

# Enviroscaping to Conserve Energy: Trees for South Florida<sup>1</sup>

Timothy K. Broschat, Alan W. Meerow and Robert J. Black<sup>2</sup>

## Introduction

Residential energy use comprises about 26% of all the energy used in the state of Florida (Florida Energy Office, 1992). In south Florida, about 35% of this annual residential energy expenditure is for cooling the home during Florida's 5- to 7-month-long summer, and about 10% is used for heating in winter (Cook, 1993). As utility rates escalate, so does the cost of staying comfortable in the home.

Glass windows and doors can account for between 30 and 60% of a building's total heat gain in the summer (Cook, 1986). As much as 270 Btu (heat unit called British thermal unit) of direct and diffused solar radiation can enter a home or building through each square foot of glass on the east and west sides. For example, if sunlight strikes only 50 square feet of a clear glass window (sliding-glass door) on a west wall, the cooling effect of more than one ton of air conditioning is required to remove the heat gained from this source alone. This is more than eight times the heat gain caused by conduction and infiltration. Even windows facing north or south can have twice as much indirect radiant heat gain than that from conduction and infiltration combined.

Before central heating and air conditioning, homes were designed and built to take advantage of natural heating and cooling. For example, a tree with high branches offers shade

in the summer and insulation from cold winter winds. Today, passive methods of climate control are once again of interest because we are now aware of fossil fuel supply limitations and the environmental effects of fossil fuel use. New information has substantially improved many passive, energy-saving landscaping concepts (known as enviroscaping) from the past.

Landscape plants can improve the appearance of our surroundings and modify the extremes of local climate (microclimate modification). Plants provide shade, insulate the home from heat loss or gain, and cool the air that surrounds their leaves through transpiration (release of water from plant pores).

Trees are the main types of landscape plants used around the home for passive energy conservation. They provide shade, influence air movement around the house and, once established, require little maintenance. The energy-conserving impact of a particular tree species depends on 1) whether it keeps its leaves during the winter and 2) the shape of a tree and density of its foliage.

## Planting Site Selection

House walls are the most practical to shade because new tree plantings take many years to cast an effective shadow on the roof. Heat transmitted through the roof is best

1. This document is Circular EES-42, formerly Landscaping to Conserve Energy: Trees for South Florida, Florida Cooperative Extension Service, UF/IFAS Extension. Publication date July 1993. Reviewed August 2010. Revised August 2013. Please visit the EDIS website at <http://edis.ifas.ufl.edu/>.
2. Timothy K. Broschat, pProfessor, Alan W. Meerow, former professor, Fort Lauderdale Research and Education Center; Robert J. Black, former associate professor, Environmental Horticulture Department, UF/IFAS Extension, Gainesville, FL 32611. The Florida Energy Extension Service receives funding from the Florida Energy Office, Department of Community Affairs and is operated by the University of Florida's Institute of Food and Agricultural Sciences through the Cooperative Extension Service. The information contained herein is the product of the Florida Energy Extension Service and does not necessarily reflect the views of the Florida Energy Office.

reduced by using attic insulation, radiant barriers and ventilation. This is because tree limbs over the roof can present both a nuisance (litter clogging rain gutters) and a risk of damage or injury should heavy limbs fall off in a storm. Existing vegetation that can provide roof shade without undue risk, however, should be incorporated into the home site design.

The correct placement of trees shading the home involves consideration of the angle of the sun's rays in summer and winter, mature tree height and structure height. In general, the target areas for shading during Florida's warm months are the walls on western, eastern and southern exposures, in that order. Though an exposure facing due south receives little direct sun on June 21, by August the sun is low enough in the sky to increase heat loads considerably on south walls. Windows provide the most direct entry for heat into the home. Consequently, special attention may need to be given to walls containing the most windows.

The benefits of new shade trees should be felt within 5 years. To accomplish this goal, a distance of 7 to 20 feet from tree to wall is recommended. Lot size and the mature tree height directly influence this distance. The closer a tree is to the house, the longer its shading effects last during the day. The shadow of a tree planted 10 feet from the home moves across the shaded surface four times slower than a tree planted 20 feet away.

