



HURRICANE WARNING



A Guide to Preparing Boats and Marinas for Hurricanes



Boat owners from Maine to Texas have reason to become edgy in the late summer and fall: Each year, on average, two hurricanes will come ashore somewhere along the Gulf or Atlantic coast, destroying homes, sinking boats, and turning people's lives topsy-turvy for weeks, or even months. This year, who knows? Florida is struck most often, but every coastal state is a potential target.

Experts predict that in the next 20 years there will be much more hurricane activity than has been seen in the past 20 years. Experts also fear that after a

number of storm-free years, people in some of the vulnerable areas will be less wary of a storm's potential fury. But to residents of North Carolina and Virginia, crippled by Isabel in 2003, and people in Florida, ravaged from hurricanes in 2004, the hurricane threat won't soon be forgotten.

Developing a Plan

If you own a boat, the first step in developing a preparation plan is to review your dock contract for language that may require you to take certain steps or to

leave the marina when a hurricane threatens. Ask the marina manager what hurricane plan the marina has in place.

Planning where your boat will best survive a storm, and what protective steps you need to take when a hurricane threatens, should begin *before* hurricane season. The BoatU.S. Marine Insurance claim files have shown that the probability of damage can be reduced considerably by choosing the most storm-worthy location possible and having your plan ready long before a hurricane warning is posted. 

Knowing What to Expect

Preparing a Boat for a Hurricane Means Defending Against Wind, Rain, Waves, and High Water—All in Proportions Rarely Experienced by Boaters. Claim Files from Past Storms Show That Damage Is Usually Due to a Combination of These Factors.

Surge

The damaging influence of high water, or storm surge, is often underestimated in preparing a boat for a storm. Storm surge raises the water level far above normal high tide, cutting off roads, forcing evacuation, and lifting boats above their docks and pilings. Surge accounts for major damage to boats because it puts docks and dockline arrangements underwater as the boat tries to float above.

Surge is the result of several factors. Due to low barometric pressure, the ocean surface is drawn upward forming a mound about one foot higher than the surrounding ocean. Large swells generated by the storm reach land first, while storm winds drive water toward the coast. As the storm makes landfall, water levels 10 to 20 feet above normal high tide are possible. Surge is responsible for extensive flooding and much of the loss of life that accompanies a hurricane. Dangerous high tides can reach outward 20 to 50 miles from the storm's center. Surge makes extra length and positioning of docklines critical.

Wind

A hurricane, of course, brings high winds. Wind speeds of 70 to 130 mph are common, and winds over 200 mph have been recorded. What may be less understood is the force created by such winds. When wind speed doubles, the wind pressure quadruples. Other factors influence wind force. To put it in practical terms, when the wind speed increases, the damage it causes increases at a much greater rate. This illustrates the importance of reducing the boat's windage, which is the amount of area your boat presents to the wind, by removing as much rigging, canvas, and deck gear as possible, and facing the bow toward the greatest exposure.



Hurricane Isabel

A storm surge during Hurricane Isabel combined with normal high tides to overcome this low-lying breakwater. The protected harbor then became an open bay and many of the boats in the harbor either sank or were badly damaged.

Waves

Waves in the ocean have tremendous energy and can reach mountainous heights. But even in relatively small harbors, sounds, and lakes, waves can build to surprising heights. In a hurricane, it is not unusual for steep, breaking waves three to six feet high to pound normally peaceful harbors. Sea walls, barrier beaches, and other structures that normally protect docks and moorings are submerged by the storm surge. This has the effect of greatly extending the “fetch,” or distance, over which the wind can generate waves.

Rainfall

Rainfall of six to 12 inches within 24 hours is normal during a hurricane, with extremes of 24 inches having been recorded. A hurricane that struck Puerto Rico in 1928 is estimated to have dumped over two-and-a-half billion tons of water on the island. Boats that are spared the worst high water and wind still can be sunk by the 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.

Tornadoes

Tornadoes are sometimes spawned by hurricanes. Of the 46 people who died during Hurricane Carla in 1961, 11 were killed by tornadoes. Little can be done to protect a boat from a tornado. The possibility of a twister, however, is a strong reason for you, your family, and your boat, if it is trailerable, to be far from the coast when a hurricane makes landfall. ⚠️

Recommended Reading:

Chapman: Piloting, Seamanship, & Small Boat Handling, by Elbert Maloney. 632 pages. Hearst Marine Books.

The Complete Book of Anchoring and Mooring, Second Edition, by Earl Hinz. 331 pages. Cornell Maritime Press.

Oceanography and Seamanship, by William Van Dorn. 463 pages. Dodd, Mead & Co.

Preparing a Boat for a Hurricane: A Success Story

by Jonathan E. Ross

On Thursday afternoon, the path of Hurricane Hugo was still uncertain but I wasn't going to take any chances. I found our old issue of the BoatU.S. damage avoidance newsletter, *Seaworthy*, with the article on hurricane preparation, and headed for the boat.

The first thing we did was take off the sails, including the roller furling headsail. I lashed the boom to the stern cleats, tightened the vang down so that the boom wouldn't move, and tied off the halyards. I also took the dodger and its frame completely off the boat.

Down below, I packed up anything valuable that could be damaged or stolen later: the loran, GPS, clothing, charts, etc. I also took home my owner's manuals, radio license, log books, and registration papers.

The big issue was where to leave the boat. Although the pilings at our floating dock were about 12' above low water, we didn't feel that was enough to protect us from a storm tide and surge. We talked to a lot of other boat owners and learned where most were going to seek a protected mooring. It sounded good, but *Seaworthy* had pointed out that many boats are damaged by other boats that drag moorings or break free, so we went another direction to anchor away from the other boats.

The announcement that a hurricane was coming sent us scrambling around trying to get the needed gear. I wanted to use three anchors, but waited too long and had to use two; the plow anchor I wanted was unavailable. The CQR and Danforth each had over 100' of line and 10' of chain. I would have liked more, but chain was in short supply, and so were fittings. Marine stores were out of big anchors and low on shackles and swivels. I had to piece something together using oversized shackles in a row to give the line some twist.

