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Post-Mortem on Hurricane Irma in Southeast Florida

This issue is devoted to an evaluation of Hurricane Irma's impact on the mainland of southeast Florida, particularly its effects on trees in our yards. Although this is a Palm Society newsletter, the article looks at a range of plant species, because most people's yards aren't landscaped exclusively with palms. To the extent that, in part, it relies on personal observations and reflects personal conclusions, if you have different opinions about any of the content, please feel free to respond by e-mail so that we might continue the post-mortem in a future issue.

Those of us who settled in the southeastern counties of mainland Florida after 1960 have experienced very few hurricanes, but that doesn't mean they weren't memorable.

In 1965, Hurricane Betsy made a shocking clockwise pirouette while already well north of the Bahamas, some 350 miles east of Daytona Beach, and then headed southwestward. It eventually hit Key Largo as a Category 3 hurricane. Flooding was widespread in Broward and Dade counties, and Key Biscayne was reported to have been left almost completely underwater. The storm made asecond landfall in Grand Isle, Louisiana.

There wasn't another strong hurricane in southeastern Florida for the next 27 years. Then Andrew devastated the southern third of Miami-Dade County with sustained winds that were upgraded years later to Category 5 status. Both trees and homes were demolished, and The Miami Herald called it 'The Big One.' But the storm was very compact, and areas from Coral Gables north went relatively unscathed, so for two-thirds of the county, Andrew was not The Big One.

Since Andrew in 1992, our part of the state has had a few near-misses, two of which could have caused the most catastrophic hurricane damage ever recorded in U.S. history. The first was Ivan in 2004. The most ominous projection by the National Hurricane Center had Ivan merging from west-central Cuba as a Category 5 storm on a track due north along the western borders of Miami-Dade, Broward and Palm Beach counties. That meant that the three most populous counties in the state would have been in the 'dirty' northeast quadrant of the hurricane. Fortunately, by the time the mid-morning advisory was released a few hours later, the storm track had shifted west into the Gulf of Mexico, and we were spared.

Hurricane Irma was the second near-catastrophe. Its 11th-hour westward track shift saved mainland southeastern Florida from a crippling hit. Most homes experienced little or no wind damage, unless, of course, something fell on them. But lots of vegetation in our area suffered a different fate; broken and overturned trees littered the regional landscape. In light of that significant destruction, many of us were startled when measurements revealed that our sustained winds did not exceed tropical storm force; hurricane-force gusts occurred only periodically.

The positive news to report in the wake of Irma is that palms did very well in mainland south-eastern Florida. There are at least a couple of likely explanations. First, the architecture of palms makes them well-suited to withstand strong winds. Fronds of

single-trunked pinnate genera such as Roystonea, Chambeyronia, and Veitchia, which carry a small number of leaves, tended to snap off to one degree or other, allowing the plant to present a relatively slender profile against storm winds. Even species with leafier crowns, such as Satakentia and Phoenix roebelenii, withstood Irma well.

Palmate species also held up admirably, but with less consistent results. Those species which are characterized by a dense crown of large, stiff leaves presented a broader profile against the winds. For instance, occasional Bismarckias went down. Although the usual admonition not to prune trees just in advance of a tropical storm is intended to address the risks posed by unsecured trimmings, it might be worthwhile to make an exception for densely-crowned palms. Pruned fronds could be stashed in a carport or garage for the duration of the storm.

Second, many popular species are native to cyclone-prone regions, and are thus adapted to withstand strong winds. Coccothrinax, Thrinax, Sabal and Copernicia were among the numerous palm species which tended to remain upright through Irma while many broadleaf trees were falling all around them.

Just why did those trees perform so poorly in a 'mere' tropical storm? There's a bit of mystery involved in assessing exactly what happened. Can you guess the source of this language?: "Many trees will be snapped or uprooted, blocking numerous roads." It's the Saffir-Simpson Hurricane Wind Scale's description of a Category 3 hurricane, which contains sustained winds of 111-129 mph.[1] Yet it's clearly a pretty accurate description of what Irma did to us.[2] How does that square with the official claim that our sustained winds were no better than tropical storm-force?

The answer appears to lie in a factor that the Saffir-Simpson Scale doesn't account for: the duration of strong winds in a given area. The consensus among local observers is that what made Irma so destructive of broadleaf trees was the length of time that its winds battered mainland southeastern Florida, rather than their absolute velocity. Hurricane Andrew, for all its power, was fast-moving and relatively dry. Irma, on the other hand, took much longer to push through our area, and produced greater rainfall. After beginning to pound the region on Saturday, it remained capable of unleashing occasional strong gusts as late as sundown on Sunday. Perhaps the Saffir-Simpson Scale could use a little fine-tuning.

A boxing match appears to serve as an apt metaphor for what happened to our broadleaf trees: Imagine a fighter whose opponent administers shots to his midsection for nine rounds. They're not enough to knock him down, but they weaken him, and a solid punch to the chin in the tenth round finally drops him to the canvas. In a similar fashion, Irma, a relatively tame storm locally, softened up many of our trees before delivering the coup de grâce.

