

# CHAPTER 4

## IN THIS CHAPTER

- ⇒ Learn basic knots
- ⇒ Prepare yourself for potential safety issues including:
  - avoiding propeller injuries
  - carbon monoxide poisoning;
  - capsizing and man overboard situations;
  - cold water immersion;
  - hypothermia;
  - running aground, checking local hazards;
  - leeway; and
  - dams, locks and bridges.
- ⇒ Learn to anticipate weather and tidal changes.

## BE PREPARED

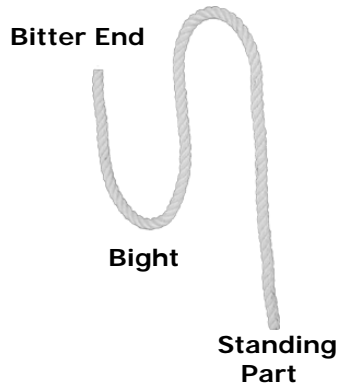
### *Lines and Knots*

#### **What is a Line?**

In boat terminology, rope is called line. Line is used for four principle purposes: pulling, holding, lifting or lowering. As a general rule, when a line is under stress, always keep an eye on it and NEVER stand where you can be injured in the event of an accident. Learning how to handle lines and tie knots can make a boating expedition more enjoyable, as well as safer. In making knots, you must know the parts of a line and certain basic turn patterns.

### Knots

Knowing how to tie knots that both hold securely and can be undone quickly and easily is very important. You must be able to depend on the knots that you tie. Some knots are more suitable for particular purposes than others. This section gives a selection of the most common knots and their uses. Sailors have developed many types of knots over the centuries. This rope work, called Marlin Spike Seamanship, is a respected skill. However, the knots shown in this section can be used for most general purposes.



It is important when learning to tie knots that you understand the terminology used. The bend you make in the rope is known as the “bight”, the part the bend is made over is known as the “standing part” and the end of the rope is the “bitter end”.

### Half Hitch

A half hitch is used to secure a line to objects such as a ring, piling or other structures. This knot is generally used to make a temporary fastening. One distinct advantage of this knot is that it can be quickly untied. The half hitch is the smallest and simplest hitch knot. Since a single half hitch may easily slip, it should not be used in situations where it will encounter great stress.



### Two Half Hitches

To reinforce or strengthen the single half hitch, two half hitches may be used. This is a reliable knot to make the ends of a line fasten around its own “standing part”. A boat can be moored to a piling or a rail using two half



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hitches. When securing to a rail, it is important to tie the line near the rail's supporting blocks. This will prevent the line from slipping along the rail. Two half hitches in the same direction are referred to as "two half hitches".

### Cleating A Line



Failing to cleat a line properly may cause it to slip or jam. The line should always be led (started) from the back of the cleat first, which will prevent it from jamming. You should take one full turn around the base of the cleat before making the figure eight turns.

### Figure Eight



This knot is commonly placed at the end of a line to keep it from running through a block, cleat or other opening. One advantage of the figure eight is that it is easy to untie, even when wet.

### Square Knot



A square knot is simple to make and is used for many applications for light duty work. This knot is made with a half hitch in one direction followed by another in the opposite direction. Typically, this knot is used to join the ends of two lines.



### Bowline (b o-l — n)

A bowline is one of the most versatile knots. It can be used for a wide variety of purposes. The bowline will not slip or jam easily. It is the best knot to use for securing a heavy line to the end of a towline.

## Safety Issues

### Avoiding Propeller Injuries

While the propeller may be one of the smaller parts on a boat, it has the potential to cause significant injuries or even death to

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swimmers, divers or water skiers. Propellers can also cause significant injuries in a very short amount of time. In order help prevent these injuries boaters should equip their boats with the necessary safety equipment and also follow safety boating practices.

Equip your boat with safety technology that will prevent propeller injuries. Some types include:

- Man overboard cut-off switch
- Lanyard engine kill (stop) switch
- Video monitoring
- Propeller guards (types vary based on vessel and boating location)
- Safety interlocks on boarding ladders

Follow safe boating practices including:

- Do not start your engine until you check the area around the back of the boat to make sure no one is swimming in the vicinity of the boat's propeller.
- Only allow boarding on the vessel when the engine is shut off.
- Educate your passengers on the dangers of propeller injuries.
- Operate your boat far away from boats towing water skiers.
- Do not allow your passengers to sit in areas of the boat where they may be prone to falling overboard and struck by the propeller. This includes the bow, gunnels or transom.