For chafe protection, I had to buy a garden hose because the marine stores were out of the ready-made chafe protectors. I just cut up the hose and used two layers wrapped in duct tape to secure it to the line. This held, although I would have preferred to drill holes so it could be lashed to the line, but I didn't have time. Once the anchors were set, I closed all of the through-hulls.

The one thing I didn't do that *Seaworthy* suggested was plug the exhaust port to prevent water from getting up the pipe and maybe ruining the engine. In retrospect, I should have looked for some cork or Styrofoam.

"I strongly recommend getting your plan ready and working out details well ahead of time."

After the Storm: Of the boats that stayed back at the marina, some were high and dry on the docks or nearby street. Some were off in the marshes still tied to the floating dock. Some were sunk at the marina—what was left of it. Our boat survived with some scratches, a twisted

bow pulpit, and some minor water damage below.

There are things I would have done differently if I had given myself enough time. First of all, anything that is not well above the cabin sole should be taken off the boat. Even though a lot of what I left on the boat wasn't valuable, it created a big mess. Papers and water created a mush that clogged the pumps.

I strongly recommend getting your plan ready and working out details well ahead of time. I waited and had to worry about where to leave the boat, how to get access by car, where to leave the dinghy, etc. Some people stayed on their boats because they didn't have a way to get to their houses—that could have been a deadly mistake.

Waiting until a hurricane watch is posted to begin implementing your plan is another mistake. As soon as the weather forecaster says there is some probability of a hurricane, you should get started. Maybe it won't be a false alarm. ⚠️

Axiom: Never Stay Aboard in a Hurricane!

One of the most dangerous mistakes a skipper can make is to stay aboard his or her boat during a hurricane. Several accounts given in claim files indicate that there is little, if anything, a skipper can do to save a boat when winds are blowing 100 mph, tides are surging, and visibility is only a few feet.

What can happen? Consider the case of a 68-year-old skipper in Charleston, who together with his grown nephew, took their trawler up the Wando River to ride out Hurricane Hugo in what they thought would be a sheltered hurricane hole. He reported that the boat seemed to be doing fairly well initially, but later that night the wind picked up to over 100 mph and 15' seas sent the boat crashing completely over.

The two men were trapped briefly in a pocket of air underwater when another wave rolled the boat back upright. They then scrambled onto the deck and were

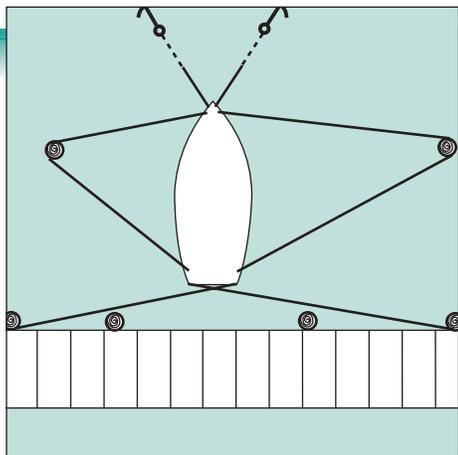
eventually rescued, but not before almost drowning and being overcome by exposure.

Another skipper who stayed aboard his motorsailer at a marina during Gloria had to jump overboard and swim through breaking waves, drifting boats, and debris after another boat broke free and rammed its mast (the boat was on its beam ends) through his boat's pilothouse window. Again, he was lucky to reach shore alive. Two Miami men who stayed aboard a Sportfisherman (not insured by BoatU.S.) during Andrew were not so lucky. They both drowned while trying to escape their battered and sinking boat.

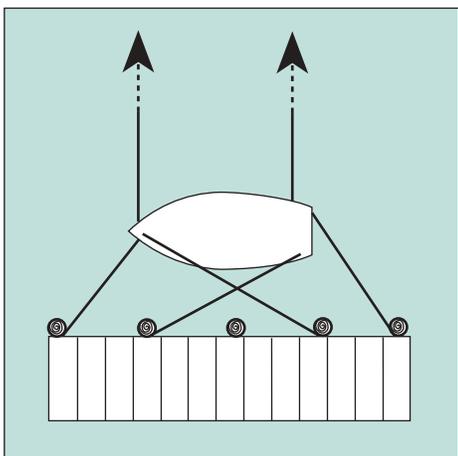
When a hurricane is approaching, you should certainly do everything you can to protect your boat: Secure extra lines, set out anchors, add chafe protection, strip the boat above and below decks, etc. Do whatever it takes, and then head inland. Your boat can be replaced; you can't. ⚠️

Where to Keep Your Boat in a Hurricane

Securing a Boat Ashore



A sample storm arrangement: note the spring lines, which were the longest lines, are now the shortest. Stern lines are extended one or two slips away. Additional bow lines lead across to the next dock or to storm anchors placed out from the slip.



On a face dock, position the boat farther (the farther, the better) than usual from the dock and add offshore lines to hold the boat away from the dock. Offshore lines can lead to distant pilings or trees, such as across a canal, or to anchors if the bottom provides adequate holding.

A study by MIT after Hurricane Gloria found that boats stored ashore were far more likely to have been saved than boats stored in the water. For many boat owners and marinas, hauling boats is the foundation of their hurricane plan. Some farsighted marinas and yacht clubs have evacuation plans to pull as many boats out of the water as possible whenever a storm is approaching and secure the rest.

There are some types of boats that must be pulled if they are to have any chance of surviving. Smaller, open boats and high-performance powerboats with low freeboard, for example, will almost always be overcome by waves, spray, and rain. Fortunately, most of these boats can be placed on trailers and transported inland.

Boats ashore should be stored well above the anticipated storm surge, but even when boats are tipped off jackstands and cradles by rising water, the damage they sustain in a storm tends to be less severe than the damage to boats left in the water.

Windage is also a consideration. If nothing else, reduce windage as much as possible and make sure your boat has extra jackstands, at least three or four on each side for boats under 30' and five or six for larger boats. The jackstands must be supported by plywood and chained together. To reduce windage, some ambitious boat owners on the Gulf Coast dug holes for their sailboat keels so that they presented less windage. Smaller sailboats were laid on their sides.

Recent storms have proven that high-rise storage racks are vulnerable in a storm's high winds. Several have been completely destroyed in recent hurricanes. If possible, boats on storage racks should be placed on trailers and taken home.

