

below  
the  
surface  
an in-depth  
look at...



## Storm Wise South Florida Landscapes

*Landscaping in hurricane-prone southern Florida*

### ON THE INSIDE

- How to prepare your landscape for a storm
- Plant maintenance before hurricane season
- A list of plants that can weather the storm and those that can't
- Evaluating your landscape after the storm

**Mark Twain once said, "Everyone complains about the weather but nobody does anything about it." While you may not be able to change Florida's tropical weather, you can take steps to design and maintain a flood- and wind-tolerant landscape. Then, in the event of a major storm, your landscape will be as prepared as you are.**

Before Hurricane Andrew struck southern Miami-Dade County in 1992, major storms were infrequent events in modern-day Florida, and most of the state enjoyed a false sense of immunity to hurricanes. That changed in 2004–5, with record-breaking, back-to-back hurricane seasons pummeling the entire peninsula. Given the dramatic increase in storm activity, many homeowners have developed hurricane preparedness plans, purchased generators and armored their homes with shuttering systems. While protecting your home and family are certainly the most important preparations you can make, you can also take steps to prepare and protect your landscape. This brochure will show you how.





---

*Groups of well-pruned trees and shrubs also tend to survive better than solitary trees because the roots form a “network” that stabilizes the planted area*

---



*Many South Florida trees and shrubs survive post-storm flooding.*

---

## **1. Plan your landscape with storms in mind**

Living in Florida means that you live with hurricanes. As you plan and design your landscape, keep in mind that there is no way to completely protect your landscape from storms. However, there are some things you can do to minimize the damage if a storm strikes.

As with Water Wise landscaping (sometimes called xeriscaping™), the “Right Plant, Right Place” principle is key to success. Recent post-storm evidence indicates that native trees and shrubs with even-spaced, spreading branches, low centers of gravity and strong, deep penetrating root systems fare best in hurricane-force winds. Species like sea grape and gumbo limbo quickly shed their leaves in hurricane-force winds, but the structures of these even-branched trees tend to remain intact, and the foliage quickly re-grows after a storm. Native palms such as cabbage and thatch palms are also highly adapted to strong winds and are known to survive virtually unscathed, even in some of the hardest hit areas of Florida.

In addition to wind tolerance, flooding tolerance and local storm-surge potential should also be taken into consideration. These factors will vary based on your location in South Florida. If your neighborhood is prone to inland flooding or portions of your yard collect water during heavy periods of rain, plan your landscape with this in mind and choose flood-tolerant species. Species like cypress, red maple and pond apple are able to survive a wide range of water conditions. These species can tolerate both low-water periods in the winter and long periods of standing water in storm season. If you live close to the coast, know the potential for storm surge in your neighborhood. Storm surge brings large amounts of salt water inland. This salt water can have a major impact on landscape plants. There are many salt-tolerant species that can be used to minimize post-storm salt mortality. A table of recommended Storm Wise plant selections are provided in this brochure.

While planning a Storm Wise landscape, it is also important to know the mature size of trees and shrubs to avoid future conflicts with fences, buildings and power lines. Mature tree height is extremely important to consider under power lines. When trees are allowed to grow into power lines, they pose a year-round maintenance issue for the power company and increase the chances that your power service may be interrupted for an extended period after a storm event.

While planning and evaluating your Storm Wise landscape, it may also be necessary to remove or phase out problem tree species in your design. Some species have extremely low wind tolerance and/or shallow root systems and should not be planted in storm-prone areas. A table of undesirable species is provided in this brochure.

When planting your new Storm Wise trees, do not stake them tightly. This prevents the plant from gradually adjusting to winds. Always stake and tie the newly planted tree loosely so that the tree can bend and move with the wind. This helps develop a stable root system that can adjust to occasional high wind events. It is also not a good idea to overfertilize or overwater newly installed trees and shrubs. This can increase the crown surface and/or decrease the root area, making the plant more prone to being toppled by the wind.

