UF IFAS Extension UNIVERSITY of FLORIDA

FOR224

Potential Woody Species and Species Attributes for Windbreaks in Florida[1]

Michael G. Andreu, Bijay Tamang, Donald L. Rockwood, and Melissa H. Friedman[2]

Windbreaks, both living and artificial, benefit farmers and growers throughout the world. Windbreaks literally reduce wind speeds, thereby providing plants and animals with better environments in which to thrive (Refer to EDIS publication FOR192 http://edis.ifas.ufl.edu/pdffiles/FR/FR25300.pdf for other windbreak benefits). In a living windbreak, the type of vegetation varies depending on the amount of protection needed or desired. In some parts of Florida, grasses such as sugarcane (*Saccharum spp.*) or ryegrass (*Lolium spp.*) are planted in windbreaks around vegetable fields. In other instances, citrus groves have been protected from cold by planting tall perennial plants like slash pine trees in combination with a shorter-growing plant like redcedar for protection from wind that causes scarring of the fruit and lowers its value as a fresh fruit. More recently, windbreaks have been explored for their potential to help manage canker, a bacterial disease spread by wind during wet conditions.

In all cases, the function of a windbreak is directly related to its design, and in particular, the species selected and their attributes. Thus, proper species selection is the most important step in planning a windbreak; when selecting species, the grower must consider site factors such as climate, soil, and amount of area to be protected (taller windbreaks protect larger areas) so that he or she can choose windbreak species with attributes that meet the necessary criteria (Table 1). Information about individual species attributes can be obtained from Table 2 and various print and internet resources (see Plant Species tables in http://www.crec.ifas.ufl.edu/extension/windbreaks/design.htm and other references at the end of this factsheet).

Evergreen vs. Deciduous

Evergreen trees retain leaves throughout the year, while deciduous trees drop most or all of their leaves during the dormant season. Evergreen species provide wind protection throughout the year. If heavy shading is a problem in the winter months, then a deciduous species may be a better planting option. However, the choice of one type of plant or another will largely depend on prevailing environmental conditions and windbreak purposes. If, for example, winds associated with storms or natural climatic variability occur in winter, then an evergreen plant might be required.

Evergreen species commonly planted in windbreaks in Florida are eastern redcedar (*Juniperus viriginiana*) and slash pine (*Pinus elliottii*). While these are both native to Florida, they share few other attributes. Both can grow in poor, sandy soils, but slash pine does better on wetter sites than eastern redcedar, while eastern redcedar does better on clayey and alkaline soils. Slash pines tend to grow faster and taller (more than100 feet) at maturity than eastern redcedar (about 40 feet). Some evergreen broadleaf species such as the non-native *Eucalyptus grandis* or cadaghi (*Corymbia torelliana*) are being evaluated successfully in windbreaks in parts of Florida so far.

1. This document is FOR224, one of a series of the School of Forest Resources and Conservation Department, UF/IFAS Extension. Original publication date June 2009. Reviewed March 2015. Visit the EDIS website at http://edis.ifas.ufl.edu.

2. Michael G. Andreu, associate professor; Bijay Tamang, Ph.D. student; Donald L. Rockwood, professor; and Melissa H. Friedman, biological scientist, School of Forest Resources and Conservation, UF/IFAS Extension, Gainesville, FL 32611.

Reviewed: 12/2024

Height at Maturity

Woody perennial trees and shrubs are basically differentiated by their general stature at maturity (shrubs are smaller), as well as by the fact that shrubs often do not have one main stem. Maximum height at maturity varies by species (Figure 1) and by site. In general, moist and nutrient-rich sites produce taller trees and shrubs, and well-drained or poorly drained sites (both commonly found in Florida) tend to reduce height growth.

Figure 1. Single-row 20-year-old cadaghi windbreak (left) at C&B Farms, Clewiston, Florida and eastern redcedar windbreak (right) at Southwest Florida Research and Education Center (UF), Immokalee, Florida. Average height of cadaghi was 59 feet and eastern redcedar was 22 feet.
Credits: Bijay Tamang, December 21, 2007.

Windbreak tree or shrub height is critical because it determines the area the windbreak will protect. Generally, for every foot of windbreak height, 10 feet behind the windbreak is protected. For example, a 60-foot windbreak should protect an area of up to 600 feet on the leeside of the windbreak.

Rate of Growth

Growth rates vary by species (Figure 2) and site. The time from establishment to attainment of effective windbreak height affects the rate of return on windbreak establishment cost. The choice between faster- or slower-growing trees ultimately depends on what other benefits (economic, aesthetic, wildlife) are gained from planting the trees. Not all fast-growing trees are suitable for a windbreak. For example, native sand pine (*Pinus clausa*) grows relatively fast on deep sandy soils common to Florida but does not have a large crown when grown in dense conditions (i.e. windbreaks) and is susceptible to breakage in high winds.