If winter windbreak effects are desired, trees should be planted on the north and northwestern exposures of the home. This is the prevailing direction of blustery, winter winds in most of Florida (see EES-5 [Florida Climate Data](#)). The effects of summer breezes, which usually prevail from the southeast and southwest in Florida, are often desirable during mild, transitional times of the year. Where air conditioning exclusively cools the home for most of the hot season, summer winds can reduce cooling efficiency by increasing hot, humid air infiltration around window and door fittings or cracks in siding and masonry. In this case, a tree windbreak located on the southeast exposure of the house deflects the energy-robbing winds from the home.

## Tree Selection

The [chart](#) at the end of this publication provides information that will help you choose one or more species best suited to your house and landscape. The trees are alphabetized by scientific name. The size category specifies the mature height of the tree (small, small-medium, medium, medium-large, and large).

If shade requirements are immediate, give careful attention to the growth-rate designation in the [chart](#). A fast-growing tree increases in height by 3 or more feet per year and provides shade benefits within 5 years. Most fast-growing trees, however, are both short lived and weak wooded, two undesirable characteristics. In such cases, it may be desirable to plant both a small, rapidly growing tree and a moderate or slow-growing species nearby. The fast-growing tree could then be removed once the other species provides shade benefits.

Site conditions directly influence the establishment and the life of a landscape tree. Coastal residents should heed the salt-tolerance ratings of the listed species. The "General Comments" column on the [chart](#) gives specific tolerances (or intolerances) of a particular species. Tailor your choices to match the conditions in your site. For instance, a tree requiring well-drained soils does not prosper where standing water accumulates after a heavy rain. If this condition applies to your home site, choose trees for wet-soil tolerance as indicated (e.g., red maple, *Acer rubrum*; pond apple, *Annona glabra*; and bald cypress, *Taxodium distichum*).

Relative drought tolerance is also indicated for each species. These ratings refer to Florida conditions only and should be interpreted as follows: High -- survives without supplemental irrigation after establishment; Moderate -- requires supplemental irrigation during very dry periods to maintain satisfactory appearance and health; and Low -- little or no drought tolerance. Drought tolerance also varies with soil type, water table, and other environmental conditions.

Whether a tree is evergreen or deciduous ("Leaf Persistence" on the [chart](#)) affects its performance. Deciduous trees, which drop their leaves in winter, are recommended for use on south, southeast and southwest exposures. In summer, they provide desired shade. In winter, their bare canopy allows the sun's rays to warm the home, creating additional energy savings. On the other hand, evergreen trees, which have leaves all year, on the north and northwest exposures provide the most effective barrier to cold, winter winds.

The shape of a tree influences how long shade lasts. Spreading, round and vase-shaped canopies provide the longest periods of shade during the day. With attention to both this category and the shade-density rating, home-shading methods can be fine tuned to meet individual needs and desires.

Interest in native plant materials has increased greatly in the state, so all native species are marked with an asterisk (\*) on the [chart](#). In some cases, native plants may be better adapted than exotic species to local soil and weather conditions.

A few common landscape trees in south Florida are not on this list. Australian pine (*Casuarina equisetifolia*), punk or cajeput tree (*Melaleuca quinquenervia*), earleaf acacia (*Acacia auriculiformis*), carrotwood (*Cupaniopsis anacardioides*), ear tree (*Enterolobium cyclocarpum*), bishopwood or toog (*Bischofia javanica*), laurel fig (*Ficus microcarpa*), and Brazilian pepper (*Schinus terebinthifolius*) are exotic species that are considered invasive, or have other serious environmental problems such as invasive root systems. These species are not recommended for south Florida landscapes.

## Planting and Maintenance

All new tree plantings benefit from soil preparation, regular irrigation, and, in some cases, protection from insects, disease or weather extremes. Young trees require a period of regular aftercare to ensure proper establishment. Knowledgeable nursery employees and county extension agents are good sources for answers to individual problems.

