Ptychosperma elegans, the solitaire palm, is often locally called the alexander palm (not to be confused with *Archontophoenix alexandrae*, the king alexander palm). This species is tall and fast growing, with a slender trunk, attractive arching leaves, and bright red fruit. It looks best when planted in informal groups.

Thrinax morrissii, the Keys thatch palm, is native to the Florida Keys and throughout the Caribbean and is a tough relative of the Florida thatch palm, *T. radiata*. This palm grows naturally in alkaline soils, sometimes even on limestone outcrops, and tolerates drought, low soil fertility, and exposure to salt spray. The leaves of *T. morrissii* are bluish-green above and silver below.

Thrinax radiata, the Florida thatch palm, is native to Florida and a few Caribbean islands. It can reach a height of 20 feet and grows naturally in sand or on limestone. It prefers sun and tolerates salty winds. The main difference between this species and its close relative, *T. morrissii*, is that the leaves are green on both sides. As in most species in the genus, ripe fruit are white. It is a tough palm with low maintenance requirements.

Veitchia spp. are natives of the South Pacific and are widely planted in south Florida. They are among the fastest growing palms and often reach 50 feet in height. The slender trunks, elegantly arching leaves, and clusters of large, red fruit make these palms particularly attractive when planted in informal groups. Additional appealing attributes include their high tolerance of hurricane-force winds and their wide adaptability to varying soil, water, and nutrient conditions. (*Note:* Care should be taken to avoid planting *Adonidia merrillii* [recently changed from *Veitchia merrillii*; Zona and Fuller, 1999], as it is highly susceptible to Lethal Yellowing.)

Palm Internet Resources

The past few years have witnessed a virtual explosion of palm-related information on the Internet. Interested persons can now subscribe to e-mail lists about palms, as well as participate in online discussion forums. Numerous websites throughout the world also contain information on palms. One of the most comprehensive online palm resources is the *Virtual Palm Encyclopedia*, located on the website of the Palm & Cycad Societies of Florida, Inc. (http://www.plantapalm.com).

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CYCADS IN THE SOUTH 'FLORIDA LANDSCAPE'

JODY L. HAYNES
University of Florida
Florida Yards & Neighborhoods Program
Miami-Dade County Extension
18710 SW 288th Street
Homestead, FL 33030

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Abstract. **Cycads are underutilized in south Florida landscapes. This article outlines landscape practices involving cycads in south Florida, specifically relating to the 'Florida friendly' principles of the Florida Yards & Neighborhoods program.**

Cycads are underutilized landscape plants in south Florida, perhaps because they are not readily available in nurseries or home improvement centers, or because many are mistakenly referred to as palms. The primary objective of this article is to discuss cycad-related landscaping practices for south 'Florida Landscapes'—i.e., landscapes that adhere to the principles of the Florida Yards & Neighborhoods (FY&N) program.

Palms and cycads are generally thought to be in the same category of landscape plants because they have a similar appearance and because many believe they have similar culture requirements. Although the former statement is true to some extent, the latter certainly is not. A secondary goal of this article is to illuminate some of the reasons that cycads should not be treated like palms.

Only four cycad species are commonly planted in south Florida. *Cycas revoluta* (king sago) and *C. rumphii* (queen sago; often mistakenly called *C. circinalis* [Hill, 1995]) are generally specimen plants, often growing quite large; *Zamia maritima* (cardboard "palm"; recently changed from *Z. furfuracea* [Schutzman and Dehgan, In press]) is commonly incorporated into raised planting beds or other common areas; and *Zamia floridana* (Florida coontie; also mistakenly known as *Z. integrifolia*, *Z. pumila*, *Z. sylvatica*, or *Z. umbrosa* [Schutzman and Dehgan, In press]) is used as a small shrub, understory plant, or groundcover.

Florida Yards & Neighborhoods

The University of Florida's FY&N program provides educational and outreach activities designed to enlist homeowners and other stakeholders in the battle to reduce non-point source pollution and to enhance Florida's environment by improving landscape management practices. This section will examine practices involving cycads in south 'Florida Landscapes', with respect to the nine principles of the FY&N program.

Right Plant, Right Place—Learning the culture requirements and site preferences for each cycad species and conducting a site evaluation are two important steps in creating a south Florida Landscape. General culture information for most cycads can be found in Jones (1993), but a general rule of thumb is that nearly all cycads require well-drained soil and most are sensitive to root rot when over-watered. Therefore, they should not be planted in wet areas or in poorly draining soil.