Crown Form–Porosity

Crown form determines the windbreak porosity, i.e., the portion of the windbreak that lacks stems, branches, or leaves. Crown shape is a function of species and planting density. Eastern redcedars tend to have a full, dense crown from top to bottom at all life stages. That form allows the plant to be used as a stand-alone species where space might be limited. Other species like southern magnolia (*Magnolia grandiflora*) have a more spreading crown.

Windbreak planting density in association with the characteristics of a particular species will determine a windbreak's porosity and ensure that no gaps are created at maturity (Figure 1) and that thinning is not needed. The crowns of some species are dense (many leaves and few gaps) while others have sparse crowns or shed lower branches as they grow (Figure 3). The porosity of the crown directly influences the effectiveness of the windbreak; denser crowns will have a greater impact on wind speed.

Figure 2. Fast-growing non-native *Eucalyptus amplifolia* (far end) and loblolly pine (*Pinus taeda*) windbreak by Castle and Rockwood at the Plant Science Research & Education Unit (UF) Citra, Florida. Both species were planted at the same time and were of similar height.
Credits: Bijay Tamang, December, 13, 2007

Figure 3. Single-row young cadaghi windbreak (left) by Castle and Rockwood at C&B Farms, Clewiston, Florida and three-row *E. amplifolia* windbreak (right) at Plant Science Research & Education Unit (UF) Citra, Florida. Cadaghi retains lower branches while *E. amplifolia* tend to shed as they grow.
Credits: Bijay Tamang, December 17, 2007

Shade Tolerance

In most cases, windbreaks are established in open areas exposed to full sunlight. However, depending on the configuration of the windbreak (single [Figure 1] vs. multiple rows [Figure 2]), shading effects may become important over time in multiple rows. In such cases, if the tree or shrub is shorter than surrounding trees and is therefore shaded, the species must tolerate lower light levels.

Establishment Requirements

Windbreak establishment, function, and management are directly tied to ease of planting and subsequent plant

development. Those responses can be influenced by multiple factors, including whether bare-root or containerized plants are used, plant size, irrigation, and weather conditions (droughty or rainy) at the time of planting and during the establishment period. Bare-root trees, especially pine species, should usually be planted in the dormant (winter) season so that they grow into their surroundings as the growing season starts. Survival tends to increase with containerized or potted (with soil) plants compared to bare-root seedlings. However, containerized or potted seedlings are more expensive. Regardless, if a drought occurs during establishment, irrigation of the seedlings is critical to their survival in first few years of planting. Regular weeding reduces competition and creates a better growing environment for seedlings.

Rooting Depth

Deep-rooting versus wide-spreading species are ideal for windbreaks if crops are planted near them. Competition for water and nutrients is high if both windbreak and crop roots use the same soil layer/horizon. Because vegetable crops usually have shallow roots, deep-rooting windbreak species should be planted near the crops whenever possible in order to reduce root competition. Deep-rooting species can also withstand high winds, which is important for Florida windbreaks.

Pest (Insect and Disease) Concerns

When choosing species, it is important to consider what pest problems the tree or shrub species will face. Some diseases/pests may not kill the tree but can retard growth or make it susceptible to wind breakage (e.g., fusiform rust on pines). Therefore, disease- and pest-resistant varieties should be used in windbreaks when available.

Native vs. Non-native

In selecting windbreak species, native plants may have several distinct advantages over non-natives, i.e., those species that do not naturally occur in Florida. The natives are likely to be better adapted to local climate, soil, pest and disease conditions and over a broader range of conditions. Nevertheless, non-natives may be desirable for many attributes such as height, growth rate and porosity (Figures 1–3) but should not reproduce and spread beyond the area planted or they may become problematic because of invasiveness.

Invasive Species

There is increasing awareness of invasiveness, i.e., the potential for an introduced species to establish itself or become "naturalized" in an ecological community and even become a dominant plant that replaces native species. Tree and shrub species can become invasive if they aggressively proliferate beyond the windbreak. At first glance, Brazilian pepper (*Schinus terebinthifolius*), a fast-growing, non-native shrub that has a dense crown, might be considered an appropriate windbreak species. However, it readily spreads by seed disbursed by birds and has invaded many natural ecosystems. Therefore, the Florida Department of Environmental Protection has declared it illegal to plant this tree in Florida without a special permit. Consult the Florida Exotic Pest Plant Council's Web page (www.fleppc.org) for a list of prohibited species in Florida.

Availability and Cost

Ideal windbreak species may not be available at all times. Therefore, species availability should also be considered while selecting windbreak species. Local sources (e.g. nurseries, forestry groups) should be consulted to check which species are locally available. Potted plants are preferred for windbreak planting, but they are expensive and may not be readily available in large number. Bare-root seedlings, which are cheaper than potted and are usually available in large numbers, can be used when either potted plants or funding is limited.

Compatibility with Other Species in Multi-row Designs

Not all species are compatible with other species. Species such as eucalypts are allelopathic in nature and can retard growth of other species. Some species grow faster than others and create shade around the windbreak. Shade-intolerant species therefore are not compatible with fast-growing species in windbreaks.