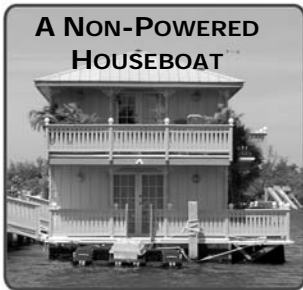
**THINK BEFORE YOU JUMP!**  
MAKE SURE THE ENGINE IS TURNED OFF AND THE PROPELLER HAS STOPPED TURNING BEFORE JUMPING OFF A BOAT.

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- Keep a close eye on children onboard your boat. They are particularly susceptible to propeller injuries.
- If you are diving, snorkeling, water skiing or swimming from a boat, use the appropriate flags and signals to alert other boaters that people are in the water.
- When retrieving a person from the water, be sure to turn the bow of the boat towards the person in the water, slowly approach the person and shift the engine out of gear and turn off the engine at least a boat length from the person in the water.

### Carbon Monoxide Poisoning

Carbon monoxide can be a “silent killer” on powered houseboats and other recreational vessels. Each year, boaters are injured or killed by carbon monoxide. Sadly, most of these accidental poisonings could have been prevented.



Photograph provided by  
Lyn Jewett

Carbon monoxide is a by-product of internal combustion engines. It is odorless, tasteless and very toxic, even in small amounts. Symptoms of carbon monoxide poisoning include eye irritation, weakness, dizziness, ringing in the ears, headache, nausea, loss of motion and unconsciousness. If anyone displays these symptoms, they should be moved into fresh air immediately. If the

symptoms persist, you should seek medical assistance.

Carbon monoxide can collect within a boat in a variety of ways. Engine or generator exhaust leaks (the leading cause of death by carbon monoxide) can allow carbon monoxide to flow through the boat and into enclosed areas. To reduce the risk of carbon monoxide poisoning, make sure that your boat’s generator is properly ventilated, keeping both the engine and generator exhausts clear. The best precaution against carbon monoxide poisoning is to keep air flowing through the vessel.

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You should also shut off your engine or generator when you are moored, anchored or not moving. Keep in mind that even properly vented exhaust can re-enter a boat, if it is moored too close to a dock or another boat, or if the exhaust is pushed back by prevailing winds. Under certain conditions, exhaust can re-enter boats, especially with canvas in place. Exhaust gases can also collect in enclosed spaces near the stern swim platform. You can prevent carbon monoxide poisoning by keeping your engine and generator well maintained as well as making sure your carbon monoxide detectors in the cabin are working properly.

Carbon monoxide poisoning can also occur outside your vessel. When in the water, avoid all areas near the engine exhaust. Inhaling engine exhaust and associated carbon monoxide may cause loss of consciousness and result in drowning. To avoid carbon monoxide poisoning, observe the following safety tips:

- Do not swim, sit near the swim platform or hold onto the swim platform when the engine is running (“Teak Surfing”) or the vessel is underway.
- Do not moor next to another vessel whose engine is running.
- Be sure to recognize the signs and symptoms of carbon monoxide poisoning, not confusing them with seasickness or intoxication.

### Man Overboard Guidelines

The majority of boating fatalities involving small boats are a result of persons falling overboard and drowning. To prevent falling overboard, both the boat operator and his or her passengers must take the appropriate precautions.



Photograph provided by YMCA of South Palm Beach County, FL

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Keep in mind that in a small boat, the weight of the passengers is often greater than the weight of the boat, causing a direct effect on the stability of the vessel. You should avoid sitting on the sides of a boat or any other part of the boat not designed for seating. Do not stand up when the vessel is moving. When you are stopped or moored in a small boat, only stand in the center of the boat and avoid leaning over.

Remember that even the best swimmers can become disoriented in the water after falling overboard. Immediate action is of primary importance when a “man overboard” situation takes place. Every second counts, particularly in heavy weather conditions. To save lives, every boat passenger should be aware of “man overboard” procedures.

### **Step One**

The first person that recognizes that someone has fallen overboard should call out “MAN OVERBOARD!” and identify the side the person has fallen over, either the Starboard side or Port side. This person needs to maintain sight of the “man overboard” and continuously point to the person in the water. It is important for the people in the boat to refrain from rushing to the side of the boat the person fell over as this could cause small boats to capsize.

### **Step Two**

Several events happen at the same time.

