. For. Serv., Urban For. Bull., Caribbean Area, 2 p. illus.

Barrett, Mary F.
1956. Common exotic trees of south Florida. 414 p. illus. Univ. Fla. Press, Gainesville.

Conover, C. A., and E. W. McElwee.
1966. Selected trees for Florida homes. Agric. Ext. Serv., Univ. Fla., Bull. 182, 77 p. illus.

Freeman, W. G., and R. O. Williams.
1928. The useful and ornamental plants of Trinidad and Tobago. 2d ed. Memoirs of the Dep. Agric. Trinidad and Tobago No. 4, 192 p.

Groves, Gordon R.
1955. Trees, shrubs, palms, and succulent plants. 3d ed. Dep. Agric. Bermuda, Bull. No. 26, 74 p.

Hartmann, Hudson T., and Dale E. Kester.
1975. Plant propagation. 2d ed. 662 p. illus. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Hearne, D. A.
1975. Trees for Darwin and northern Australia. 130 p. (plus plates). Dep. Agric., Forestry and Timber Bureau, Australian Government Publishing Service, Canberra.

Kennard, William C., and Harold F. Winters.
1960. Some fruits and nuts for the tropics. U.S. Dep. Agric., Agric. Res. Serv., Misc. Publ. 801, 135 p. illus.

Kuck, Lorraine E., and Richard C. Tongg.
1955. The modern tropical garden. 250 p. illus. Tongg Publishing Co., Honolulu.

Little, Elbert L., Jr., and Frank H. Wadsworth.
1964. Common trees of Puerto Rico and the Virgin Islands. U.S. Dep. Agric. For. Serv., Agric. Handb. 249, 548 p. illus.

Little, Elbert L., Jr., Roy O. Woodbury, and Frank H. Wadsworth.
1974. Trees of Puerto Rico and the Virgin Islands, second volume. U.S. Dep. Agric. For. Serv., Agric. Handb. 449, 1024 p. illus.

Martorell, Luis F.
1953. ¿Qué árbol sembraré? (What tree to plant.) Carib. For. 14 (3+4):152-160.

Oliva-Esteva, Francisco.
1969. Arboles ornamentales y otras plantas del trópico. (Ornamental trees and other plants of the tropics.) 368 p. illus. Ediciones Armitano, Caracas.

Pennock, William.
1967. Ornamental trees for landscaping in Puerto Rico. Agricultural Experiment Station, Univ. Puerto Rico, Mayaguez Campus, Rio Piedras, Misc. Publ. 64, 58 p.

Puerto Rico, Autoridad de las Fuentes Fluviales.
[n.d.] Siembre adecuadamente. (Proper planting.) 34 p. illus. San Juan.

Schory, Elbert.
1973. 60 trees for south Florida. 44 p. illus. Dep. Agric. and Consumer Services, Tallahassee.

Schubert, Thomas H., and José Zambrana.
1978. West Indies or small-leaf mahogany: an ornamental and shade tree for semi-confined areas and adverse conditions. U.S. Dep. Agric. For. Serv., Urban For. Bull., Caribbean Area, 2 p. illus.

Schubert, Thomas H., and José Zambrana.
1978. Honduras or bigleaf mahogany: an ornamental and shade tree for avenues, road intersections, and large areas. U.S. Dep. Agric. For. Serv., Urban For. Bull., Caribbean Area, 2 p. illus.

Sturrock, David, and Edwin A. Menninger.
1946. Shade and ornamental trees for south Florida and Cuba. 179 p. illus. Stuart Daily News, Inc., Stuart, Fla.

U.S. Department of Agriculture, Forest Service.
1974. Your tree's trouble may be you! U.S. Dep. Agric. For. Serv., Agric. Inf. Bull. 372, 21 p. illus.

Virgin Islands Soil and Water Conservation District.
[n.d.] Selected Virgin Islands plants; a guide to ground covers, barrier hedges, privacy screens, windbreaks. 47 p. illus. St. Croix Landmarks Society, Christiansted.

Winters, H. F., and N. Almeyda.
1953. Ornamental trees in Puerto Rico. Carib. For. 14(3+4):97-105.

Woman's Club of Havana.
1952. Flowering plants from Cuban gardens. 365 p. illus. Criterion Books, New York.