Detailed information on proper tree placement, shading patterns, and microclimate modification are in the following publications available at your county extension office:

[EES 43 Enviroscaping to Conserve Energy: Microclimate Modification](#)

[EES 49 Enviroscaping to Conserve Energy: Determining Shade Patterns for North Florida](#)

[EES 50 Enviroscaping to Conserve Energy: Determining Shade Patterns for Central Florida](#)

[EES 48 Enviroscaping to Conserve Energy: Determining Shade Patterns for South Florida](#)

## References

Cook, Gary. 1986. *A guide to selecting window and glazing options for Florida buildings*. IFAS/Florida Energy Extension Service EES-36. Gainesville, FL.

Cook, Gary. 1993. Personal communication. Gainesville, FL.

Florida Energy Office. 1992. *Florida energy data report: 1970-1990*. Dept. of Community Affairs, Florida Energy Office, Tallahassee, FL.

## Key to South Florida Tree Chart

- Leaf Persistence: D = Deciduous, E = Evergreen, S = Semi-Evergreen
- Form: C = Columnar, O = Oval, P = Pyramidal, R = Round, S = Spreading, V = Vase-Shaped
- Growth Rate: S = Slow (less than 6 inches per year), M = Moderate (6 inches to 3 feet per year), F = Fast (more than 3 feet per year)
- Shade Density: L = Light, M = Medium, H = Heavy
- Size: S = Small (up to 25 feet), M = Medium (25 - 40 feet), L = Large (more than 40 feet)
- Drought Tolerance: L = Low, M = Moderate, H = High
- Salt Tolerance: L = Low, M = Moderate, H = High

Table 1. Tree Selection for South Florida

<b>Scientific Name Common Name * = native</b>	<b>Leaf Persistence</b>	<b>Form</b>	<b>Growth Rate</b>	<b>Shade Density</b>	<b>Size</b>	<b>Drought Tol.</b>	<b>Salt tol.</b>	<b>General Comments</b>
<i>Acer rubrum</i> Red maple	D	O-R	F	M	M	M	L	Tolerates wet soils. Red flowers and fruit in late winter/early spring.
* <i>Annona glabra</i> Pond apple	D	R	M	M	S	L	M	Tolerates wet sites.
<i>Araucaria heterophylla</i> Norfolk Island pine	E	C-P	M	M	M-L	H	M	Tends to drop branches in high winds.
<i>Averrhoa carambola</i> Carambola	E	R	M	M	S	M	L	Edible fruit; can be messy.
<i>Bauhinia x blakeana</i> Hong Kong orchid tree	S	R	F	H	M	H	M	No messy fruits. Long season of bloom.
<i>Bixa orellana</i> Annatto	E	R	M	M	S	M	L	Requires wind protection. Attractive flowers and fruit; fruit a source of natural dye.
<i>Bombax ceiba</i> Red silk cotton tree	D	R	M	M	L	H	L	Red or orange-red flowers in winter. Spiny trunk and branches.
<i>Bucida buceras</i> Black olive	E	R	M	M	M-L	H	H	Seed-grown stock variable in many characteristics.
<i>Bulnesia arborea</i> Vera wood	E	R	M	H	M	H	M	Yellow flowers in summer. Weak-rooted.
* <i>Bursera simaruba</i> Gumbo limbo	D-E	R	M	M	M	H	H	Attractive form and red peeling bark.
<i>Butea frondosa</i> Flame of the forest	D	S	S	M	M	M	M	Spectacular orange flowers; Requires fertile soil.
<i>Caesalpinia granadillo</i> Bridal veil tree	E	V-S	M	L-M	M	M	L	Attractive bark. Lacy foliage. Very hard wood.
<i>Callistemon citrinus</i> Lemon bottlebrush	E	O	M	M	S	H	M	Red bottlebrush flowers in spring. Tolerates moist sites.
<i>Callistemon viminalis</i> Weeping bottlebrush	E	R	M	M	S	H	M	Weeping habit. Attractive red bottlebrush flowers.
<i>Calophyllum brasiliense</i> Beauty Leaf	E	R	M	H	M	M	H	Glossy foliage. Flood tolerant.
<i>Canaga odorata</i> Ylang-ylang	E	O	F	M	M	M	L	Extremely fragrant flowers.
<i>Cassia bakeriana</i> Pink cassia	D	R	M	M	M	H	L	Showy pink flowers. Soft velvety light green foliage
<i>Cassia fistula</i> Golden shower	D	O	F	M	M	H	M	Bright yellow flowers. Seed pods messy.

