



Boat Owner's Hurricane Worksheet

Use this worksheet, after reading the material in this guide, to adapt it to your own circumstances. Then be sure to distribute copies to your alternates as well as your marina owner/manager.

Boat's Name: _____ Length: _____ Model: _____

Your Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone Day: _____ Night: _____

Alternates/Caretakers (if you are not available):

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone Day: _____ Night: _____

Has Boat Keys? _____ Access to Hurricane Equipment? _____

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone Day: _____ Night: _____

Has Boat Keys? _____ Access to Hurricane Equipment? _____

Boat's Current Location: Slip #: _____

Marina Name/Address: _____

List All Equipment Needed Aboard to Prepare Boat:

Equipment _____ Current Location _____

1. Extra Lines _____

2. Chafe Protectors _____

3. Fenders _____

4. Anchors _____

5. Swivels _____

6. Shackles _____

7. Duct Tape _____

8. Plugs (Exhaust Ports) _____

9. _____

10. _____

List Equipment To Be Stripped from Boat:

Equipment _____ Storage Location _____

1. Electronics _____

2. Dinghy _____

3. Outboard/Fuel _____

4. Sails _____

5. Bimini _____

6. Galley Fuel _____

7. Ship's Papers _____

8. Personal Effects _____

9. _____

10. _____

Planned Location During Hurricane: _____

If at a Dock: Slip #: _____

Marina Name/Address: _____

Additional Lines #: _____ Length: _____ Size: _____

Chafe Gear: _____ Fenders: _____

If at a Hurricane Hole: _____

Travel Time by Water from Present Location: _____

Are There Any Bridges? _____

If Yes, Will They Open Prior to Hurricane? _____

Has Owner of Surrounding Land Been Contacted? _____

How Will the Skipper Get Ashore? _____

Type of Bottom: _____ Depth: _____

Additional Anchor Needed: # _____ Size(s): _____

Type(s): _____

Additional Lines: # _____ Length: _____ Size: _____

Additional Chain: # _____ Length: _____ Size: _____

Chafe Gear: _____ Swivel: _____ Shackle(s): _____

If at a Mooring/Anchorage:

Has Mooring Been Inspected Within the Last Six Months? _____

How Will the Skipper Get Ashore? _____

Type of Bottom: _____ Depth: _____

Mooring Line Should Be Extended _____ to Increase Scope

Additional Anchors Needed: # _____ Size: _____

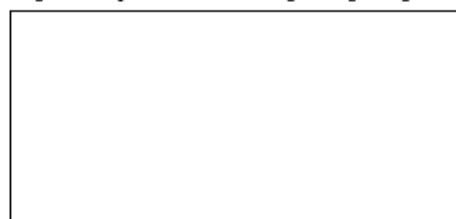
Type(s): _____

Additional Lines: # _____ Length: _____ Size: _____

Additional Chain: # _____ Length: _____ Size: _____

Chafe Gear: _____ Swivel: _____ Shackle(s): _____

Diagram of Proposed Hurricane Docking/Mooring Arrangement:



If Stored Ashore:

Windage Reduced by Stripping Sails, Furling Gear, Bimini, Antennas? _____

Blocking Adequate for Storm Conditions? _____

What Arrangements Have Been Made for Hauling? _____

Storage Location: _____

Contact Name (Marina/Property Owner): _____

Phone #: _____



A Boat Owner's Guide to Storm Preparation

Created in partnership by BoatUS Marine Insurance Damage Avoidance Program and Charleston Area Project Impact

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Charleston Area Project Impact



Building Disaster Resistant Communities

The Risk is Real

While June through November is a wonderful time to enjoy the warm and beautiful South Carolina waters, it is also hurricane season. During this time, boat owners must be on alert. On average, two hurricanes hit the eastern US each year. Since 1851, more than 40 tropical cyclones (hurricanes, tropical storms and tropical depressions) have made landfall in the Charleston area.

Don't wait until hurricane season is upon us to take measures to protect your boat. Always be prepared to protect your valuable asset. The best advice is to prepare or move your boat when a hurricane is a substantial possibility, even before a watch is issued. If you wait longer, and your plan includes relocating the boat, bridges may be locked down and the hurricane hole you choose may be inaccessible. If you wait, you may find that the marina is too busy to haul your boat.