Securing a Boat in the Water

Any boat in the water should be secured in a snug harbor (don't even think about riding out the storm at sea unless you're the skipper of an aircraft carrier). The trick is deciding which harbors will still be snug and which will be vulnerable if a hurricane comes ashore. Storm surge—high water—is a major consideration. A storm surge of 10' 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.

Crowded, rock-strewn harbors are picturesque, but they may not be the best place to keep your boat in a storm. Rocks are hard on boats, should yours break loose, and when a harbor is crowded, the chance of another boat breaking loose and banging into your boat is that much greater.

Finally, what is the bottom of the harbor like? If you plan to anchor, check your charts to see how much water your boat will be anchored in. The best anchoring is usually in sand, followed by clay, hard mud, shells, broken shells, and soft mud. Also, water can sometimes

When to Take Action

“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

A hurricane “warning” advisory is posted when sustained winds of 74 mph or higher are expected within 24 hours or less—too late, in most situations, to head for the

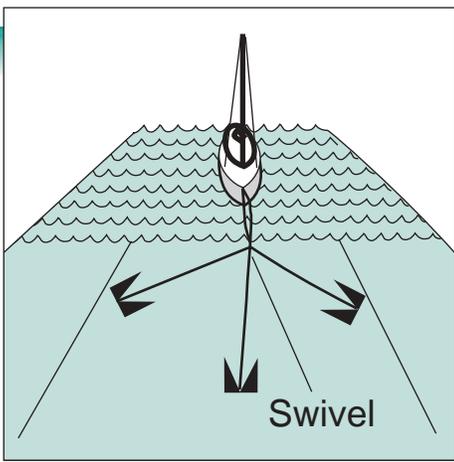
boat. Securing the house, gathering emergency provisions, and evacuating the family will need attention at this point.

A hurricane “watch” is posted when hurricane conditions pose a threat to a specified coastal area, usually within 36 hours. Some hurricane observers believe waiting for a watch to be posted also may be too late to head for the marina or to move the boat to a safer location.

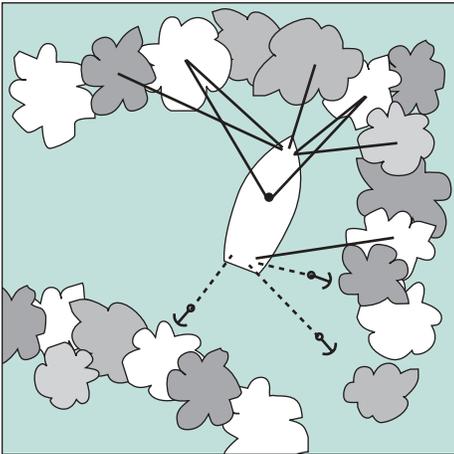
Even watching the barometer, which is helpful for some weather patterns, can't tell you when to prepare for a hurricane.

The extreme low pressure associated with a hurricane occurs close to the eye of the storm—too late to predict landfall.

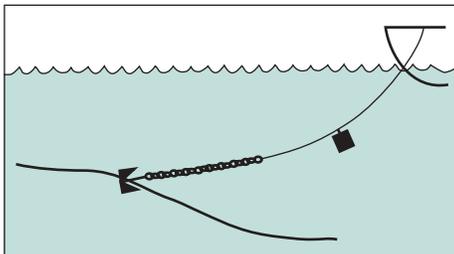
The best advice is to prepare or move your boat when a hurricane is a substantial possibility, even before a watch is issued. If you wait longer, and your plan includes relocating the boat, bridges may be locked down and the hurricane hole you choose may be inaccessible. Or, if you plan to have your boat weather the storm ashore, you may find the marina is too busy to haul your boat. ⚠



Using three anchors set 120° apart allows the boat to swing and face the wind. This is an especially good technique if the boat must be moored in a crowded harbor because the boat will not swing in as wide an arc as a boat that is riding on only two anchors.



One boat that survived Hurricane Andrew was secured in a mangrove channel with eight 5/8" lines to shore and three large anchors: a 60-lb. Danforth; a 37-lb. Fortress; and a 45-lb. Bruce. Each of the lines had 10' of slack to allow for the tidal surge.



Using a weight (sentinel) on the rode can lower the angle of pull and help reduce the jerking motion.

be blown out of the harbor, leaving boats stranded briefly. If this happens, your boat would be better off settling onto anything but rocks.

At a Dock

Members of the BoatU.S. Catastrophe Team estimated that as many as 50% of the boats damaged during Hurricane Fran could have been saved by using better docklines: lines that were longer, larger, arranged better, and/or protected against chafing. If you decide to leave your boat at a dock, you'll need to devise a docking plan that is liable to be far different than your normal docking arrangement. By the time preparations are completed, your boat should resemble a spider suspended in the center of a large web. This web will allow the boat to rise on the surge, be bounced around by the storm, and still remain in position.

Take a look at your boat slip and its relation to the rest of the harbor. For most boats, you'll want to arrange the bow toward open water or, lacking that, toward the *least* protected direction. This reduces windage. Next, look for trees, pilings, and dock cleats—anything sturdy—that could be used for securing docklines. With most docking arrangements, lines will have to be fairly taut if the boat is going to be kept away from pilings. The key to your docking arrangement is to use long lines, *the longer the better*, to accommodate the surge. (A good rule of thumb: Storm docklines should be *at least* as long as the boat itself.) You will probably want to use other boat owners' pilings (and vice versa), which calls for a great deal of planning and cooperation with slip neighbors and marina management.

Lines should also be a larger diameter to resist chafe and excessive stretching. On most boats, you should use 1/2" line for boats up to 25', 5/8" line for boats 25' to 34', and 3/4" to 1" lines for larger boats. Chafe protectors (see "Critical Points," on page 7) *must* be on any portion of the line that could be chafed by chocks, pulpits, pilings, etc.

Floating docks allow boats to rise with the surge if pilings are sufficiently tall—at least 18' above mean high water. With shorter pilings (and most floating docks have pilings that are too short), docks and boats will be lifted by the surge and carried away.

Hurricane Holes: Canals, Rivers, and Waterways

Whenever canals, rivers, or waterways are available, they serve as shelters—hurricane holes—and offer an attractive alternative to crowded harbors and marinas. Your mooring arrangement will depend on the nature of the hurricane hole.