1. If the boat is equipped with LORAN or GPS equipment, the memory button should be set to mark the position where the incident occurred. Otherwise, turn the boat back in the direction the victim fell overboard. This will keep the stern of the boat away from the person in the water. Try to approach the person from downwind or by heading into the waves.

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2. Another passenger throws a flotation device, life saving device or floating cushion over the same side of the boat the person fell over. The floating device should be aimed upwind of the victim in the water so that it has a greater chance of blowing toward him. Use your knot skills and tie a bowline to the object being thrown to assist in pulling the person to the boat.
3. The passenger pointing to the “man overboard” goes to the bow, if weather permits, he continues to monitor the victim, and points to the location of the person at all times.
4. The captain makes preparations for the pickup.
5. The captain makes the recovery approach, briefing the other passengers on the boat as to how the recovery will be made and the side of the boat it will be made on. As you come alongside the person, the captain should turn off the engine or motor to minimize the risk of injury due to a propeller strike.

### Step Three

Unless you are trained in saving a victim in the water, go for help. Victims in the water can be dangerous if you do not know how to properly handle the situation. Keep in mind the American Red



Cross rescue sequence: **Reach, Throw, Row, Go**. First you try to **reach** the victim by using a pole, oar, shirt or similar device that can assist you in extending your reach to the victim. If there is nothing available that you can use to assist you in reaching the victim and the victim is close to the boat, lay flat on your stomach on the boat and offer your hand to pull the person to the boat. Be careful not to lean over the side of the boat and be pulled into the water yourself. If you cannot reach the victim using one of these methods, find a flotation device or other buoyant object, tie a line to it securing the end of the line to the vessel and **throw** the buoyant object to the victim in the water.

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Allow the victim to grab onto the buoyant object and haul him or her onboard at the stern of the vessel. If the victim is too far away for you to throw something to him or her and a non-powered boat is available, **row** to the victim and allow them to grab on to the stern of the boat. Do not try to haul the victim onboard since you can easily capsize your boat. Instead, row to shore with the victim hanging on to the boat. If the victim is unable to hang on to the boat, hold on to him or her until another person arrives to help. Only as a final option when all the other possibilities have been exhausted, should someone who is trained in lifesaving **go** into the water to retrieve the victim. Anyone who is not a trained rescue swimmer should go for help instead. If a rescuer does choose to swim to a victim, he or she should put on a PFD and carry a second buoyant object to give to the victim. If the victim is unconscious or injured, only a trained rescue swimmer should retrieve the victim. The rescuer should secure a line to a PFD and swim toward the victim, while another passenger holds the line attached to the rescuer's PFD. Once the rescuer reaches the victim, the passenger will then pull the line in with both the rescue swimmer and the victim.

### Capsizing

Capsizing and falling overboard are the number one cause of boating accident fatalities. Here are some ways that you can minimize the potential for capsizing in small vessels:

- When loading your boat, make sure your load is balanced. Remember: do not overload your boat. Refer to Chapter 3 for more information about loading your vessel.
- Stay low and centered in the vessel, maintaining at least three points of contact and avoid standing or making sudden moves that could upset the vessel.
- Avoid rough water when operating your boat.

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If your boat capsizes, you should put on a Personal Flotation Device (PFD) or grab another flotation device. You should signal for assistance using visual distress signals, sound producing devices or a mirror. It is important that you do not try to swim ashore, but stay with the boat and the other passengers until help arrives. This is because most boats are equipped with flotation and are much easier for rescuers to spot in the water than a person or group of people. Only leave the boat as a last resort. You must focus on conserving your energy and body heat in order to prevent exhaustion and hypothermia. If possible, climb on top of the overturned boat. Reboarding the capsized vessel is especially important in cold water when keeping your body out of the water is essential. If you are unable to grab a flotation device or climb on top of the boat, grab another item that will help you float such as a cooler, oar or several empty soda bottles. You should also take a head count to make sure that everyone is present and accounted for. If there is a person in distress, follow the Red Cross Rescue Sequence: **Reach, Throw, Row, Go** discussed in the previous section.

### **Capsizing in a River**

If you capsize in a river and are separated from your boat in a swift current, you should float on your back with your feet downstream. Do not try to stand up as your feet can be easily caught in rocks or trees on the river bottom as your body is forced downstream, possibly causing serious injury. Wait until you reach an area of the river where the current slackens and then try to either recover your boat or swim to shore if it is close enough for you to easily reach.