<b>Scientific Name</b> <b>Common Name</b> <b>* = native</b>	<b>Leaf Persistence</b>	<b>Form</b>	<b>Growth Rate</b>	<b>Shade Density</b>	<b>Size</b>	<b>Drought Tol.</b>	<b>Salt tol.</b>	<b>General Comments</b>
<i>Cassia javanica</i> Apple blossom cassia	D	R	F	M	M	M	L	Showy pink and white flowers.
<i>Chorisia speciosa</i> Silk floss tree	D	R	M	L-M	L	H	L	Thorny trunk. Surface roots. Can be messy.
* <i>Chrysophyllum oliviforme</i> Satinleaf	E	R	M	M	S-M	H	H	Attractive foliage. Excellent accent tree.
* <i>Citharexylum fruticosum</i> Fiddlewood	E	O	S	M	S	H	M	Small, white, fragrant flowers.
* <i>Coccoloba diversifolia</i> Pigeon plum	E	O	M	M	S-M	H	H	Interesting bark. Good accent or specimen tree.
* <i>Coccoloba uvifera</i> Sea grape	E	S	M	M	S	H	H	Superb seaside tree. Edible fruit. Attractive bark.
<i>Cochlospermum vitifolium</i> Buttercup tree	D	O	F	M	S-M	H	M	Large yellow flowers.
* <i>Conocarpus erectus</i> Buttonwood	E	O-R	F	M	M	H	H	Can be used as a screen or hedge.
* <i>Conocarpus erectus var. sericeus</i> Silver buttonwood	E	R	M	M	S	H	H	Silver-leaved form of species. Stays smaller than typical variety.
<i>Cordia boissieri</i> White Geiger	E	R	M	M	S	H	M	Showy white flowers.
* <i>Cordia sebestena</i> Geiger tree	E	R	M	M	S	H	H	Bright orange flowers most of the year. Often defoliated by insects.
<i>Delonix regia</i> Royal poinciana	D	S	F	M-H	M-L	H	H	Spectacular red flowers. Brittle wood. Large, woody fruits are messy.
<i>Eriobotrya deflexa</i> Bronze loquat	E	R	M	M	S	H	M	Attractive bronze or red new growth.
<i>Eriobotrya japonica</i> Loquat	E	R	M	M	S	H	M	Edible fruit. Host for Caribbean fruit fly.
<i>Erythrina spp.</i> Coral trees	D	C-S	F	L	M-L	H	H	Showy red flowers. Seeds toxic. <i>E. indica</i> and several other species do well in Florida.
<i>Eucalyptus torrelliana</i> Torrelliana eucalyptus	E	O	M	L	M	H	H	Smooth green bark.
* <i>Eugenia spp.</i> Stopper trees	E	O	M	M	S	H	M	Several native species available. Aromatic foliage. Edible fruit.
* <i>Ficus aurea</i> Strangler fig	E	V-R	F	L	M-L	H	M	Often scraggly. Not as aggressive as many exotic fig species, but needs adequate space.
* <i>Ficus citrifolia</i> Shortleaf fig	E	S	M	M	M-L	H	M	Few aerial roots.

