



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

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## INTRODUCTION

Residential energy use comprises about 26% of all the energy used in the state of Florida (Florida Energy Office, 1992). In central Florida, about 28% of this annual residential energy expenditure is for cooling the home during Florida's 5-to-7-month summer. And about 15% 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 the advent of 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 type 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 impacts of a particular tree species depends on 1) whether it keeps its leaves during the winter and 2) the shape and density of its foliage.

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## 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 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 homesite 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 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 circular 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 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 homesite, choose trees for wet-soil tolerance as indicated (e.g., Loblolly bay, *Gordonia lasianthus*; Sweetbay, *Magnolia virginiana*; 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 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 needs 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 central Florida are not on this list. Australian pine (*Casuarina equisetifolia*), Punk or Cajeput tree (*Melaleuca quinquenervia*), and Brazilian pepper (*Schinus terebinthifolius*) are exotic, invasive species that are considered noxious weeds in some parts of the state. It is recommended that their use as landscape plants be severely curtailed if not eliminated.

Climatic conditions in the southern portion of central Florida are quite different from those characteristic of the northern portion. This has been taken into consideration in the tree lists by indicating whether a particular species is suitable for north central Florida (NC), south central (SC), or both (NC & SC). Trees with the SC designation are cold sensitive and should only be used in microclimates where frost danger is minimal. For homes in southern-most central Florida, additional trees may be found in the publication, **EES-42** *Enviroscaping to Conserve Energy: Trees for South Florida*. Your county extension agent can advise you further on the suitability of specific trees for your area.

## 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 Central Florida Tree Chart**

Leaf Persistence D = Deciduous  
 E = Evergreen  
 S = Semi-evergreen

Shade Density L = Light  
 M = Medium  
 H = Heavy

Form C = Columnar  
 O = Oval  
 P = Pyramidal  
 R = Round  
 S = Spreading  
 V = Vase-shaped

Size S = Small (up to 25 ft.)  
 M = Medium (25-40 ft.)  
 L = Large (over 40 ft.)

Growth Rate S = Slow  
 M = Moderate  
 F = Fast

Drought Tolerance L = Low  
 M = Moderate  
 H = High

Zone NC = North Central Florida  
 SC = South Central Florida  
 NC & SC = North or South Central Florida

Salt Tolerance N = None  
 L = Low  
 M = Moderate  
 H = High

Scientific Name - Common Name, * = native	Leaf Persistence	Form	Growth Rate	Shade Density	Size	Zone	Drought Tol.	Salt Tol.	General Comments
<i>Albizia julibrissin</i> - Silk tree	D	S	F	L	S-M	NC	H	L	Slow to leaf out in spring. Short-lived; subject to wilt disease. Litter from fruit.
<i>Araucaria bidwillii</i> - Bunya-bunya	E	P	M	M	M	NC & SC	M	M	Spiny foliage. Large, heavy cones can be a nuisance.
<i>Araucaria heterophylla</i> - Norfolk Island pine	E	P	M	M	M-L	SC	M	M	Formal specimen tree.
<i>Bauhinia variegata</i> - Orchid tree	D	R	M	M	S	SC	H	M	Large flowers over a long period.
<i>Brassaia actinophylla</i> - Schefflera	E	V	F	M	S	SC	H	L	Shade tolerant. Spectacular red flowers.
<i>Callistemon citrinus</i> - Citrus leaf bottlebrush	E	R	M	M	S	NC & SC	M	L	Numerous red flowers in spring. Tolerates moist sites.
<i>Callistemon viminalis</i> - Weeping bottlebrush	E	R	M	M	S	NC & SC	M	M	Weeping habit. Attractive red bottlebrush flowers. Moderate salt tolerance.
* <i>Carpinus caroliniana</i> - American hornbeam	D	R	S	M	M	NC	L	N	Interesting "sinewy" limb shape. Tolerates wet soils.
* <i>Carya glabra</i> - Pignut hickory	D	O	S	M	L	NC	H	N	Subject to bag worms. Nut crop may cause objectionable litter.
* <i>Celtis laevigata</i> - Hackberry/Sugarberry	D	R	M	M	L	NC	H	N	Prefers moist soils. Tolerant of urban conditions.