### **Cold Water Immersion**

It is important to know that most man overboard victims that fall overboard in cold water do not die of hypothermia but of cold water immersion. Upon sudden immersion in cold water, the body's physiological shock response often results in death within the first five minutes, oftentimes long before the body feels the effects of hypothermia. Cold water immersion follows four stages including cold shock, swimming failure, hypothermia and post-rescue collapse.

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### **Stage 1: Cold Shock**

At the shock of hitting cold water, a body's natural reflex is to gasp. If a person's head is under water, his or her lungs can fill with up to two to three quarts of water. This is why it is important to have your PFD on prior to entering the water. If your lungs fill with this much water, you will not re-surface unless you are wearing a PFD. Following the initial gasp reflex, common responses include hyperventilation and rapid heart rate. Cold shock can also cause a heart attack. Generally, the cold shock stage lasts three to five minutes.

### **Stage 2: Swimming Failure**

After the initial shock of hitting the water, victims will experience swimming failure after three to thirty minutes in the water. Swimming failure is a result of the rapid loss of manual dexterity and muscle control. This coordination loss causes the victim to assume a body angle that is incompatible with swimming and uses a greater amount of energy. Failure occurs when the victim is unable to make forward progress or keep his or her head above the water.

### **Stage 3: Hypothermia**

While dependent on the water temperature, exposure, victim's clothing and other factors, hypothermia generally affects the victim after thirty minutes in the water. Hypothermia is discussed in greater detail in the next section.

### **Stage 4: Post-rescue Collapse**

Even after rescue, a cold water immersion victim may still be in danger. As blood vessels in the victims' extremities re-warm, blood pressure can fall dangerously low. If the blood vessels fail to remain constricted, inhaled water can damage lung tissue. Heart problems can also develop as colder blood from the victim's extremities is released into the body's core. It is important to seek medical treatment for a cold water immersion victim as soon as possible.

### Cold Water Survival

If an emergency occurs and you or one of your passengers falls overboard, there are some important points to remember while you are waiting to be rescued.

1. Know that wearing your PFD is imperative to surviving in cold water. A PFD will assist you in staying afloat, conserving energy and remaining visible to rescuers.
2. Do not panic. Try to control your breathing, taking slow breaths.
3. You must also attempt to keep your head and neck out of the water as you float. This is very important because about 50% of body heat loss is from the head. Do not attempt to remove any heavy clothing because air trapped in clothing can provide additional flotation.
4. Try to keep your movements to a minimum. Excess activity can cause you to lose your body heat quickly.
5. Maintain a heat conserving position by floating with your legs together, elbows close to your sides and arms folded across the front of your PFD. This position minimizes your body surface exposure to the cold water. If more than one person has fallen overboard, huddle together for warmth, facing each other with your arms around each other's shoulders.
6. If you cannot get into a boat, do not try to swim ashore. This will only decrease your chances of survival because swimming will cause blood to be pumped to extremities where it will cool more quickly.
7. Once you are in the boat, wrap yourself with clothing, life jackets and anything that you can find to cover your body, including your head, to help reduce body heat loss.

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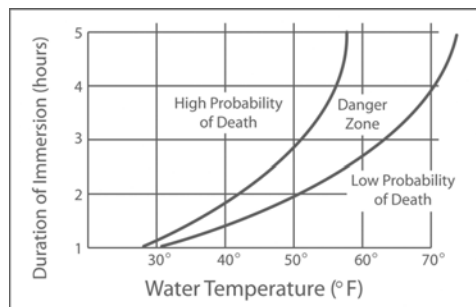
The U.S. Coast Guard has numerous documented cases where victims have been rescued with no apparent harmful effects after long immersions. If a person that has fallen overboard has been in the water for a considerable length of time and shows no signs of life, remember that it may be possible to revive him or her. If possible, start CPR immediately and get the victim to a hospital as quickly as possible.

### Hypothermia

Hypothermia is a physical condition where the body loses heat faster than it can produce it thereby reducing the core body temperature. It is caused by exposure to wind, “cold” or wetness. The danger of hypothermia is greatest for a person immersed in cold water. Unlike cold-water immersion that can cause rapid death, hypothermia normally affects a victim after being immersed in water for a longer period of time.