Zambrana, J. A., and William E. Balmer.
1979. Maria: an ornamental and shade tree. U.S. Dep. Agric. For. Serv., Urban For. Bull., Caribbean Area, SA-GR4, 3 p. illus.

Zambrana, José A., and Thomas H. Schubert.
1977. Black olive or gregre: an ornamental and shade tree for confined areas and adverse conditions. U.S. Dep. Agric. For. Serv., Urban For. Bull., Caribbean Area, 2 p. illus.

Appendix

Other sometimes-planted species and their limitations:

1. *Anacardium occidentale* L.; pajuil, cashew — limited adaptability and slow growth.
2. *Bambusa vulgaris* Schrad.; bambú, common bamboo — hard to control spread.
3. *Brassaia actinophylla* Endl.; scheflera, umbrella-tree — form not very attractive except when young, needs repeated pruning.
4. *Calophyllum inophyllum* L.; kamani — not as attractive or versatile as *Calophyllum calaba* because of its long branches and heavy crown.
5. *Cassia fistula* L.; cañafistula, golden-shower — when not in flower, large pods and straggling branches make it unattractive.
6. *Cochlospermum vitifolium* (Willd.) Spreng.; rosa imperial, Brazilian-rose — poor form and unattractive appearance when not in flower.
7. *Cyathea arborea* (L.) J.E. Smith; helecho gigante, tree fern — limited adaptability because it needs constant moisture.
8. *Enterolobium cyclocarpum* (Jacq.) Griseb.; guanacaste, earpod-tree — giant tree susceptible to root disease.
9. *Ficus lyrata* Warb.; fiddle-leaf fig. — considered less attractive than *Ficus nekbuda*.
10. *Ficus retusa* L.; laurel de la India, India-laurel fig. — short-lived and difficult to remove, thrips insects deform leaves and irritate eyes of people beneath crown.
11. *Gliricidia sepium* (Jacq.) Steud.; mata-ratón, mother-of-cocoa — less attractive than *Cassia javanica,* form shrubby and straggly.
12. *Jacaranda mimosifolia* D. Don; jacaranda — does not generally flower well, needs cooler and drier climate than that of Puerto Rico and the Virgin Islands.
13. *Melaleuca quinquenervia* (Cav.) S.T. Blake; cayeputi, cajeput-tree —usually has very scraggly form.
14. *Melia azedarach* L.; alelaila, chinaberry — frequently with poor form, poisonous.
15. *Pimenta racemosa* (Mill.) J.W. Moore; malagueta, bay-rum-tree — very slow growth.
16. *Pithecellobium saman* (Jacq.) Benth.; samán, raintree — large attractive tree but very susceptible to root disease.
17. *Plumeria alba* L.; alelí, milktree — less attractive than *Plumeria rubra*.
18. *Sabal causiarum* (O.F. Cook) Beccari; palma de sombrero, Puerto Rico palmetto — slow growth, less attractive than *Roystonea borinquena*.

19. *Salix humboldtiana* Willd.; sauce, Humboldt willow — loses vigor after a few years and then has poor appearance.
20. *Spathodea campanulata* Beauv.; tulipán africano, African tuliptree —easily broken by wind, roots may damage sidewalks and buildings, sprouts from roots, and is likely to seed into open areas.
21. *Tibouchina granulosa* (Desr.) Cogn.; glorybush — widespread adaptability not yet proven.

Index of Common and Scientific Names

Schubert, Thomas H.
1979. Trees for urban use in Puerto Rico and the Virgin Islands. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. SO-27, 91 p.

Describes and illustrates forty-six tree species useful for shade and ornament in Puerto Rico and the Virgin Islands. Information is also provided about planting, maintenance, and appropriate use of trees in urban areas.

Additional keywords: Tree planting, urban forestry.

This paper mentions the use of pesticides. If pesticides are handled, applied, or disposed of improperly, they may be injurious to humans, domestic animals, desirable plants, and pollinating insects, fish, or other wildlife, and may contaminate water supplies. Use pesticides only when needed and handle them with care. Follow the directions and heed all precautions on the container label.

Some states have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your local agricultural extension agent to be sure intended use is still registered.