Scientific Name - Common Name, * = native	Leaf Persistence	Form	Growth Rate	Shade Density	Size	Zone	Drought Tol.	Salt Tol.	General Comments
* <i>Cercis canadensis</i> - Redbud	D	R	M	M	S-M	NC	M	N	Showy, early spring flower display. Attractive foliage.
* <i>Chionanthus virginicus</i> - Fringe tree	D	R	S	M	S	NC	L	N	Prefers rich soil; airy spring flowers in mass display before leaves emerge.
<i>Cinnamomum camphora</i> - Camphor tree	E	R	F	H	L	NC & SC	H	L	Aromatic leaves. Reseeds. Needs ample room (spreads twice as wide as height).
<i>Citrus spp.</i> - Citrus	E	R	M	H	S	NC & SC	M	L	Well-drained soils. Fragrant white flowers, edible fruit. Some pest problems.
* <i>Cornus florida</i> - Dogwood	D	R	M	M	S	NC	M	L	Beautiful spring flowers. Red fruits and fall color. Attractive tiered branching pattern.
<i>Dalbergia sissoo</i> - Rosewood	D	S	F	M	L	NC & SC	M	L	Aggressive root system, but otherwise a handsome specimen tree.
<i>Eriobotrya deflexa</i> - Bronze loquat	E	R	M	H	S	NC & SC	H	M	New growth attractive bronze or red color.
<i>Eriobotrya japonica</i> - Loquat	E	R	F	H	S	NC & SC	H	M	Fragrant flowers in the fall. Edible fruit. Tolerates most soils. Host for Caribbean fruit fly.
<i>Erythrina spp.</i> - Coral trees	D	S	F	M	M-L	SC	H	L	Showy red flowers. Seeds toxic. <i>E. indica</i> and several other species do well in Florida.
<i>Eucalyptus cinerea</i> - Silver-dollar gum	E	V	M	L	S	NC & SC	H	L	Interesting foliage and shape. Prone to fungal diseases.
* <i>Fraxinus pennsylvanica</i> - Green ash	D	R	F	M	L	NC	M	N	Fruitless cultivars available.
* <i>Gordonia lasianthus</i> - Loblolly bay	E	O	M	M	M	NC & SC	L	N	Fragrant white flowers from summer to fall. Tolerates wet soils.
<i>Grevillea robusta</i> - Silk oak	E	O	F	M	L	NC & SC	H	M	Interesting foliage and flowers. Can be messy. Brittle with age.
<i>Hibiscus tiliaceus</i> - Sea hibiscus, mahoe	E	S	F	H	M	SC	H	H	High salt tolerance; best near coast, placed where its massive spread is not a problem.
* <i>Ilex cassine</i> - Dahoon	E	O	M	L	M	NC & SC	M	M	Salt tolerant. Best in moist soils. Attractive red fruits on female plants.
<i>Ilex latifolia</i> - Lusterleaf holly	E	P	M	H	M	NC & SC	M	N	Difficult to propagate. Generally pest-free.
* <i>Ilex opaca</i> - American holly	E	P	S	M	M-L	NC	H	L	Attractive foliage. Red berries on female plants.
<i>Ilex rotunda</i> - Round holly	E	R	S	H	M	NC & SC	M	N	Attractive specimen tree. Several cultivars. Good fruit display.

Scientific Name - Common Name, * = native	Leaf Persistence	Form	Growth Rate	Shade Density	Size	Zone	Drought Tol.	Salt Tol.	General Comments
<i>Jacaranda mimosifolia</i> - Jacaranda	D	S	F	L	M	SC	H	N	Beautiful lavender flowers in spring. Ferny foliage.
* <i>Juniperus silicicola</i> - Southern red cedar	E	P	S	M	M	NC & SC	H	H	Salt tolerant. Tolerates neglect. Difficult to transplant. Good windbreak species.
<i>Koelreuteria elegans</i> - Golden rain tree	D	S	F	M	M-L	NC & SC	M	N	Yellow flowers in fall, followed by pink, papery fruits. Can become weedy.
<i>Lagerstroemia indica</i> - Crape myrtle	D	V	M	L	S	NC & SC	H	N	Numerous cultivars with different flower colors, size or habit. Flowers for long period in summer.
<i>Ligustrum japonicum</i> - Japanese privet	E	V	F	M	S	NC & SC	M	L	High salt tolerance. More commonly used as shrub.
<i>Ligustrum lucidum</i> - Glossy privet	E	R	F	M	S	NC & SC	L	L	Quality foliage. Tolerates poor conditions. Needs frequent pruning.
* <i>Liquidambar styraciflua</i> - Sweet gum	D	R	F	M	L	NC & SC	H	N	Fall color. Spiny fruit a problem in some situations.
* <i>Magnolia grandiflora</i> - Southern magnolia	E	O	S	H	L	NC & SC	H	M	Long-lived. Salt tolerant. Fallen leaves do not readily decompose. Large, fragrant white flowers.
* <i>Magnolia virginiana</i> - Sweetbay	E	S	M	M	M-L	NC	L	N	Attractive, silvery leaf color. Tolerates wet soils.
<i>Melia azedarach</i> - Chinaberry tree	D	S	F	H	M	NC & SC	H	N	Low branching. Brittle wood. Attractive flowers. Fruit messy, seed poisonous. Can spread from seed.
* <i>Morus rubra</i> - Red mulberry	D	S	F	M	M	NC	M	N	Fruitless cultivars available.
* <i>Myrica cerifera</i> - Wax myrtle	E	R	M	M	S	NC & SC	H	H	Tolerates salt and unfavorable soils. Aromatic foliage.
* <i>Nyssa sylvatica</i> - Tupelo/sour gum	D	O	M	M	L	NC	L	N	Tolerates wet soils. Good foliage with fall color.
* <i>Ostrya virginiana</i> - American hophornbeam	D	O	M	M	M	NC	H	N	Pleasing, irregular branching pattern. Tolerates dry soils.
<i>Parkinsonia aculeata</i> - Jerusalem thorn	D	S	F	L	S	NC & SC	H	L	Unusual green branches and picturesque form. Good late spring flower show. Very drought tolerant.
<i>Persea americana</i> - Avocado	E	R	F	H	M	SC	M	N	Low branching when young. Edible fruit.
* <i>Pinus clausa</i> - Sand pine	E	O	F	L	M	NC & SC	H	L	Persistent cones. Picturesque leaning or twisted habit when old. Very tolerant of poor, dry soils.
* <i>Pinus elliotii</i> - Slash pine	E	R	F	L	L	NC & SC	H	M	Straight trunk.