What to Expect



In order to make a plan for how to protect your boat, you need to understand the threats you will need to defend against. When a hurricane hits you have to be prepared for extremely strong winds, excessive rain, unusually large waves, damaging storm surge and tornadoes.

EXTREMELY STRONG WIND: Hurricanes are marked by having sustained surface winds greater than 74 mph. Some storms have produced gusts over 200 mph have been recorded. It is therefore critical to reduce windage—the surface area of the boat that will catch the wind. The less surface area exposed, the better it is for your boat.



EXCESSIVE RAINFALL: Rainfall of 6-12 inches within 24 hours is normal during a hurricane. Boats can be sunk by torrential rain. Cockpit decks are seldom 100% watertight, and the ability of a bilge pump and battery to handle rain accumulation is greatly overestimated. Deck drains and pump discharges located near the waterline can backflow when waves and rain put drains underwater.



WAVES: Hurricanes can produce steep, breaking waves 3-6 feet high that pound normally peaceful harbors. Sea walls, barrier beaches and other structures designed to protect docks and moorings may be submerged by storm surge. This has the effect of greatly extending the “fetch,” or distance, over which the wind can generate waves.



SURGE: Storm surge accounts for much damage because it puts dock-line arrangements underwater as boats try to float above. Surge raises the water level as much as 10-20 feet above the normal high tide, cutting off roads, forcing evacuation and lifting boats above their docks and pilings. Surge-influenced high tides can reach 20-50 miles from the storm's center, making extra length and positioning of dock-lines critical.



TORNADOES: Hurricanes sometimes produce tornadoes. There is little that can be done to protect a boat from a tornado, unless it is trailerable. If it is, take your boat as far from the coast before the hurricane arrives.

Critical Points

Chafe Gear



Using polyester line from the cleat through the chock, secured to an existing nylon line to the piling or mooring, gives you better protection from chafe, while also absorbing, shock. Make eye splices in both lines



A properly backed cleat: Note the washers and the backing plate. These are essential in a hurricane and a good idea in quieter times as well.



Lines led perpendicular from a cleat can wrench the cleat out of the deck. Two-hole cleats are more vulnerable than four-hole cleats.

Chafe protectors are essential on all lines as winds and high water works them against chocks and other contact points. On moorings or at anchor, lines stretched over the rail can create sufficient internal heat to melt them. Polyester (Dacron) stretches less, but is much more chafe resistant than nylon. Using a polyester line from the cleat through the chock and then joining it with a nylon line (using two eyes) to the pilings or mooring provides the chafe resistance of polyester line and the stretch of nylon. Covering lines with hose or duct tape at the chocks greatly increase the degree of protection.

Cleats and Chocks

These are two of the most commonly neglected-yet strategic—pieces of equipment on your boat. This becomes woefully apparent when larger-diameter storm lines are brought into use during a storm. Installing additional and larger cleats and chocks during clam weather helps secure your boat year-round. Check your cleats to make sure they are backed properly with stainless steel or aluminum plates. Marine plywood is acceptable if it's free of rot and delamination. Securely backed winches on sailboats and even keel-stepped masts also can be used to secure lines at a dock. (Note: Anchor lines should not be secured to the mast as it increases the chance of chafe failure.) Two lines per cleat is a good maximum, and they should not be led perpendicular to the base, but rather at a smaller angle, to avoid wrenching out the cleat.

Reduce Windage

Strip all loose gear that creates windage: canvas cover, bimini tops, outriggers, antennas, anchors, running rigging, booms, life rings, dinghies, portable davits, etc. Lash down anything on deck that can't be taken off. Unstepping sailboat masts is strongly recommended when possible. If not, remove sails—especially roller-furling headsails which create substantial windage, particularly when they come unfurled. All halyards should be run to the masthead and secured with a single line to the rails to minimize windage and flogging damage to the mast. The line can be used to retrieve the halyards later.

Do Not Wait to Take Action

The best advice is to prepare or even move your boat when a hurricane is a substantial possibility, even before a watch is issued. If you wait longer to relocate your boat, bridges may be locked down and the hurricane hole you choose may be inaccessible, or the marina staff may be too busy to haul your boat.

A hurricane **watch** is posted when hurricane conditions pose a threat to a specified coastal area, usually within 36 hours. Waiting for a watch to be issued may be too late to head for the marina or move your boat to a safe location. Even watching the barometer can't tell you when to prepare for a hurricane. The extreme low pressure associated with a hurricane occurs close to the eye of the storm—too late to predict a landfall.