## **2. Perform proper maintenance before hurricane season starts**

Homeowners who have selected suitable plants, placed them properly and encouraged healthy root systems will have little to do to prepare their landscape for hurricane season. Landscapes are more likely to survive a major storm intact if they are maintained throughout the year. This includes routine trimming of shrubs as well as removal of dead limbs and those located too close to a fence, house or a utility line. This should be done early in the year – well before hurricane season begins on June 1. Piles of branches can become a hazard if waste disposal crews

## STORM WISE HURRICANE KIT:

### *Items you will need to salvage your landscape after storm damage:*

- ✓ Garden hose in the event your irrigation system is not working due to a power outage
- ✓ Pruning tools
- ✓ Ladder
- ✓ Tree stakes/rebar
- ✓ Biodegradable rope or strapping cloth
- ✓ Come-along tool to right toppled trees and shrubs
- ✓ Shovel
- ✓ Burlap or blankets to protect exposed root balls if you are unable to secure your landscape immediately; do not use plastic as it will trap heat
- ✓ Sharpened, fueled, gas-powered chainsaw
- ✓ Hearing and eye protection
- ✓ Bug spray and sunscreen

cannot clear them immediately before a storm.

Periodically check your landscape throughout the year, cutting back trees and weak branches that could contact buildings.

Assess the shape of your trees and shrubs and envision what they should look like before you begin pruning. Some trees, such as sea grapes, should have spreading, open canopies; pigeon plums are naturally columnar in shape and develop compact canopies. Regardless of the species, you should regularly thin foliage so that wind can flow freely through the branches of trees and shrubs, decreasing the chance that they will be uprooted in strong winds. This selective pruning routine should start when the tree is young in order to encourage a well-shaped, wind-hardy form.

In addition to the canopy, it is also important to keep the root systems of your trees healthy to prevent unnecessary storm damage. Over-watering and over-fertilization can lead to weak growth and shallow

root systems that easily “pop up” in wind events, especially if the soil is saturated.

Encourage deep root systems by following the Water Wise principles, watering only when needed and fertilizing sparingly, if at all.

Avoid cutting tree roots during construction such as swimming pool installation or sidewalk replacement, as it will de-stabilize the tree in a high wind event.

Know your local waste disposal regulations, and be sure to follow disposal guidelines. Observe collection day schedules for vegetation and large items. You should check your yard for any items that could become missiles in a storm (rotted fencing, lumber, trellises or old lawn furniture) and place them at the curb on your bulk waste collection day, well before hurricane season starts.

Periodically check your swales and drainage system to ensure that there are no blockages to impede water from flowing away from your property.

## What to Expect:

### Category ONE Hurricane:

Winds 74-95 mph. Storm surge generally 4-5 ft. above normal. No real damage to buildings. Damage primarily to unanchored structures (trellises and gazebos), unsecured or rotted fencing and extremely wind-intolerant trees and shrubs. Small branches, fruits and dead palm fronds blown. Newly planted trees may be toppled. Some coastal and inland flooding possible.

### Category TWO Hurricane:

Winds 96-110 mph. Storm surge generally 6-8 ft. above normal. Some roofing material, door and window damage. Considerable damage to unanchored structures and fencing. Some trees blown down, especially if wind-intolerant and/or improperly maintained and pruned. Considerable damage to storm-intolerant species. Coastal and inland flooding possible.

### Category THREE Hurricane:

Winds 111-130 mph. Storm surge generally 9-12 ft. above normal. Some structural damage to small buildings. Damage to trees and shrubs with foliage blown off most trees. Some large trees blown down. Trees with low wind-tolerance are most impacted, but some wind tolerant species will also be damaged, depending on growing conditions and location. Trees and shrubs growing in saturated soils are more likely to be blown over. Unsecured structures and poorly constructed fences are destroyed.

### Category FOUR and FIVE Hurricanes:

Winds 131-155 mph and greater. Storm surge generally 13-18 ft. above normal. Some to many complete roof and whole building failures. Many to all trees and shrubs sustain extensive damage, crown twists; large trees uprooted and blown down, especially when soils are saturated. Coastal and inland flooding probable, depending on tides and/or associated rain totals. Little vegetation survives highest winds.



# Storm Wise Plant List for South Florida

Following hurricane cleanup, you may wish to re-landscape your yard. A little bit of planning can help reduce future storm-related problems. First, make certain the plants being considered are appropriate for your area. Consult the SFWMD Water Wise plant guide for horticultural details and xeriscape principles. In addition, consider the “storm hardiness” of the plant and plan for the approximate mature size and shape of the tree. This will help determine where to locate the plant to minimize pruning due to interference with utility lines or branches rubbing against fences, the house or other structures.