<b>Scientific Name</b> <b>Common Name</b> * = native	<b>Leaf Persistence</b>	<b>Form</b>	<b>Growth Rate</b>	<b>Shade Density</b>	<b>Size</b>	<b>Drought Tol.</b>	<b>Salt tol.</b>	<b>General Comments</b>
<i>Ficus lyrata</i> Fiddleleaf fig	E	R	M	M	M	H	M	Much less aggressive than other figs. Large leaves can be messy.
<i>Ficus religiosa</i> Sacred fig	E	R	M	M	M	H	M	Quaking aspen-like quality to leaves.
<i>Ficus rubiginosa</i> Rusty fig	E	R	M	H	M	H	L	Rusty undersides on leaves.
<i>Filicium decipiens</i> Fern tree	E	R	M	H	M	M	M	Fine, fern-like foliage.
<i>Guaiacum officinale</i> Lignumvitae	E	R	S	M	S	H	H	Showy blue flowers.
* <i>Guaiacum sanctum</i> Native Lignumvitae	E	R	S	L	S	H	H	Showy blue flowers and fine textured foliage.
<i>Harpullia arborea</i> Harpullia	E	R	S	M	S	H	H	Ornamental fruits and seeds.
* <i>Ilex cassine</i> Dahoon	E	O	M	L	S	M	M	Best in moist soils. Attractive red fruits on female plants.
<i>Jacaranda mimosifolia</i> Jacaranda	D	R	F	L	M	H	L	Purple flowers in spring. Ferny foliage. Brittle branches.
<i>Juniperus virginiana silicicola</i> Southern red cedar	E	P-O	M	M	S-M	H	H	Very fine textured foliage.
<i>Kigelia pinnata</i> Sausage tree	E	R	M	M	M	H	M	Novelty tree for its large, dangling flowers and fruits. Messy.
<i>Krugiodendron ferreum</i> Black ironwood	E	O	S	M	S	H	H	Very dense wood.
<i>Lagerstroemia indica</i> Crape myrtle	D	O	M	M	S-M	H	L	Many sizes and flower colors available.
<i>Lagerstroemia speciosa</i> Queen crape myrtle	D	R	F	H	M-L	H	L	Very showy flowers. Attractive long-lasting fall color.
<i>Litchi chinensis</i> Litchi	E	R	M	H	M	M	L	Delicious fruit. Handsome shade tree. Several cultivars.
* <i>Lysiloma latisiliqua</i> Wild tamarind	E	R	M	L	M	H	H	Very fine leaf texture. Tolerates seaside locations.
<i>Lysiloma sabicu</i> Sabicu	E	V-S	M	L	S	H	H	Flat-topped tree with weeping branches.
<i>Macadamia integrifolia</i> Macadamia nut	E	R	S	H	S-M	H	L	Several cultivars. Nut production erratic in Florida.
<i>Mangifera indica</i> Mango	E	R	M	H	S-M	H	M	Delicious fruit can be messy. Attractive new leaves.
<i>Manilkara roxburghiana</i> Mimusops	E	R	M	H	M	H	H	Edible fruit.