Maximize Mulch & Groundcover—Mulch is important for cycads for the same reasons as previously discussed for palms (Haynes, this volume). As with palms, some small cycad species, such as the Florida coontie and the fernlike *Zamia vazquezii* (which is usually mistakenly called *Z. fischeri* [Schutzman and Dehgan, in press]), can be effectively used as nontraditional groundcovers.

Recycle Yard Waste—The same benefits of composting dead cycad leaves hold true as described previously for palms (Haynes, this volume). The key to this principle is to reduce municipal solid waste by converting cycad leaf debris into mulch or compost.

Water Efficiently—Cycads require less water than many other landscape plants and most can tolerate dry spells without irrigation. However, as mentioned above, cycads should always be planted in well-draining soil and should never be over-watered.

Fertilize Appropriately—The only known fertilization recommendations for cycads are those of Broome (1997), who suggested that, since most palm fertilizers are low in nitrogen, cycads generally do not perform well with such products. The following recommendations are based on Broome's (1997) article.

In the early stages of growth, cycads push a single leaf at a time on a fairly regular schedule. After the plants reach a certain size, each consecutive flush begins to contain more leaves. When cycads reach the next threshold size, the plants change from a continuous to an episodic growth pattern (Robbertse, 1995). Since small cycads exhibit continuous growth, they benefit most from a continuous release fertilizer, such as a 360-day, plastic-coated 18-6-8 with minors. When the plants switch to episodic growth, they require a different formulation at approximately quarterly intervals to coincide with leaf flushes. A product labeled 24-7-8 plus minors, with about half of the nitrogen being in a fast-acting form, works best for all larger cycads.

Manage Pests & Diseases Responsibly—Most cycads are relatively free of pests and diseases, which makes them welcome additions to a south Florida Landscape. One notable exception is the aulacaspis scale epidemic affecting king and queen sagos. The causal organism, *Aulacaspis yasumatsui*, is a white scale insect pest introduced to the U.S. from Thailand a few years ago (Howard et al., 1996; Weissling et al., 1999). This scale primarily infects cycads of the genus *Cycas*. Left untreated, infected plants will die. The recommended course of action in a south Florida Landscape is—wherever possible—to remove infected sagos and replace them with resistant cycad species (see list of recommended cycads below).

The most important disease of cycads is stem and root rot, which is usually caused by over-watering or by planting in soil that does not drain freely. This problem is easily circumvented by watering efficiently and by carefully choosing planting locations.

Reduce Non-Point Source Pollution—With respect to cycads, the simplest way to reduce non-point source pollution is to choose species with low fertilizer and water requirements and few pests and diseases (see list below).

Attract Wildlife—Due to the toxins in their leaves and seeds, cycads do not represent an attractive food source for most forms of wildlife. In fact, cycads are considered pest plants in some parts of the world because livestock often get sick or die from eating the foliage and seeds (Jones, 1993). Rodents do not appear to be affected by these toxins, however, and the flesh around the seed (called the sarcotesta) of some cycads is a delicacy for squirrels and rabbits.

Cycads also attract interesting insects. For example, a recent experience by the author in a private cycad garden in Sarasota suggests that large cycads are quite attractive to lightning bugs, which put on an impressive show at dusk when in large numbers. Another insect that is attracted to cycads is the atala butterfly (*Eumaeus atala*), a rare south Florida endemic whose sole food source is the Florida coontie (Culbert, 1995).

Protect the Waterfront—Since cycads cannot be planted near water, the most effective general recommendation for this principle is to establish a 20-foot-wide "No Application Zone" along the entirety of the waterfront and to construct raised beds or dig swales to prevent storm water from running off into surface waters.

Twelve Cycads Recommended for South 'Florida Landscapes'

Cycads can be broadly categorized into two groups, those that live in hot and/or dry areas and those that live in rainforests. Due to their high drought tolerance, low nutrient requirements, and minimal pest and disease problems, only cycads in the former group are recommended for south Florida Landscapes. Although many such cycads are well suited to the soil conditions and climate of south Florida, most have traditionally been unavailable except to the avid cycad collector. Much interest has been generated in cycads in the last few years, however, through several new books and numerous new societies. As a result, supply of unusual cycads in wholesale nurseries in Florida has tripled in the last five years (Broome, 1998).

Twelve "low maintenance" cycads that grow well in south Florida and that are either widely available or will be within a few years are *Ceratozamia hildae, C. kuesteriana, C. latifolia, C. robusta, Dioon edule, D. mejiae, D. spinulosum, Encephalartos ferox, E. gratus, Z. loddigesii, Zamia floridana*, and *Z. vazquezii*. The attractive characteristics and general culture requirements for each are provided below (adapted from Broome [1998], Hubbuch [2000], and Jones [1993]).