*Sea grape that withstood a severe storm.*

Plant Species	Wind Tolerance	Flooding (Inundation) Tolerance	Salt (Storm surge) Tolerance	Mature size HxW
<b>Paurotis Palm</b> <i>Acoelorrhaphe wrightii</i>	High	High	High	20' x 5'
<b>Florida Thatch Palm</b> <i>Thrinax radiata</i>	High	Medium	High	20'x3'
<b>Coconut Palm</b> <i>Cocos nucifera</i>	High	Medium	High	60'x5'
<b>Cypress</b> <i>Taxodium spp.</i>	Medium	High	Low	80'x25'
<b>Live Oak</b> <i>Quercus virginiana</i>	High	Medium	Low	60'x40'
<b>Gumbo Limbo</b> <i>Bursera simaruba</i>	Medium-High	Medium	High	40'x35'
<b>Sea Grape</b> <i>Coccoloba uvifera</i>	Medium-High	Medium	High	30'x25'
<b>Strangler Fig</b> <i>Ficus aurea</i>	High	High	Medium	50'x50'
<b>Cocoplum</b> <i>Chrysobalanus icaco</i>	Medium	High	High	12'x10'
<b>Mastic</b> <i>Mastichodendrum foetidissimum</i>	Medium-High	Medium	Medium	45'x30'
<b>Cabbage Palm</b> <i>Sabal palmetto</i>	High	High	High	40'x5'
<b>Dahoon Holly</b> <i>Ilex cassine</i>	Medium	High	Low	25'x15'
<b>Pond Apple</b> <i>Annona glabra</i>	Medium	High	Low	20'x15'
<b>Black Ironwood</b> <i>Krugiodendron ferreum</i>	High	Medium	Medium	25'x10'
<b>Stoppers spp.</b> <i>Eugenia, Myrcianthes</i>	High	Medium	Medium	25'x10'
<b>Buttonwood</b> <i>Conocarpus erectus</i>	High	High	High	20'x25'
<b>Red Bay</b> <i>Persea borbonia</i>	Medium	High	Low	40'x30'
<b>Royal Palm</b> <i>Roystonea spp.</i>	High	High	Medium	80'x7'
<b>Jamaican Caper</b> <i>Capparis cynophallophora</i>	Medium	Medium	High	10'x4'

## Comments

A clumping palm ideal for coastal and wind-prone areas. Withstands high winds, flooding and salt exposure. Suitable adjacent to power lines.

Slender-trunked palm that withstands high wind and salt conditions. Can withstand brief post-storm inundation. Suitable adjacent to power lines.

Although not native to Florida, this palm withstands extremely high winds and salty coastal conditions. Coconuts should be removed before storm season. Set back 30' from power lines.

Bald and pond cypress both thrive flooded but also grow well in drained sites. Ideal for areas prone to occasional flooding. Moderate wind tolerance; survives high winds; best planted in groups. Should not be planted in coastal salt spray zones. Set back at least 30' from power lines.

Extremely wind tolerant, especially when pruned properly. Breaks apart only in extreme wind events like tornadoes. Avoid planting close to buildings, sidewalks and driveways as this restricts proper root system development. Set back at least 30' from power lines.

Very storm-hardy, sheds leaves and small branches in storm-force winds. Only withstands moderate post-storm inundation. High salt tolerance for coastal areas. Set back 30' from power lines.

Spreading, round tree does well in coastal areas. Naturally very sturdy with multi-stemmed trunk. Over-pruning into a single-trunked tree decreases wind stability. Leaves shed during the storm but re-grow quickly. Withstands only brief flooding but highly salt-tolerant, and survives storm-surge events. Set back 30' from power lines.

Native fig tree that does not topple like the commonly planted exotic fig species. Very wind tolerant, especially if allowed to form natural buttresses and if pruned and thinned regularly to reduce the canopy's wind-loading potential. Set back at least 30' from power lines.

Good shrub selection for mixed plantings. Red-tipped variety survives periodic flooding. Horizontal variety is highly salt-tolerant and a good choice for coastal plantings. Suitable adjacent to power lines.

Large native shade tree, medium to high wind tolerance, especially if the canopy is thinned routinely. Withstands moderate post-storm inundation and salt spray. Set back 30' from power lines.