<b>Scientific Name</b> <b>Common Name</b> <b>* = native</b>	<b>Leaf Persistence</b>	<b>Form</b>	<b>Growth Rate</b>	<b>Shade Density</b>	<b>Size</b>	<b>Drought Tol.</b>	<b>Salt tol.</b>	<b>General Comments</b>
<i>*Mastichodendron foetidissimum</i> Mastic tree	E	R	S	H	M	H	M	Edible fruit. Attractive leaves.
<i>Murraya paniculata</i> Orange-jasmine	E	R	M	M	S	H	M	Fragrant white flowers throughout the year. Often shrubby.
<i>Noronhia emarginata</i> Madagascar olive	E	O	M	M	S	H	H	Tough, seaside specimen.
<i>Pachira aquatica</i> Guiana chestnut	E	O	M	L	M	M	L	Showy, brush-like flowers.
<i>Peltophorum pterocarpum</i> Yellow poinciana	D	V	M	L	M	H	H	Showy yellow flowers. Can topple in strong winds.
<i>Persea americana</i> Avocado	E	R	F	M	M	M	L	Edible fruit. Brittle wood. Susceptible to laurel wilt disease.
<i>Persea borbonia</i> Red bay	E	O	M	M	M	H	H	Tolerates wet sites. Susceptible to laurel wilt disease
<i>*Pinus clausa</i> Sand pine	E	O	M	L	M	H	L	Persistent cones. Picturesque leaning or twisted habit when old.
<i>*Pinus elliottii</i> Slash pine	E	O	F	L	L	H	M	Straight trunk.
<i>*Piscidia piscipula</i> Jamaican dogwood	D	S	F	M	M	H	H	Attractive pink flowers in spring.
<i>Podocarpus gracilior</i> Weeping podocarpus	E	O	M	M	M	M	L	Attractive weeping branches.
<i>Podocarpus macrophyllus</i> Podocarpus	E	C	M	M	M	H	M	Low branching. Intolerant of flooding.
<i>Pongamia pinnata</i> Pongam	S	R	M	H	M	H	M	Leaves and pods can create litter problems.
<i>Pseudobombax ellipticum</i> Shaving brush	D	S	M	M	S	M	M	Spectacular pink flowers when leafless. Reddish new foliage.
<i>*Quercus laurifolia</i> Laurel oak	E	O-S	F	H	L	H	L	Tend to be short-lived.
<i>*Quercus virginiana</i> Live oak	E	S	M	H	L	H	H	Old trees very picturesque. Long-lived.
<i>Senna polyphylla</i> Desert cassia	E	R	M	M	S	H	M	Showy golden flowers year round.
<i>Senna surattensis</i> Glaucous cassia	E	R	M	M	S	H	M	Showy golden flowers year round.
<i>*Sapindus saponaria</i> Soapberry	D	R	M	M	M	H	H	Soap-like compound derived from fruits. Fruits can be messy.
<i>*Simarouba glauca</i> Paradise tree	E	R	S	L	M	H	L	Glossy dark green leaves.

<b>Scientific Name</b> <b>Common Name</b> * = native	<b>Leaf Persistence</b>	<b>Form</b>	<b>Growth Rate</b>	<b>Shade Density</b>	<b>Size</b>	<b>Drought Tol.</b>	<b>Salt tol.</b>	<b>General Comments</b>
<i>Spathodea campanulata</i> African tulip tree	S	O	M-F	M	M	H	M	Showy orange flowers. Weak-wooded.
* <i>Swietenia mahagoni</i> West Indian mahogany	S	R	M	M	M	H	M	Woody fruits can be messy. Insects may cause defoliation in the spring.
<i>Swietenia macrophylla</i> Big-leaved mahogany	E	O	M	M	L	H	M	Taller, more upright form than <i>S. mahagoni</i> .
<i>Tabebuia caraiba</i> Silver trumpet tree	D	O	M	M	S-M	H	M	Irregular crown. Silvery leaves. Large yellow flowers. Weak-wooded.
<i>Tabebuia chrysotricha</i> Golden trumpet tree	D	R	M	L	S	H	M	Yellow flowers. Sparse canopy.
<i>Tabebuia heterophylla</i> Pink trumpet tree	E	O	M	M	S	H	M	Pink flowers. Fine street tree. Thrips a problem.
<i>Tabebuia impetiginosa</i> Purple tabebuia, Ipe	D	R	M	M	S	H	M	Pink-purple flowers.
<i>Tamarindus indica</i> Tamarind	S	R	M	M	M	H	H	Handsome form. Wind resistant. Edible fruits can be messy.
* <i>Taxodium distichum</i> Bald cypress	D	P	M	L-M	L	H	L	No serious pests. Very tolerant of both wet and dry soils.
* <i>Tecoma stans</i> Yellow elder	E	R	F	M	S	H	M	Yellow flowers most of the year. Often shrubby. Weak-wooded.
* <i>Zanthoxylum fagara</i> Wild lime	E	R	M	M	S	H	M	Thorny. Takes coastal conditions well.