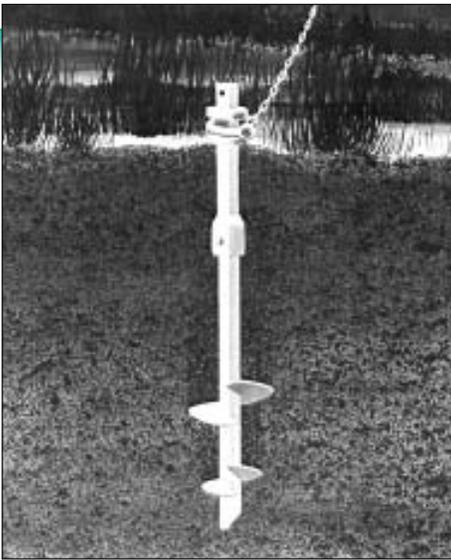
In a narrow residential canal, a boat should be secured in the center with several sturdy lines ashore (the "spider web") to both sides of the canal. This technique was common to most of the boats in canals that survived Hurricane Andrew. Conversely, boats that were left at docks without the benefit of lines to both sides of the canal didn't fare any better during Andrew than boats at marina docks. The boat should be facing the canal's entrance and be as far back from open water as possible. Besides sheltering the boat, being away from the entrance will help to maintain a navigable waterway.

Securing boats in canals near private homes is possible only if you make arrangements with the home owners whose trees and pilings you will be using to secure your boat. This can be difficult if your boat isn't normally moored in the canal. If your boat is already in the canal, getting other homeowners involved in planning for a hurricane increases the chances that your boat (and theirs) will survive. This is important. All it takes to wreak havoc in a narrow canal is one or two neglected boats coming loose.

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. Try to find a spot that is well away from open water and that has tall banks, sturdy trees, and few homes. Moor your boat away from the main channel. Other considerations: A hurricane hole that ordinarily takes an hour to reach may take two hours to reach when winds and seas are building; bridges may not open as frequently once a hurricane warning has been posted; or the bridges may be locked down to evacuate cars. (This was the case on the Miami River before Hurricane Andrew.) *Plan on moving your boat early.*

At a Mooring, at Anchor, or Both

Mooring in a sheltered location can also be a good alternative to exposed harbors and crowded marinas. A boat on a mooring can swing to face the wind, which reduces windage, and it can't be slammed into a dock unless the anchor or mooring drags.



Mooring tests have shown the helix anchor has tremendous holding power compared to traditional mushroom and deadweight anchors.



High-rise storage racks can be toppled by a storm's high winds. If possible, put your boat on a trailer and take it further inland.



A boat on davits is extremely vulnerable to storm surge. If possible, store the boat ashore.

The first question, then, is: Will your mooring hold? As a result of numerous moorings being dragged during recent hurricanes and northeasters, a search has been under way for a more secure mooring anchor. A BoatU.S. test using a large tug and several types of moorings found moorings that are the least likely to be dragged are the “embedment” type anchors—a helical and an expanding fluke anchor—which are deliberately screwed or driven into the harbor bottom. Traditional moorings—mushroom anchor and deadweight blocks—were far more likely to be dragged with relatively little effort. A mushroom anchor that isn’t sufficiently buried has very little holding power. And while the holding power of a mushroom or deadweight anchor can be increased by extending the pennant’s scope, you also have to consider the proximity of other boats. Embedment anchors do not rely on scope to increase holding power, but scope must be sufficient to allow for tidal surge.

If you have doubts about your mooring, the chances of it dragging can be reduced significantly by using one or two additional storm anchors to enhance its holding power and to decrease the room your boat will need to swing.

An arrangement that uses two anchors (or a mooring and an anchor) set 45° apart has been used successfully to moor boats in storms. Three anchors, if they are set correctly, are even better. Three anchors should be set 120° apart (see diagram, page 5) and joined at a swivel.

Whatever arrangement you decide on, it is important to have plenty of scope—at least 10:1 if possible—and a lot of heavy oversized chain. Probably 50/50 is the optimum chain-to-line ratio. A riding weight, or sentinel, placed at the chain/line juncture will lower the angle of pull on the anchor and reduce jerking and strain on the boat. To absorb shock, an all-chain rode must have a snubber (usually nylon line) that is about 10% of the rode’s length.

Chafe gear is essential on any line, but it is especially important on a mooring line. Recent storms have given dramatic evidence that a boat on a mooring is especially vulnerable to chafing through its pennants (see “Critical Points,” on page 7). Unlike a boat at a dock, which is usually sheltered and is secured with multiple lines, a boat on a mooring is more exposed and secured with only two pennants, which are under enormous loads and will chafe through quickly if they aren’t protected.

Trailer Boats

A trailer is, or should be, a ticket to take your boat inland to a more sheltered location away from the tidal surge. But your boat won’t get far on a neglected trailer that has two flat tires and rusted wheel bearings. Inspect your trailer regularly to make sure it will be operable when it’s needed.

If you take your boat home, you may want to leave it, and not your car, in the garage. A boat is lighter and more vulnerable to high winds than a car. If this isn’t practical, put the boat and trailer where they will get the best protection from wind, falling branches, etc.

Let some air out of the trailer tires and block the wheels. You can increase the weight of lighter outboard boats by leaving the drain plug in and using a garden hose to add water. (Rain will add a lot more water later.) This has the added advantage of giving you emergency water (non-drinking) if the main water supply gets knocked out by the hurricane. Place wood blocks between the trailer’s frame and springs to support the added weight. On a boat with a stern drive, remove the drain plug so that the engine won’t be damaged by flooding.

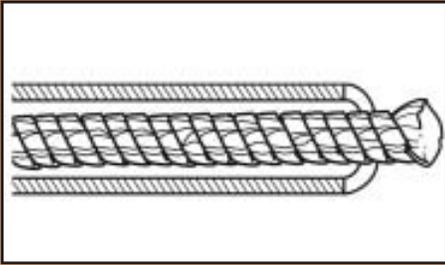
Secure the trailer to trees or with anchors or augers. Strip all loose gear, bimini tops, canvas covers, electronics, etc., and then lash the boat to the trailer.