A common misconception regarding hypothermia is that a person is only at risk during very cold weather or if immersed in extremely cold water. In fact, hypothermia can affect anyone in conditions that are cooler than the body’s core temperature. To prevent hypothermia, dress appropriately for the current weather conditions. If the weather is cold or windy, dressing in layers will help trap heat and keep you warm, even if you are suddenly immersed in water. Be sure that you are wearing clothing that protects areas of rapid heat loss such as the head, neck and groin. If you are going to be in the water during a boating activity, wear either a wet suit or a dry suit as necessary. Most importantly, wear your PFD and prepare yourself to be immersed in cold water.

The graph describes the average risk associated with immersion in water. The Danger Zone indicates where safety precautions and appropriate behavior can increase your chance of survival when immersed in cold water.



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Follow the safety tips described in the previous section on Cold Water Immersion to increase your chance of survival during a “Falls Overboard” emergency. Symptoms of hypothermia include the following:

- Violent shivering
- Blue-gray lips, nail beds or skin color
- Muscle spasms
- Loss of feeling in or use of arms and legs
- Confusion or drunken behavior
- Dizziness
- Slurred speech
- Blurred vision

If left untreated, hypothermia can result in unconsciousness, a coma or death. A hypothermia victim should get medical treatment immediately; however, there are certain steps that you can take to help the victim. Get the person out of the wind, rain or water. Be gentle with the victim, restricting his or her movements. Do not allow him or her to walk unless absolutely necessary. Take precautions to warm the victim up slowly. Rapidly applying heat to a hypothermia victim can send the person into shock. Replace the victim’s wet clothes with dry clothes. If he or she is conscious and alert, you can allow him or her to drink warm liquids that do not contain alcohol or caffeine. Cover the person in a blanket or any other material such as trash bags that will help his or her heat retention. If the victim is semi-conscious, keep the person awake. When you return to shore, seek medical attention as soon as possible.

### **Running Aground**

Be familiar with your boat and shallow water locations to avoid running aground. By using a nautical chart, you can identify potential hazards such as sandbars or rocks that will be clearly marked on the chart. If you are operating in a body of water that is influenced by tides or currents, be sure to compensate for changes

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in water depth since some areas that are navigable in high tide are much too shallow at low tide to be safe. Should you run aground put on PFDs and check for damage to your vessel. If you are in a small boat, you may be able to step into the water and push yourself off. Check to make sure that your vessel is not taking on water, then shift your weight away from the point where the boat is grounded and push off using an oar or paddle. If you are operating a boat with an inboard/outboard engine, you should shift your weight away from the point of impact, stop the engine and lift the outdrive or propulsion unit. A larger boat may have to wait for high tide or be towed to deeper water. Waves and tidal action in some inlets can cause great damage to your boat and perhaps pose a safety hazard. If unable to free the boat, you should signal for help either visually or by using a VHF radio.

### **Checking Local Hazards**

Nautical charts are very valuable when familiarizing yourself with a body of water. If the body of water has no available charts, use of “local knowledge” (local boaters, law enforcement officials and marina owners) can be invaluable to navigation, especially when confronting unmarked hazards like rapids, shoals or submerged cables as well as hazards that can potentially change from what is marked on the nautical chart, such as sandbars. Tidal tables can help navigation in an area with a tidal current and the National Oceanic and Atmospheric Administration (NOAA) weather channel broadcast on VHF radio can provide information about sudden changes in weather, including storms, heavy winds and hurricanes. When navigating unfamiliar waters, it is important to use as many “tools” as possible to ensure the safety of yourself, your passengers and your vessel.

### **Leeway**

Be aware of the way your boat responds to wind and current. Both wind and current can cause boats to drift laterally or sideways when underway. This lateral or sideways movement is known as leeway. Wind will have a greater effect on a boat with a shallow draft while a boat with a deep draft and small cabin will be more affected by the current.

### Dams, Locks and Bridges

A dam is built to restrict and control a body of water. Two types of dams that are hazardous to boaters are low head dams and conventional dams. Low head dams are built to provide small amounts of upstream water to another channel of water. They vary in height from one to several feet below the water's surface. The danger to boaters occurs when water flowing over the dam creates a strong circulating current at the base of the dam. Boaters can be trapped against the face of the dam and pulled under water even on small rivers. These dams pose a danger to boaters both above and below the dam. To ensure the safety of you and your passengers, do not go over or boat near a low head dam.

The second type of hazardous dams is the conventional dams that have locks, powerhouses and spillways. These dams can easily be recognized as being dangerous to boaters and should be avoided.