A hurricane **warning** is posted when sustained winds of 74 mph or higher are expected within 24 hours. At this point it is certainly too late to focus on protecting your boat. Securing your home, gathering emergency provisions and evacuating family members will take precedence at this point.

"The time for taking all measures for a ship's safety is while still able to do so. Nothing is more dangerous than for a seaman to be grudging in taking precautions lest they turn out to have been unnecessary. Safety at sea for a thousand years has depended on exactly the opposite philosophy."

-Admiral. Chester W. Nimitz

Tropical Storm vs. Hurricane

a **Tropical Storm** is a tropical cyclone in which the sustained surface wind speed range is from 39 to 73 miles per hour

a **Hurricane** is a tropical cyclone in the northern hemisphere with sustained surface winds greater than 74 miles per hour

Develop a Plan for Where to Keep Your Boat in a Hurricane

Decide where your boat will best survive a storm and what protective steps you need to take before hurricane season. If your boat is in a marina, check your dock contract for language that requires you to take certain steps or depart the marina when a hurricane threatens. Also find out if your marina has a hurricane contingency plan. Whatever you decide to do, never stay aboard during a hurricane.



Securing a Boat Ashore

A Massachusetts Institute of Technology study found that boats stored ashore during a hurricane were far less likely to have been wrecked than boats left in the water. In fact, many marinas and yacht clubs pull as many boats out of the water as possible. Some boats—especially smaller, open boats and high-performing power boats with low free-board—must be hauled ashore to have any chance of surviving a storm.

Wherever you take your boat ashore, do all that you can to reduce windage. Remove all loose gear including: bimini tops, canvas covers, outriggers, antennas, anchors, running rigging, booms, life rings, dinghies, portable davits, electronics, etc. Anything on deck that can't be removed should be lashed securely. If you have a sailboat, you might consider digging a hole in the ground for your keel. If you have a smaller sailboat you were laid on their sides. High-rise storage racks are vulnerable in high storm winds. If possible, boats on the storage racks should be placed on trailers and taken home.



If possible, trailer your boat to safety. Inspect your trailer regularly to make sure that it will be fully functional and operable when you need it. When you trailer your boat, be sure to do so prior to evacuating your family. During an evacuation, officials want as few vehicles on the road as possible.

If you take your boat to your home, consider garaging it. Your boat is lighter and more vulnerable to high winds than your car. If this is not possible, put the boat and trailer where they will be best protected from the wind and falling branches. Let some air out of the trailer tires and block the wheels. Increase the weight of lighter outboard boats by leaving the drain plug in and filling it with water. Place wood blocks between the trailer's frame and springs to support the added weight. On stern drive boats, protect the engine by removing the drain plug. Secure the trailer to trees or with anchors and augers. Lash the boat to the trailer.

If you do not store your boat on a trailer, ensure your boat has enough support with at least three or four jackstands on each side for boats under 30' and five or six on each side for larger boats. The jack stands must be supported by plywood and chained together. Store your boat well above the expected storm surge level. Rising waters can tip a boat off its cradle or jackstands, but there likely will be less damage sustained than if the boat is left in the water.

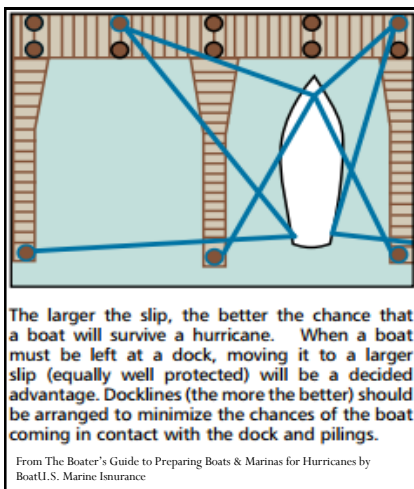
Securing a Boat in the Water

Any boat which rides out a hurricane in the water should be secured in a snug harbor. However, your hurricane plan for securing a boat in the water must take storm surge into account. A storm surge of 10 feet or more is common in a hurricane, so a seawall or sandy spit that normally protects a harbor may not offer any protection in a hurricane.