Boats on Davits and Lifts

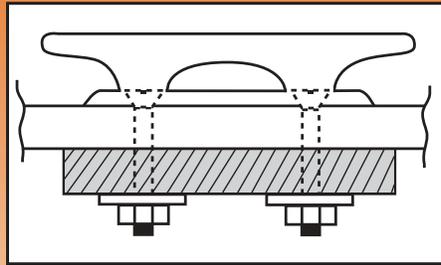
Boats on backyard davits or lifts are vulnerable to storm surge, which will probably reach higher than the boat can be raised. If possible, boats on lifts or davits should be stored ashore.

If the boat must be left on its lift, remove the drain plug so the weight of accumulated rainwater will not collapse the lift. (If the tidal surge reaches the boat, it will be flooded, but to leave the plug in place is likely to result in more serious structural damage.) Tie the boat securely to its lifting machinery to prevent the boat from swinging or drifting away. Plug the engine’s exhaust outlet and strip the boat. ⚠

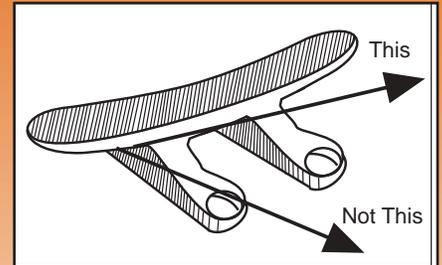
Critical Points



Super system for chafe: use neoprene garden hose at all potential chafe points. Drill holes and use cord to secure it to the line.



Using a 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 with at least five tucks.



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 Gear!

As a practical matter, chafe prevention at a dock and chafe prevention at an anchorage or mooring should be considered separately when preparing a boat for a storm. The same chafe protection that is used successfully at a dock likely won't be as effective on rope at a mooring. At a dock, rope is usually in a direct line between the boat and piling and chafe occurs wherever the rope could make contact with another piling, a dock or chock. The rope usually fails externally, starting from the outside and working in as it is abraded. If your chocks are large enough, fit a section of garden hose around the line. Drill holes and use cord to tie them securely to the line. There are also various varieties of readymade chafe protection at BoatU.S. or West Marine.

If you need chafe protection quickly, use duct tape (a lot) to secure several layers of heavy canvas or denim to the lines. This won't be as rugged as hose, but it is better than leaving a line unprotected.

When a boat is anchored, that same nylon rope will be constantly working back and forth over a chock at a steep angle down to the anchor. This working back and forth at an angle produces a tremendous amount of heat. At anchor or at a mooring, the rope typically fails internally. It melts. (The further the cleat is from the chock, the more the line stretches and the more heat that will be generated; much less heat builds up when cleats are installed directly at a boat's rail.)

Tests at MIT in Massachusetts after Hurricane Bob showed that under heavy cycling loads, wet nylon yarn is more abrasion-resistant than dry nylon. (Under light cycling loads, the reverse is true—dry nylon yarn outlasts wet nylon.) Heat builds up because of friction between the fibers and also because of internal molecular friction. Wet nylon is more likely to hold up in a hurricane when the storm's heavy rains provide additional lubricity. Aside from using chafe protection that wicks water, a simple way to provide durability to an anchor line in a storm is to use polyester line from the cleat through the chock (see diagram). Polyester line stretches far less and is more abrasion-resistant than nylon line under heavy cycling loads. When the polyester and nylon lines are wet, the difference in abrasion resistance is even greater. Instead of joining the nylon and polyester lines with a knot, which creates a weak spot in the rode, the two should be joined using eye splices in the polyester and nylon lines (see diagram).

Cleats and Chocks

Many boats have cleats and chocks that are woefully inadequate. This problem becomes critical when more and larger-diameter storm lines are used during a storm. If necessary, add more and larger cleats and chocks now; they'll make securing the boat easier all year.

Assess the ability of cleats to carry heavy loads. This means making sure all are backed properly with stainless steel or aluminum plates. Marine plywood is OK if it's healthy—free of rot and delamination. On sailboats, winches and even keel-stepped masts can also be used to secure lines at a dock. (NOTE: anchor lines should NOT be secured to the mast, as it

creates that much more stretch on the line at the chock, which further increases the chances of chafe failure.)

Don't put too many eggs in one basket by leading numerous lines to a single cleat, even if it is backed properly. Two lines per cleat is probably the maximum. Also, a cleat is not reliable when lines are led perpendicular to the base and the cleat can be wrenched out by the tremendous loads (see diagram, top right).

Reduce Windage!

Strip all loose gear that creates windage: canvas covers, bimini tops, outriggers, antennas, anchors, running rigging, booms, life rings, dinghies, portable davits, etc. Remove cowl ventilators and seal the openings. Anything on deck that can't be taken off should be lashed.

Unstepping masts on sailboats is strongly advised. If this is impractical, sails, particularly roller furling headsails, *must be removed*. Roller furling headsails create a lot of windage, especially when they come unfurled, which is almost guaranteed to happen no matter how carefully they're secured.

Preventing Water Damage

Remove cowl ventilators and seal the openings. Use duct tape to secure covers over instrument gauges. Duct tape should also be used around hatches, ports, lockers, etc., to prevent water damage below. Close all but the cockpit drain seacocks and bang a plug into the engine's exhaust ports. If the boat does take on water, it will sit lower, and water could back up into the cylinders. (Remember to remove the plug before starting the engine when the storm has passed.)