Conclusion

Living windbreaks of trees and shrubs can provide protection from wind to large areas of fruit and vegetable production in Florida throughout the year. To select an effective windbreak species it is best to consider climate, soil type, amount of area to be protected, species attributes, availability, cost, and compatibility with other species.

References

Andreu, M.G., B. Tamang, M.H. Friedman and D. Rockwood. 2008. The benefits of windbreaks for Florida growers. Extension Digital Information Source (EDIS), http://edis.ifas.ufl.edu/pdffiles/FR/FR25300.pdf, School of Forest Resources and Conservation, University of Florida, Gainesville, FL.

Burns, R.M. and Barbara H. Honkala (Technical Coordinators). 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654.

U.S. Department of Agriculture, Forest Service, Washington, DC, http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm

Castle, W.S., K.A. Langeland and D.L. Rockwood. 2008. *Casuarina cunninghamiana* Miq. (River sheoak) in Florida and its potential as a windbreak plant for citrus groves. Extension Digital Information Source (EDIS), http://edis.ifas.ufl.edu/pdffiles/HS/HS39200.pdf, Horticultural Sciences Department, University of Florida, Gainesville, FL.

USDA, NRCS. 2009. The PLANTS Database http://plants.usda.gov. National Plant Data Center, Baton Rouge, LA.

Wunderlin, R.P. and B.F. Hansen. 2008. Atlas of Florida Vascular Plants http://www.plantatlas.usf.edu/.[S. M. Landry and K. N. Campbell (application development), Florida Center for Community Design and Research.] Institute for Systematic Botany, University of South Florida, Tampa, FL.

Florida Exotic Pest Plant Council, http://www.fleppc.org/index.cfm. Accessed July 8th, 2009.

Table 1. Attributes to consider for windbreak trees and shrubs.

Evergreen vs. deciduous
Height at maturity
Rate of growth
Crown form–porosity
Shade-, cold-, and salt-tolerance
Establishment requirements
Rooting depth
Pest (insect & disease) concerns
Native vs. non-native
Invasiveness
Availability; cost
Compatibility with other species in multi-row designs

Table 2. List of potential trees and shrubs for Florida windbreaks.

Common Name	Scientific Name	Native to Florida	Habit[1]	Suitable Sites	Growth Rate	Maximum Height	Shade Tolerant /Intolerant	Establishment Spacing
Trees								
Slash pine	*Pinus elliottii*	Yes	E	Flatwoods	Moderate to Fast	80 ft	Intolerant	3–6 ft
Eucalyptus	*Eucalyptus grandis*	No	E	Wide range of soil types	Fast	90 ft	Intolerant	3–6 ft
Eucalyptus	*E. amplifolia*	No	E	Agriculture fields	Fast	90 ft	Intolernat	3–6 ft
Cadagi	*Corymbia torelliana*	No	E	Wide range of soil types	Fast	75 ft	Tolerant	8–12 ft
Eastern redcedar	*Juniperus virginiana*	Yes	E	Ridges and flatwoods	Slow to Moderate	40–60 ft	Intermediate	4–6 ft
Silk oak	*Grevillea robusta*	No	E	Flatwoods in coastal areas	Moderate to Fast	40 ft	Intolerant	6 ft
Sand pine	*Pinus clausa*	Yes	E	Well-drained, acidic soil	Moderate to Fast	50–60 ft	Intermediate	3–6 ft
Eastern cottonwood	*Populus deltoides*	Yes	D	Moist, well-drained sands	Fast	80–100 ft	Intolerant	3–6 ft
Southern magnolia	*Magnolia grandiflora*	Yes	E	Well-drained soil	Slow to moderate	40–80 ft	Tolerant	6–10 ft
Shrubs								
Crape myrtle	*Lagerstroemia indica*	No	D	Flatwoods	Moderate	30 ft	Intolerant	3–6 ft
Wax myrtle	*Myrica cerifera*	Yes	E	Ridges and flatwoods	Moderate	10–15 ft	Intolerant	6 ft
Saw palmetto	*Serenoa repens*	Yes	E	Ridges and flatwoods	Slow	6 ft	Tolerant	3 ft
Walter's viburnum	*Viburnum obovatum*	Yes	E	Ridges and flatwoods	Moderate	20 ft	Intermediate	6 ft
Sweet viburnum	*Viburnum odoratissimum*	No	E	Ridges and flatwoods	Slow	20 ft	Tolerant	6 ft
Simpson's stopper	*Myrcianthes fragrans*	Yes	E	Ridges and flatwoods	Slow	20–30 ft	Tolerant	3–6 ft
Common winterberry	*Ilex verticillata*	Yes	D	Moist or dry soil	Moderate	10 ft	Intermediate	6 ft
Dahoon Holly	*Ilex cassine*	Yes	E	Flatwoods	Slow	25–30 ft	Tolerant	6 ft

[1] E – Evergreen, D – Deciduous