Florida's state tree, extremely rugged and storm-hardy, survives hurricanes unscathed. Brown fronds should be trimmed before a storm. Trimming green fronds weakens most palms. Very flood and salt tolerant and can be planted in any area of the state. Set back 30' from power lines.

This upright, small tree has medium wind tolerance. Best if planted in a grouping of native trees and shrubs. Withstands extended flooding. Very little salt tolerance; should not be planted in areas that will be impacted by salt spray. Set back 30' from power lines.

Sturdy small tree when mature and canopy is thinned. Naturally occurs in flooded areas but grows well in drained areas. Ideal for areas prone to occasional or prolonged flooding. Low salt tolerance. Suitable adjacent to power lines.

Extremely strong wood lends this small, subtropical tree very high wind tolerance. Low frost tolerance. Canopy may be thinned to improve storm performance. Withstands moderate post-storm flooding and salt spray.

All of Florida's native "stoppers" perform well in high winds. Securely anchored by dense roots, a good choice to use in groupings of trees and shrubs. Easily thinned before hurricane season to decrease wind load. Only withstands moderate amounts of flooding and salt. All stoppers are suitable adjacent to power lines.

Native coastal tree/shrub useful throughout the landscape. Naturally multi-trunked, especially low frost tolerance. Well adapted to storm conditions. Canopy should be thinned periodically. Highly flood and salt tolerant. Silver variety is more compact and suitable adjacent to power lines. Green variety should be set back at least 30' from power lines.

Medium-sized native tree excellent for use in mixed plantings with occasional flooding. Not salt-tolerant. Set back at least 30' from power lines.

Extremely tall palm with large fronds. Well adapted to high winds. Survives especially well if brown fronds are removed before the storm. Do not remove green fronds. Withstands prolonged periods of flooding and moderate amounts of salt spray. Set back at least 30' from power lines.

Good shrub selection for mixed plantings in areas with occasional flooding. High salt tolerance. Suitable adjacent to power lines. Showy pink flowers.



## Consider Removing

The trees listed here are species that performed so poorly in recent storms that you should carefully reconsider their place in your landscape. It is not recommended that you plant them as part of a Storm Wise landscape. If these species are already a part of your landscape, you may want to consider removing them and replacing them with something that is storm hardy.



*Black olive tree propped up.*



*Tabebuia propped up.*

Plant Species	Comments
<b>Australian Pine</b> <i>Casuarina</i> spp.	Extremely dangerous in high wind events. This tree species can grow to heights of 100 feet, so when they do topple, they impact a large area. Roots tend to “tip up” and impact structures, roads and utilities. Invasive exotic.
<b>Yellow Tabebuia</b> <i>Tabebuia caraiba</i>	Unstable in any amount of wind. Extremely wind intolerant, topples easily and should not be used.
<b>Norfolk Island Pine</b> <i>Araucaria heterophylla</i>	Loses branches easily in high winds, and sometimes topples. Far too tall for residential landscapes.
<b>Black Olive</b> <i>Bucida buceras</i>	Often breaks apart in moderate to high winds, especially if not maintained properly.
<b>Weeping Fig</b> <i>Ficus benjamina</i>	One of the most damaging trees in southern Florida. Dense canopies act like sails in high winds and pull the large trees over, exposing large root balls and doing extensive damage to sidewalks, roads, fences, structures and utilities. Invasive exotic.
<b>Queen Palm</b> <i>Syagrus romanoffzianum</i>	Shallow rooted, commonly impacted by butt rot, which makes this palm easily blown over in high winds.
<b>Carrotwood</b> <i>Cupaniopsis anacardioides</i>	Umbrella-shaped canopy makes this tree species wind intolerant. Invasive exotic.
<b>Royal Poinciana</b> <i>Delonix regia</i>	Tall tree with a large canopy that is difficult to thin. Brittle wood breaks apart easily in high winds.
<b>Silk Oak</b> <i>Grevillea robusta</i>	Short-lived, fast-growing tree with brittle wood and a shallow root system that breaks apart and topples easily.
<b>Java Plum</b> <i>Syzygium cumini</i>	Large, dense canopy makes this species wind-intolerant. Invasive exotic.
<b>Hong Kong Orchid</b> <i>Bauhinia variegata</i>	Umbrella shape makes tree easy to topple. Wood is brittle and breaks apart easily. Invasive exotic.
<b>Jacaranda</b> <i>Jacaranda mimosifolia</i>	Brittle wood leads to split trunks and twisted canopies.
<b>Earleaf Acacia</b> <i>Acacia auriculiformis</i>	Extremely brittle wood, limbs break apart in low to moderate winds. Invasive exotic.
<b>Eucalyptus</b> <i>Eucalyptus camaldulensis</i>	Brittle wood breaks apart in storm conditions. Invasive exotic.
<b>Javanese Bishopwood</b> <i>Bischofia javanica</i>	Dense canopy gives this tree species low wind tolerance. Brittle wood breaks apart. Can easily up-root especially in moist soils. Invasive exotic.
<b>Washington Fan Palm</b> <i>Washingtonia robusta</i>	Tall, shallow-rooted palm that topples in storm-force winds.