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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:

<i>Equipment</i>	<i>Current Location</i>
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:

<i>Equipment</i>	<i>Storage Location</i>
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: _____

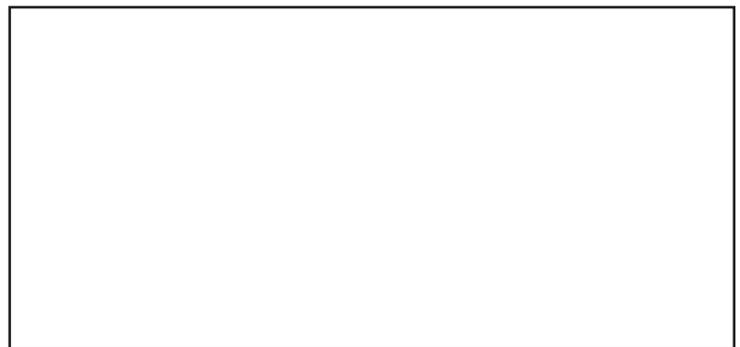
Type(s): _____

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 #: _____

“Cat Team” Helps BoatU.S. Insureds



Hurricane Ivan

The Experience Gained in Over Two Decades of Resolving Problems after Major Storms, Combined with Constant Planning, Distinguishes the BoatU.S. Catastrophe Team. Insured Members Get Back on the Water Sooner

As soon as a tropical depression forms miles at sea, a BoatU.S. underwriting supervisor begins plotting the storm's progress. Updates are received directly from the National Hurricane Center in Miami, Florida, and the National Weather Service in nearby Sterling, Virginia. As the storm nears the coast, the locations of BoatU.S.-insured boats are identified by computer so the owners can be contacted if the storm hits.

Whenever a hurricane strikes and damage is severe, the BoatU.S. Catastrophe Team goes into action. At Headquarters, staff members set in motion a special administrative support system. Underwriters and Policy Service staff start calling in to affected areas to identify marinas and moorings which have sustained damage. Calling insureds also allows them to discuss their own unique problems or emergencies.

The BoatU.S. Travel Department makes arrangements to bring the Cat Team together; the Accounting Department sets up local bank accounts; and other BoatU.S. resources contribute their specialties.

Claims personnel contact local resources, and adjusters shift workloads in preparation for handling the added storm losses in addition to normal peak season claims.

Field members of the Cat Team are *en route* to the scene before winds subside. A complete insurance claims processing office is set up. Other specialists—surveyors, adjusters, and estimators—who have trained with the Team arrive from various parts of the country. Within three days of Hurricane Bob's landfall, for example, a full-blown claims operation was established in Massachusetts.

Each storm presents new challenges. After Alicia, roads and marinas were inaccessible for many days. In Charleston, SC, after Hugo, the search for boats washed away by the storm required slogging through pudding-like mud. Boats were stranded in marshes far from roads; others were stacked into awkward piles, some with floating docks still attached. A shortage of facilities meant towing and salvage companies were brought in from as far away as Annapolis and Key West.

Hurricane Bob forced an estimated 6,000 boats onto New England beaches, and helicopters were brought in to remove boats from environmentally sensitive wetlands. After every hurricane, the BoatU.S. Team clears damaged boats from marinas and moves them to repair yards of the owner's choice, or to a safe staging area. To expedite repairs, some are transported out of the hurricane-stricken area.

In 2005 the BoatU.S. Cat Team dealt with the aftermath of four hurricanes in Florida. Restricted access to devastated marinas, damaged bridges and roads, a lack of hotel rooms, and environmental concerns plagued the team. In spite of the significant logistical difficulties, the team handled over 3,900 claims from the four storms and salvaged over 600 boats.

The Cat Team now includes a boat transport and crane specialist, an experienced storage yard manager, and its own radio communication system. When the next inevitable storm strikes, BoatU.S. policyholders will benefit from the Team's accumulated experience. ^A

Learning from Experience: A Guide for Preparing Marinas for Hurricanes

Philip Hale says he sometimes stands in his boatyard and imagines it under four or five feet of water. Philip looks at all of the yard's valuable equipment and he looks at the boats. What could be done to secure all of those boats?

It's a scene that isn't difficult for Hale to imagine. His marina, Martha's Vineyard Shipyard, has been pounded on at least two occasions, by Hurricane Bob in 1991 and then by the big "No-Name" storm that swept up the coast in early 1992. Other marina owners in areas like Charleston, South Carolina, and South Florida, who were hit hard by Hugo and Andrew, are plagued by the same sorts of questions. Hurricanes do that to people. What if it happens again?

Experience . . . the Teacher that Gives You the Test First and the Lesson Afterward

One mistake that any responsible marina owner would never make twice is to wait until a hurricane warning is posted to think about hurricane preparations. An extraordinary amount of work has to be done in a short time, perhaps only a few hours, and important decisions have to be made months in advance. Where will boats be stored? If boats are going to be stored ashore, which boats will be pulled first? What arrangements have been made with the owners?

Any hurricane plan ultimately involves people, and one of the first things Hale did after Bob was to put together a list of emergency employees, including many former employees and some local boat owners who are familiar with the boats and boatyard. This emergency staff is organized into teams, each having a specific assignment and leader, who can be called upon to join the regular staff whenever a large storm is approaching.

Most marinas don't have the personnel available to attend to all of the boats, and they depend on boat owners to strip their boats and add extra lines and chafe protection. James Frye, who runs a group of Westrec marinas in South Florida, says that in addition to evaluating their own procedures, one of the biggest parts of their new hurricane plan is getting the name of a local alternate for each boat owner who will take care of hurricane preparations if the owner



is out of town. There isn't enough time before a storm, Frye says, for marina personnel to take care of all of the boats and still have time left for their homes and families.

Time is critical. At Martha's Vineyard Shipyard, preparations start at the beginning of the boating season by requiring that all boats in the harbor use extra pennants and chafe gear. At other yards, like Burr Brothers in Marion, Massachusetts, a second, extra-heavy pennant is added to boats in the beginning of August, when the hurricane season gets started in earnest. Although boats would still have to be stripped, sails stowed, ports taped, etc., adding extra lines and chafe gear gives marinas and boat owners a valuable head start before a storm.

In the likely event that at least some owners won't be available to prepare their boats, many marinas will haul and/or prepare boats for a fee, but this should be arranged at the start of the season, not in the waning hours before a storm is due ashore. One marina in a particularly exposed Florida location has arranged to have several paid captains available to move boats to a more secure marina further inland. In this case, the agreement was written into the hurricane contract, but extra services usually require a separate agreement.

Hauling Boats

A study by MIT after Hurricane Gloria found that boats stored ashore were far less likely to have been wrecked than boats stored in the water, and for many marinas, hauling boats is the foundation of their hurricane plan. Toby Burr at Burr Brothers has a list of boat owners who have agreed to have their boats hauled by the marina

whenever a hurricane threatens. The decision to haul boats is left to the marina, and Burr says it puts an extra burden on them to decide at what point a storm might pose a threat. The responsibility is more than offset, however, by the additional time it gives them to evacuate boats.