Ceratozamia hildae, or the bamboo cycad, gets its name from the upright habit of its leaves, which have clustered, "bowtie" leaflets and can attain a height of seven feet. This cycad prefers partial shade, but can be grown in moderate sun or in deep shade. It can become mature in as little as four to five years with proper care.

Ceratozamia kuesteriana is a cold-hardy cycad from Mexico with a short or subterranean stem and brown emergent leaves. Because it is one of the few cycads that is completely unarmed (i.e., lacking all spines and prickles), this species makes a good accent plant near walkways, where most people would not normally want to use a cycad. It prefers a shady location with well-drained soil and will attain a spread of five feet.

Ceratozamia latifolia is one of the best landscape plants in the genus. It prefers to be in the shade to look its best. It has proven to be very cold and frost hardy. It grows fairly fast and reacts well to fertilizer applications. This plant will eventually attain a seven-foot spread. There are variations of this species, but most have beautiful red emergent leaves.

Ceratozamia robusta has thin, green leaflets and green emergent leaves. It has proven to be one of the most cold-hardy of the genus. This plant can attain a spread of nine feet and can grow in sun or shade. It is much less common than many others in the genus, but well worth the effort in locating it.

Dioon edule is the most widely available, as well as the most-cold hardy of the uncommon cycads grown in Florida. This species prefers sandy conditions in full sun, but performs well in virtually any soil type with good drainage. It has a high tolerance to salt and has the general appearance of the king sago, except with lighter green foliage. Some varieties have lavender, pale-blue, or pale-red emergent leaves. Old plants have multiple trunks and can reach 6-8 feet in height.

Dioon mejiae is a small to medium-sized cycad that develops a trunk to three feet tall and ten inches across, often producing offsets at the base. Young leaves are light green with very long hairs; these harden off to become rigid, dark green, slightly spiny mature leaves. This is a tough species that will withstand considerable exposure to sun and short periods of drought. This species should be considered as a replacement or alternative for the king sago in south Florida.

Dioon spinulosum, a native of the lowlands of the Sierra Madre Oriental mountains in Mexico, is the largest American cycad, with multiple trunks reaching heights of up to 30 feet. Mature specimens bear numerous stiff, light green leaves that can reach six feet in length. This species is an attractive, easily grown, and popular plant for the subtropics, preferring partial shade and tolerating a wide range of soils. It should be considered as a favorable replacement or alternative for the queen sago.

Encephalartos ferox, from South Africa, is one of the most sought-after and unusual cycads in south Florida. This species has glossy, dark-green leaflets that resemble holly leaves, and mature plants bear large, bright-red cones. This cycad prefers a semi-shady area and can attain a spread of nine feet.

Encephalartos gratus is one of a large group of highly collectable cycads from South Africa. All require bright light and well drained soil, but plenty of water in dry weather. It is a relatively fast-growing cycad and can reach immense dimensions.

Zamia floridana is the native Florida coontie. It grows throughout the state, but exhibits a high degree of variation from place to place. The leaflets range from long and narrow to short and wide, and overall height ranges from two feet (in Miami-Dade County) to five feet ('Palatka giant'). The coontie is a popular landscape plant that is especially attractive when used in borders and as a groundcover. It can be grown in full sun or partial shade. Coonties have an underground stem and dark, glossy green leaves that form a graceful crown. Large, reddish-brown cones are borne near the surface of the soil, with male and female cones produced on separate plants; male cones are lance-shaped, while female cones are more rounded and much larger overall.

Zamia loddigesii is an extremely tough and drought-tolerant cycad from Mexico. It is related to the common cardboard "palm," but has much narrower leaflets. Its light green leaves can grow up to three feet long and the plant can grow to be three feet across. It prefers to grow in full sun but can tolerate partial shade. This cycad can be used as a small shrub or accent plant.

Zamia vazquezii (usually called *Z. fischeri*), resembles a fern and is often mistakenly sold as one. This cycad prefers to grow in partial shade and can be used as a small shrub or a large groundcover. It can have green or brownish emergent leaves and can grow up to four feet tall and four feet across.

Cycad Internet Resources

Cycad-related information on the Internet has dramatically increased in recent years. Anyone interested in this ancient group of plants can now subscribe to e-mail lists and can participate in online discussion forums. Numerous websites around the world also contain information on cycads. The *Virtual Cycad Encyclopedia* (VCE), located on the website of the Palm & Cycad Societies of Florida, Inc. (http://www.plantapalm.com), is a fairly comprehensive online resource for cycads. The VCE also contains an extensive list of links to other cycad-related websites.

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