Since dams control the flow of water from one body of water to another, at times water levels vary between these water bodies. Locks are then used as a means of controlling the water level. A lock is a section of waterway that can be closed on either end. Some locks are designed to allow boaters to pass through in order to safely travel between water bodies. When using a lock, always follow the lock attendant's instructions. Be aware that commercial traffic has the right of way over recreational vessels. When approaching the lock wait at least 400 feet away from the lock and signal the lock attendant using one prolonged blast to notify him of your intention to pass through. Do not proceed until the lock attendant allows you to do so. Once inside the lock have both line and fenders ready at hand to secure your vessel to the lock.

Bridges are other structures that can endanger boaters because they can obstruct visibility. Although many bridges are high enough for boaters to pass through, some may be drawbridges. If you have a boat that exceeds the clearance of a drawbridge, you must notify the bridge attendant by either signaling or radio of your intention to pass through. Always proceed with caution near bridges and operate at slow speed.

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### *Prepare and Anticipate Weather*

To prepare for a safe and fun-filled day of boating, you should make yourself aware of your weather, local water conditions, and your environment. In fact, you should make this a pre-requisite for planning your trip. Bad weather could ruin a day on the water, and in the worst-case scenario, become extremely hazardous. Before you leave land, you should get the weather information from the TV, radio, local newspaper, online or from one of the weather channels on your VHF radio. Identify cloud formations because they can help you predict changing weather conditions.

### **Clouds**

Cloud formations can help you predict changing weather conditions. Identify the cloud formations before you leave the dock and make it a point to check for cloud changes throughout the day. Two main types of clouds are stratus clouds and cumulus clouds. Stratus clouds form a horizontal base at lower altitudes when compared to cumulus clouds. These clouds look like a low gray blanket and normally bring some form of precipitation.



**STRATUS CLOUDS**

Cumulus clouds are puffy in appearance with a flat base. These clouds usually mean fair weather, but can become thunderheads if they grow tall. A buildup of dark clouds is a common indicator of an approaching thunderstorm.



**CUMULUS CLOUDS**

### **Storms**

Conditions associated with storms such as increased winds, rain and lightning are often dangerous to boaters. At minimum, storms could delay your trip or cause an unpleasant end to your fun day of boating. In the worst-case scenario, storms could damage your boat or represent a life-threatening situation. If you are on the water and see an approaching storm, you should put on your PFD and head to the nearest safe port or marina.

### **Hurricanes**

One type of severe storm is a hurricane. Hurricanes are tropical storms that form during the months of June through November and generally pose the greatest threat to the East and Gulf Coasts of the United States. Once a tropical storm strengthens to the point that its sustained winds reach 74 miles per hour, it is classified as a hurricane. Under no circumstances should boaters be on the water during a hurricane. Hurricane warnings are issued by weather services to alert boaters of a severe approaching storm. Once aware of the potential danger, boaters should not go out on the water until the danger has passed. Boaters should also ensure that their boats are stored and secured properly.

### **Wind**

Changes in wind severity can be an indication of changing weather and sea state. Wind blowing over the water creates waves. If strong winds blow over the water for a long period of time, waves can build up to dangerous heights that threaten the safety of boaters. Sustained winds can also cause damage to rigging on sail boats, making it difficult to maneuver the boat. As with all dangerous weather conditions, boaters should head for shore when winds increase to avoid damage to their boat or potential injury.

### **Lightning**

The most effective way to avoid a lightning strike is not to boat or fish in a thunderstorm. Before you leave the dock, prepare for a lightning strike by making sure your rigging is properly grounded, which will reduce the impact of the strike. When on the water, pay attention to worsening weather conditions by watching cloud formations and distant lightning. If conditions are deteriorating, quickly make your way to shore.

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### **Fog**

Fog is another dangerous weather condition that can negatively affect your boating outing. Fog can obscure your visibility and make it very difficult for you to navigate your boat. If you get caught in fog, make the required sound signals with your sounding device, navigate cautiously and head for shore.

### ***Tides***

Tides are the continuous rise and fall of the surface of bodies of water. The change from high to low tide usually occurs twice a day. To determine your local boating area's tidal flow, contact your local marina or U.S. Coast Guard station. Coastal states are greatly affected by tidal changes. Normal tide levels can fluctuate a few inches to several feet. The boat operator should be able to read and understand tide tables. It is important to understand tidal changes so that you can anchor and dock your boat.