While almost all of the boats hauled by Burr Brothers for Hurricane Gloria escaped with relatively little damage, boats that were stored ashore during Hurricane Bob were not so fortunate.

Unlike Gloria, which came ashore at low tide, Bob came ashore at high tide and many of the boats stored in the yard got knocked off their cradles by the surge. To prevent a recurrence of the damage done by the rising water, Burr Brothers has arranged to receive NOAA charts that predict when and where the surge is likely to be highest. If the surge predicted poses a threat to boats stored ashore, Burr Brothers has a contingency plan to unstep masts so that boats can be moved further inland to higher ground.

Ashley Marina in South Carolina doesn't have the facilities to haul boats, and even if it did, Ed Rhodes at Ashley says the grounds are too close to sea level to offer even minimal protection from tidal surge. Rhodes recommends boat owners take boats to nearby Ross Marina, which has a travel lift and a storage area that is a much safer 15' above sea level. David Browder at Ross acknowledges that many of his regular customers have already made arrangements to have their boats hauled and stored at his yard whenever a storm threatens.

A Model Plan: The Houston Yacht Club

Probably the best known and most comprehensive hurricane plan for a facility was devised by the Houston Yacht Club after Hurricane Alicia wrecked the club's docks and 141 of its members' boats in 1983. The plan, now used as a model for many other marinas and yacht clubs, is anchored by the individual efforts of all its members, each of whom is required to submit a hurricane plan with their harbor rental agreement. Each plan must include details on where the boat will be kept, what equipment is available, and the name of a "boat buddy"

Continued on page 11

After the Storm

Some Guidelines to Help Get You Back on the Water Sooner

After a storm has passed and authorities are allowing travel, get to your boat quickly. It is a boat owner's responsibility to protect the boat from further damage, and its equipment from theft, regardless of its condition. If there is severe damage at the marina, you will be needed to help arrange moving the boat. An important task is calling your insurance company. They need to know the exact location and condition of the boat, and will assist you in what steps to take. The BoatU.S. Emergency Dispatch phones are manned 24 hours a day, and will be heavily staffed after a storm to assist BoatU.S. insureds.

Don't take chances. A marina can be a hostile environment after a storm. Leave children and sightseers at home. Be cautious of exposed electrical lines, leaking fuel, sewage backups, missing dock boards, and other dangers. And don't mind if you are challenged to show proof of ownership or asked to keep out of damaged areas. Marina management and authorities should restrict access to damaged and undamaged boats.

Some things to take to the boat include duct tape to secure broken rigging or railings and seal cracks or holes; pencil and paper to inventory damage; and lots of cleaning gear and anti-corrosion spray. Removing salt, mud, and moisture should begin as soon as it can be done safely. Take trash bags to remove leaking cans and debris that could

clog bilges and pumps. Don't forget bug spray, boots, and gloves.

If the boat appears undamaged or has only minor scrapes, inspect for chafed lines and broken ports or hatches where rain can enter. Monitor water level in the bilge in the event there is underwater damage. Make sure the galley and main engine fuel systems are undamaged and the bilge pump is working. Report damage to the insurance company.

If the boat is sunk, beached, or otherwise in need of salvage, contact your insurance representative on how to proceed. While you have the right to salvage your boat, contracting with salvors can be tricky business and is best left to insurance professionals. Inexperienced, poorly equipped, or overpriced crews can cause delays and additional damage that may keep you ashore longer than necessary. If the marina wants to act as a contractor, it should have your permission and the agreement of your insurance company before moving or salvaging your boat.

Boat owners insured with BoatU.S. should call the 24-hour Emergency Dispatch Center, 1-800-937-1937, before contracting for salvage or removal work. If communications are impaired, look for BoatU.S. Catastrophe Team field people who will be in the area immediately after

to one of the 14 dock captains, who coordinate the preparation efforts at each of the club's docks. There are other captains and teams to haul and secure boats in the club's one-design fleets and strip them of masts and sails. Each captain has a backup.

In addition to the dock and fleet captains, there are also crew chiefs who are responsible for the crane operations, harbor operations, and securing the clubhouse and grounds. The crew chief for the grounds, for example, is responsible for seeing that volunteers board windows, store outdoor furniture, shut off electricity, store emergency water, and provide sources of electricity.

The captains and chiefs report to the



Hurricane Hugo

a major hurricane.

Whoever raises a sunken boat should begin cleaning the boat and "pickling" and preserving the engine and machinery immediately. Flush everything with fresh water, remove cushions and clothing to dry, and dry out the interior. Your yacht policy should cover the reasonable cost of any steps you take to reduce further damage.

Your policy should also reimburse any costs incurred for security you may hire if the boat is exposed. After past storms, boats thrown onto beaches or parking lots fell victim to looters. In one sad case, a classic yawl cast onto a New England beach by a storm was dismembered by souvenir hunters with chain saws. After Hugo, boats stranded in marshes were stripped clean before salvors could reach them. After Andrew, someone painted a claim on a large yacht, mistakenly thinking that an "abandoned" boat was up for grabs. Police will be occupied with higher priorities and it is up to you to protect your damaged boat and its equipment. 

HOUSTON YACHT CLUB, from page 10

who will take care of the boat if the member is sick or out of town. The plan must be approved by the club's Hurricane Committee.

Individual plans must conform to the overall guidelines set by the club. For example, boats in the outer harbor have to be evacuated, and arrangements must be made to move them to hurricane holes and alternative dock sites further inland. During hurricane season, owners of boats in the outer harbor are required to keep fuel tanks topped off and extra mooring gear aboard.

In the event of a storm, boat owners report

hurricane operations group at the clubhouse, and the entire effort is coordinated by the club's Commodore and Vice Commodore. Preparations are implemented in carefully planned phases, beginning 72 hours before the hurricane's ETA.

Perhaps the most notable accomplishment of the Houston Yacht Club is that their plan wasn't written and then left on a shelf to gather dust. Although it has been over a decade since the club was devastated by Alicia, the plan continues to be examined and revised. Members must still submit individual plans whenever they bring a boat into the facility. And every year at the start of hurricane season, the entire membership gathers together to rehearse the plan. 