In addition, avoid crowded areas to reduce chances of other boats breaking loose and banging into yours. Also avoid rocks and rocky-bottomed areas in case your boat breaks loose or extreme gale winds blow the water out of a safe harbor or cove, stranding boats briefly. Your boat would be better off settling on anything but rocks.

At a Dock

If you decide to dock your boat you will have to decide between using a fixed dock or a floating dock. Because they rise with the surge, floating docks often offer better protection for boats. And floating docks also offer the advantage of not needing to run lines to distant pilings because the boats and docks rise in tandem. However, it is essential that you make the pilings are tall enough to accommodate the surge.



Hurricane preparedness plans that involve docking your boat will require a docking plan that is very different than your normal docking arrangement.

If you decide to shelter your boat in a fixed dock, once you complete your hurricane preparations, your boat should resemble a spider suspended in the center of a large web of dock lines. This web of dock lines will allow the boat to remain in position even as it rises on the surge or is bounced around by the wind and waves.

It is essential that you use long lines (to accommodate surge) with a larger diameter (to resist chafe and excessive stretching). A good rule of thumb is that the storm dock line should

be at least as long as the boat itself. With most docking arrangements, lines will have to be fairly taught so that it is kept away from pilings. Lines should also be a larger diameter to resist chafe and excessive stretching. Chafe protectors must be on any portion of the line that could be chafed by chocks, pulpits, pilings, etc.

In most cases, the bow should face open water or the least protected direction to reduce windage. Use surrounding trees, pilings and dock cleats to secure dock-lines. All things being equal, wood pilings are a better choice than concrete pilings. You will probably want to use other boat owners' pilings and vice versa, which will require planning and cooperation with slip neighbors and marina management.

Floating docks allow boats to rise with the surge if the pilings are tall enough (usually about 18 feet tall) to accommodate the surge. Shorter pilings present a greater chance that docks and boats will be lifted over by the surge and washed ashore. In addition, with floating docks there is no need to run lines to distant pilings because the boats and docks rise in tandem.

In a Hurricane Hole

Hurricane holes—waterways like canals and rivers—are another option for sheltering your boat in a storm.

If sheltering in a narrow residential canal, your boat should face the canal's entrance and be far back from open water and the waterway's entrance. It should be secured in the center of the canal with several sturdy lines ashore to both sides of the canal. Your boat should resemble a spider suspended in the center of a large web of dock lines. You must make arrangements with the homeowners whose trees and pilings you will use to secure your boat. You will also need to ensure that any other boats being sheltered in the canal are properly secured as a neglected boat could wreak havoc.

In wider canals and waterways, boats should be secured using a combination of anchors and lines tied to trees ashore. The more lines and anchors, the better. Moor your boat far from open water and the main channel and in a spot that has tall banks, sturdy trees, and few homes. Move your boat early as it may take longer to reach these hurricane holes as the winds and seas build. In addition, bridges may not open as frequently, or at all, once a hurricane warning has been issued.

At a Mooring and/or Anchor

Mooring in a sheltered location is another alternative. A moored boat can swing to face the wind, reducing windage, and is less likely to be slammed into a dock unless the anchor or mooring drags.

In order to safely moor you will need to determine if your mooring will hold. A study by the BoatU.S. Foundation, Cruising World magazine, and the Massachusetts Institute of Technology found that a helix mooring was strongest. However, the holding power of a mushroom or deadweight mooring anchor can be increased by extending the pennant's scope, which has as much to do with holding power of a mooring as the anchor itself. Additional scope, while always advantageous, appears to be less critical with helix anchors. As with with moorings, conventional storm achivrs rely on scope—at least 10:1 if possible—to increase holding power.

Boats that use a single working anchor are much more likely to wash ashore. The more and the larger the anchors increase a boat's chance of staying put.

If your storm preparedness plan is to moor or anchor your boat, before hurricane season, ensure that your mooring's chain has been inspected and is in good condition. It is also imperative to remember that chafe fear is essential on any line, but it is especially important on mooring and anchor lines.

On a Davit or Lift

Most experts agree that they would not want their boat to be on a hoist or lift during a storm. If a boat must be left on a lift, remove the drain plug so the weight of accumulated rainwater will not collapse the lift. Tie the boat securely to its lifting machinery to prevent the boat from swinging or drifting away.

If you must store your boat on a high-rise storage rack, ensure that it is a newer rack, that is built to a higher standard and is free from rust.