Scientific Name - Common Name, * = native	Leaf Persistence	Form	Growth Rate	Shade Density	Size	Zone	Drought Tol.	Salt Tol.	General Comments
* <i>Pinus glabra</i> - Spruce pine	E	O	M	L	M	NC	H	L	Tolerates moist sites. Attractive form and texture.
* <i>Pinus palustris</i> - Longleaf pine	E	R	M	L	L	NC	H	N	Excellent background plant. Straight trunk, long needles.
* <i>Pinus taeda</i> - Loblolly pine	E	R	M	L	L	NC & SC	H	N	Irregular crown. Good screen or windbreak.
<i>Pistacia chinensis</i> - Chinese pistache	D	O	F	H	M-L	NC	H	N	Drought and heat tolerant. Fruits can be messy.
* <i>Platanus occidentalis</i> - Sycamore	D	R	F	M	L	NC	L	M	Attractive exfoliating bark. Prefers moist, fertile soils.
<i>Platycladus/Thuja orientalis</i> - Oriental arborvitae	E	C	M	H	S-M	NC & SC	M	N	Good windbreak tree. Many cultivars. Tolerates moist soils but not salt.
<i>Podocarpus macrophyllus</i> - Podocarpus	E	C	M	H	S-M	NC & SC	M	M	Low branching.
<i>Podocarpus nagi</i> - Nagi podocarpus	E	O	S	L	M-L	NC & SC	M	M	Moderate salt tolerance. Pest free. Can be clipped as hedge.
* <i>Prunus caroliniana</i> - Cherry laurel	E	R	F	H	S-M	NC	M	N	Low maintenance. Fruits attract birds. Will naturalize. Tolerates most soils and neglect.
* <i>Prunus umbellata</i> & <i>P. angustifolia</i> - Flatwoods plum, Chickasaw plum	D	R	M	M	S	NC	M	N	Spring flower display. Fruit edible, but variable in quality.
<i>Psidium littorale</i> - Cattley guava	E	V	M	M	S	SC	H	N	Edible fruit. Attractive bark.
* <i>Quercus laevis</i> - Turkey oak	D	O	M	L	M-L	NC	H	N	Short-lived, can be difficult in cultivation, best in native landscape.
* <i>Quercus laurifolia</i> - Laurel oak	S	O	F	H	L	NC & SC	H	L	Height greater than spread. Lives only 30-50 years.
* <i>Quercus nigra</i> - Water oak	S	V	F	H	L	NC	H	L	Short-lived (20-30 years). Tolerates moist soils.
* <i>Quercus shumardii</i> - Shumard oak	D	R	M	M	L	NC & SC	H	N	Handsome form. Good fall color.
* <i>Quercus virginiana</i> - Live oak	S	S	M	H	L	NC & SC	H	H	Old trees very picturesque. Spread greater than height. Long-lived. Salt tolerant.
* <i>Sapindus saponaria</i> - Soapberry	D	R	M	M	M	NC & SC	H	M	Soap-like compound prepared from fruit. Fruit can be messy.
* <i>Styrax grandifolia</i> - Styrax	D	R	M	M	S	NC	L	N	Attractive spring flowers.
<i>Tabebuia caraiba/T. argentea</i> - Golden trumpet tree	D	O	M	M	M	SC	H	M	Irregular crown. Silvery leaves. Large yellow flowers.

<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>Zone</b>	<b>Drought Tol.</b>	<b>Salt Tol.</b>	<b>General Comments</b>
<i>*Taxodium distichum</i> - Bald cypress	D	P	M	L	L	NC & SC	H	N	No serious pests. Very tolerant of both wet and dry soils.
<i>*Ulmus alata</i> - Winged elm	D	R	M	M	M	NC	H	N	Interesting, corky branches.
<i>Ulmus parvifolia</i> - Chinese elm	D	S	F	M	M-L	NC	H	M	Tolerates dry soils and salt. Very attractive, exfoliating bark.
<i>Ulmus pumila</i> - Siberian elm	D	R	F	M	S	NC	M	M	Short-lived. Several cultivars.
<i>Viburnum odoratissimum</i> - Sweet viburnum	E	R	F	H	S	NC & SC	M	N	Very fragrant flowers in spring.