### 3. Prepare when a storm is forecast to strike your area

- **Mow your yard before the storm.**

This chore may seem inconsequential, but it will make debris easier to clear and it gives you one less thing to worry about post-storm.

- **Brown fronds and seed pods on palms should be removed.** If you have not already done so, remove coconuts from coconut palm trees and harvest items (e.g., fruits) from other trees that are mature enough to be picked.

- **Bring in all potted plants and lawn ornaments.** If they cannot be secured inside, lay them on their sides.

- **Stake small trees and tall garden plants with wood, plastic or other sturdy stakes driven at least 8 inches into the ground.** Masses of heavy vines growing on fences pull fencing over in high winds. If the mass of vines is extensive, you may want to trim and remove it from fencing. You can also lay arches and trellises on the ground to protect vines growing on them. Anchor them with rope or wire to keep them grounded.

- **Remove items of value in areas of your yard where water accumulates or flows through.** Remember that storms sometimes bring flooding and storm surge. Make a last-minute check of your surrounding drainage system to ensure there are no blockages that may prevent water from properly draining in high rain events. (While it is important to check this when a storm is approaching, it should also be a part of your routine maintenance plan.) If you have waited until the last minute to trim large branches, store them in your garage or other safe place so trimmings don't become a windblown threat.

- **If you own exotic pets such as reptiles or birds, be sure to bring them inside or secure them to prevent escape.** Exotic animal populations are a major environmental problem in South Florida. Escapes during storms are a com-

mon source of these nonindigenous animals, which can sometimes breed in the wild.

### 4. Evaluate your landscape carefully post-storm

Don't make any hasty landscaping decisions immediately following the storm. Secure and/or remove hazards, but put off pruning and removing desirable trees and shrubs for as long as possible while you repair other areas of your home. The damage to your landscape may look severe in the wake of the storm, but wind-whipped trees and shrubs often look dramatically improved in just a matter of months. You may decide later that the damage was not as severe as you thought.

In addition to wind damage, you may also be faced with flooded areas of your yard for several days or weeks. Flooded conditions can seriously impact water-intolerant species, leading to fruit drop, wilting and root rot. Check your drainage system to ensure there are no blockages. In most cases, there is little you can do to immediately alleviate post-storm standing water. Some of the symptoms of waterlogging may not appear for more than a year. Be aware of this, and if you choose to remove plants from this area of your yard, replace them with flood-tolerant species.

Carefully assess the immediate damage. Factors to consider in making post-storm decisions include:

- Extent of damage
- Location
- Species
- Value it adds to property

Split trunks, broken branches or loosely attached branches are obvious safety concerns and should be taken care of as soon as possible. If the majority of the main branches of the tree are gone, or if the trunk has vertical cracks, the tree has little chance of recovering and should be removed. Once you make the decision to remove a tree, think about your long-term plans for the area. If you are going to leave



*Queen palms have poor storm tolerance.*

the stump, cut it flush with the ground. If you plan to replant another tree in the same location and need to remove the stump, leave four feet of the trunk in place. Removal is easier if the stump can be pulled rather than grubbed out of the ground.

If a tree is basically healthy and not creating a hazard, it can generally recover if given post-storm care. Decide which branches must be removed at this time, and cut the damaged branches at the nearest lateral branch or main stem, not in the middle of the branch. Branches smaller than 3-inch diameter can be removed using either pruning shears or a pruning saw. Be sure to make a clean cut, careful not to crush or tear the bark. Use a sharp manual saw or a chainsaw to cut larger branches. If a chainsaw is used, safety rope, a harness, eye and hearing protection are essential.