HURRICANE TRACKING CHART

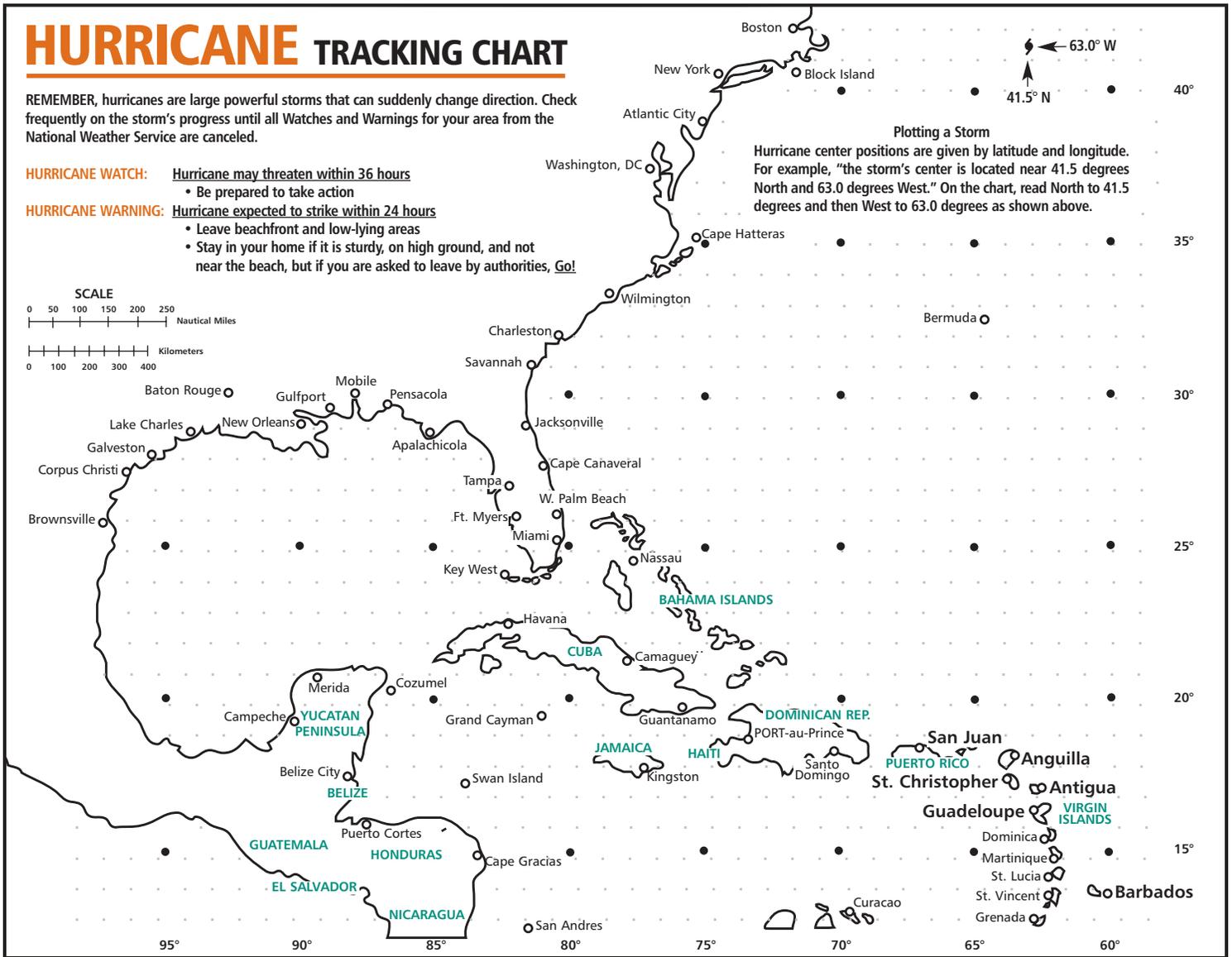
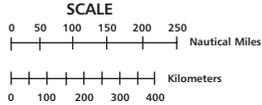
REMEMBER, hurricanes are large powerful storms that can suddenly change direction. Check frequently on the storm's progress until all Watches and Warnings for your area from the National Weather Service are canceled.

HURRICANE WATCH: Hurricane may threaten within 36 hours

- Be prepared to take action

HURRICANE WARNING: Hurricane expected to strike within 24 hours

- Leave beachfront and low-lying areas
- Stay in your home if it is sturdy, on high ground, and not near the beach, but if you are asked to leave by authorities, Go!



Seaworthy:

A Different Type of Publication

The hurricane information in this guide first appeared in *Seaworthy*, the publication that offers a practical, hands-on approach to safer boating. *Seaworthy* is sent free of charge to boat owners insured through BoatU.S. as part of a comprehensive Damage Avoidance Program. Its pages are filled with real case studies of marine insurance claims that provide "how-to" tips on avoiding accidents, breakdowns, and injuries.

Now, *Seaworthy* is also available by subscription to boaters not insured through BoatU.S. Call **1-800-274-4877** x3276 to start receiving this unique quarterly publication, just \$10 per year.

BoatU.S. Marine Insurance



For the low price of a policy, you can become part of the unique BoatU.S. Marine Insurance program. Yacht Policy benefits include many "boaters-only" features such as Investigative Services for Manufacturer's Defects, a 24-Hour Dispatch Service for boating emergencies such as fuel spill or salvage, Lifetime Repair Guarantee, Special Liability Coverage for fuel spill and containment, and Full Salvage Assistance, including salvage coverage up to the insured value of the boat. For a free quote or to get more information about BoatU.S. Marine Insurance, call 1-800-283-2883.

Membership in BoatU.S. includes time- and money-saving benefits such as Towing and Towing Dispatch Services, a 704-page Annual Equipment Catalog of discounted marine equipment, Group-Rate Marine Insurance, Congressional Lobbying efforts on all important boating issues, a Legal Defense Fund to defend the rights of recreational boaters, a Consumer Protection Bureau, and much, much more. To receive an information package on the many benefits of becoming a BoatU.S. Member, call 1-800-395-2628.