What factors made certain broadleaf trees more vulnerable to Irma's extended assault? The explanation generally can be found in the interrelated areas of shape, pruning practices, root system habits, and site preparation. (Also, keep in mind that other variables, such as tornadoes and down-bursts, within a storm can significantly influence what happens to any tree in your yard, no matter how resistant it might normally be.)

(1) Shape: Dense, broad crowns act like barriers or sails that ultimately prove no match for strong, persistent winds. Ficus benjamina is probably Exhibit A in support of this proposition. Its aerial roots, upon contacting soil, form new trunks that help stabilize the tree. When, as is common in our region, those roots are cut above ground, stability is diminished. On the other hand,

the root systems of Ficus benjamina are extensive and can heave sidewalks, foundations and even interior floor surfaces, so this species poses multiple risks. In recent years, because of high maintenance demands, many of them lining the roads of Coral Gables have been replaced with live oaks, and the differences in storm survival are striking.

(2) Pruning techniques: The practice of hatracking trees only results in a canopy that is denser and thus more wind-vulnerable than before; it has slowly fallen into disrepute and is even illegal in some municipalities. A superior alternative is the technique known as selective pruning, or pick-pruning, in which whole branches are removed from the tree, allowing strong winds to flow more freely through the canopy. Selective pruning done in phases over a three-year period appears to achieve the best results. That's particularly true for fruit trees, because reducing one-third of the canopy at a time makes it more likely that they will stay in production throughout the pruning process.

Not all broadleaf species are amenable to even the best of pruning practices. The growth habits of some Ficus species and some Tabebuia species, for example, involve the interlacing of so many branches that storm-resistant pruning is hard to achieve. In contrast, live oaks are much easier to prune into a very sculptural form in which they develop extremely strong scaffold branches.

(3) Inflexibility: Some tree species are brittle, tending to break up before they fall over. They include avocado, mahogany, royal poinciana, eucalyptus, jacaranda, and silk oak. That doesn't mean that they shouldn't be planted in southern Florida; rather, care should be taken not to place
them close to a home, garage, driveway or storage shed. Two other brittle species, bischofia and earleaf acacia, have other strikes against them that render them undesirable for our area.

Fortunately, there are many species that possess greater resilience to tropical storm winds. In addition to live oak, they include lychee, sapodilla, mango, gumbo limbo, mastic, Simpson stopper, strangler fig, cordia, and pandanus. Less well-known than these species is Elaeocarpus decipiens, the Japanese Blueberry, but it merits more extensive use. It grows naturally in an attractive pyram idal shape, but takes well to pruning

(4) Root system habits: Not only are some tree species naturally shallow-rooted, but in parts of southeastern Florida that trait is exacerbated by the limestone substrate that occurs just under the surface of the soil. Avoiding species that are notoriously shallow-rooted, or at least exiling them to distant parts of your property, will make your home more likely to escape devastation from tropical storms.

(5) Site preparation: This factor is at the core of many tree failures in our region. In areas where thin soil is underlain by limestone, the practice of planting a tree in a hole just large enough to accommodate its root system is as ill-considered as it is common. The roots of many tropical hardwoods have difficulty pushing their way through the rock. As a result, root systems fail to achieve the type of distribution that leads to optimum stabilization of the tree. A trip down U.S. 1 in southern Miami-Dade County presented stark visuals of that phenomenon. Most of the overturned ornamental trees in the median or along the fringes of the highway exposed a rootball that was small in comparison to the size of the tree. (Perhaps the worst example of lazy planting habits appeared on one large upturned tree, where the side of its container still clung to the rootball! Note to contractors: Remove trees from their pots before planting.)

Although digging a large planting hole is advisable, filling that hole with rich soil is not. That's true whether the site consists of limestone or sand. The practice only encourages the tree's root system to confine itself to the better soil, ultimately affecting the size and stability of the tree. The superior practice is to refill the planting hole with the material that came out of it -- except for any large chunks of rock that may still be present. That technique will encourage the root system to reach out in all directions around the planting hole. There is an additional helpful step in site preparation that can be taken, especially if a backhoe is available. An X-shaped trench can be dug, providing even more room for stabilizing roots to extend into as the tree grows.

L.G.

1 The NOAA team that updated the Saffir-Simpson Scale in 2012 wrote, "The maximum *sustained* [emphasis added] surface wind speed (peak 1-minute wind at the standard meteorological observation height of 10 m [33 ft] over unobstructed exposure) associated with the cyclone is the determining factor in the scale."

2 The harm to vegetation that Irma caused in mainland southeastern Florida would also have fit within an earlier Saffir-Simpson Scale description of the effects of a Category 3 hurricane: "Damage to shrubbery and trees with foliage blown off trees and large trees blown down."