Tattered fronds should not be removed from surviving palm trees immediately after the storm. Storm-hardy palms have the ability to "mine" nutrients from damaged fronds. Allow the injured fronds to stay on your palms until they turn brown.

Branches hanging over power lines are major safety hazards. Do not attempt to prune these branches yourself. Contact the power company or an arborist trained in electrical line clearance to have these branches removed. This can be extremely dangerous even if the lines are not "live." With proper planning and maintenance, your landscape plants should not interfere with utility lines, but sometimes lines are pulled down by neighboring trees.

If trees and shrubs have been toppled and uprooted, and you would like to try to save them, you must cover exposed root material immediately and keep it moist. Cover the rootball with burlap or soil, and water daily until you are able to upright the tree or shrub. Do not use plastic as it will trap heat and further damage the roots. Prune the toppled tree just enough to balance root losses. Cut broken or dead branches before you pull the tree into an upright position.

It is best to attempt to right downed trees while the ground is still moist. If necessary, remove some soil from beneath the root mass so it will be even with the existing soil grade when pulled upright. You may need to use rope and a come-along tool, depending on the size of the tree or shrub. Once it is back into position, tamp in the original soil around the rootball, fill airpockets and water thoroughly. Stake the tree for the first year to prevent the tree from falling again. Do not use rope, wire, wire in garden hose or any narrow band of material to tie around the tree, as these items can injure the trunk. It is better to use a broad strap, biodegradable rope or other fabric at least one-inch wide and to move the strap periodically over the next year to minimize impacts to the bark. You should continue watering every other day for at least two weeks. Do not fertilize immediately following the storm as it can damage sensitive new roots that are trying to grow.

Turf and groundcovers should be cleared of debris and mud as soon as possible to allow them to recover. If your landscape had saltwater exposure (via salt spray or storm surge), hose it down thoroughly with fresh water as soon as possible to reduce the potential for salt damage. Periodic flushes of fresh water are critical if your landscape has many salt-intolerant species. Waiting for the symptoms of salt damage to appear can result in irreversible damage to your landscape.

#### For further reading:

Nelson, Gil. 2003. *Florida's Best Native Landscape Plants*. Gainesville: University Press of Florida.

Osorio, Rufino. 2001. *A Gardener's Guide to Florida's Native Plants*. Gainesville: University Press of Florida.

Waterwise South Florida edition. *Landscaping to Promote Water Conservation Using the Principles of Xeriscape™*. Free publication of the South Florida Water Management District, West Palm Beach. 1-800-432-2045.

---

**The South Florida Water Management District** is a regional, governmental agency that oversees the water resources in the southern half of the state. It is the oldest and largest of the state's five water management districts.

Our Mission is to manage and protect water resources of the region by balancing and improving water quality, flood control, natural systems and water supply.



**sfwmd.gov**

**South Florida Water Management District**  
3301 Gun Club Road  
West Palm Beach, Florida 33406  
561-686-8800 • FL WATS 800-432-2045  
[www.sfwmd.gov](http://www.sfwmd.gov)

MAILING ADDRESS: P.O. Box 24680  
West Palm Beach, FL 33416-4680

#### DID YOU KNOW?

- Hurricanes and drought in the early to middle twentieth century, combined with efforts to populate this "new frontier" in Florida, led the U.S. Congress to adopt legislation in 1948 creating the Central and Southern Florida Flood Control Project (C&SF).
- SFWMD's Emergency Management, meteorological staff and field operations are constantly tracking storms during hurricane season.
- In preparation for the summer rainy season and hurricane season, many parts of the regional water management system are purposefully lowered – to create additional room to safely store stormwater and provide flood protection.
- SFWMD's regional flood control system works in concert with smaller systems, which are managed by communities or local governments such as cities, counties or water control districts. Each part of this network has a crucial role to play in avoiding catastrophic flooding, while preserving navigation, water supplies and environmental values.
- Trees should be trimmed and pruned by early June. Many municipalities have "amnesty days" before hurricane season, when homeowners can set out more than the allowable limit of yard debris for city pick-up. Call local municipalities for more information.