

# Hurricanes

## Understanding Hurricanes

Of all the natural threats that might affect Cape Cod, hurricanes have the potential to cause the most property damage and loss of life if adequate planning and preparation is not undertaken.

The National Weather Service's National Hurricane Center/Tropical Prediction Center in Miami, Florida, has the responsibility of monitoring conditions in the tropical Atlantic, Caribbean Sea, Gulf of Mexico and the eastern Pacific for potential tropical storm development. The Center has many tools at their disposal including satellites, weather reconnaissance aircraft, radar and several computer models that help the forecasters to create forecasts covering several days. Although hurricanes can produce tremendous damage they can, unlike other threats, be tracked for several days before impacting a community – giving residents and visitors time to prepare and evacuate if necessary.

### HURRICANE SEASON

The Atlantic Hurricane season runs from June 1st through November 30th. Based on the number and intensity of storms, mid-August through mid-October is defined as the peak months. During the months of June and July, hurricanes tend to form in the Caribbean and the Gulf of Mexico. By mid-August, as the waters of the tropical Atlantic warm, the focus turns to the Eastern Atlantic in the vicinity of the Cape Verde Islands off the African coast. The tropical waves intensify as they move westward, become tropical depressions, then tropical storms and finally hurricanes. Most of these storms turn northward around the peripheries of the semi-permanent Bermuda and Azores high-pressure areas, but can become exceptions to the rule and affect the Atlantic and Gulf Coast states. By early October, the waters over the Atlantic begin to cool and the focus for storm development shifts to the Caribbean and the Gulf of Mexico.



Photo above and in background courtesy of Jim O'Connell, ©2004

### DECIPHERING THE FORECAST

Emergency managers, hurricane center forecasters, and TV meteorologists have created unique terminology for hurricanes and tropical storms. Below are a few definitions that may help you better understand storm information.

**Tropical Depression:** A closed circulation of low atmospheric pressure, originating over tropical waters, winds blow counter-clockwise around a center at speeds less than 39 mph.

**Tropical Storm:** A closed circulation of low atmospheric pressure, originating over tropical waters, winds blow counter-clockwise around a center at speeds ranging from 39 to 73 mph.

**Hurricane:** A violent storm over tropical waters with sustained winds of 74 mph or greater. The winds blow in a counter-clockwise direction around a storm center which may range from 100 miles to several hundreds miles in diameter. The most intense weather is usually found in the right-front quadrant of the storm.

**Forecast Advisory:** Advisory messages are issued by the National Hurricane Center for all tropical depressions, tropical storms and hurricanes at six-hour intervals. These advisories are increased to three-hour intervals when landfall is expected within 24 hours. An advisory gives details as to where the storm is located, its intensity, direction and speed of movement. Precautionary measures are given for ships and coastal residents near the storm center.

**Tropical Storm Watch:** An announcement made for specific coastal areas when tropical storm conditions may pose a threat within 36 hours.

**Tropical Storm Warning:** An announcement warning of tropical storm

conditions, including sustained winds of 39-73mph, that are expected in specific coastal areas within 24 hours.

**Hurricane Watch:** Indicates that a hurricane is near enough that everyone in the "watch" area should listen for advisories and be ready to take protective measures if a Hurricane Warning is issued.

**Hurricane Warning:** Issued when a hurricane is expected in a specified coastal area within 24 hours or less. When a Hurricane Warning is issued, all precautions should be taken immediately. If a hurricane's path is erratic, the warning may be issued only a few hours before the onset of hurricane conditions.

### WHAT ARE THE REAL HAZARDS INVOLVED DURING A HURRICANE?

Some people can't visualize the total devastation that a hurricane can cause. Some of us have experienced or seen the massive damage from the Hurricane of 1938, but most of us have not.

Hurricane Bob, while destructive in its own right, was only a relatively weak Category 2 storm. It can, and sometimes it likely will, get much worse. Always prepare for the worst.

**Wind:** Strong surface winds of 74 to 200 mph can cause a barrage of flying debris. Hurricane force winds can sever power and communication lines. Winds in excess of even just 45 mph begin to cause damage to traffic signals and topple trees (also bringing down power lines).

**Tornadoes:** Tornadoes may form in the rain bands of a hurricane and cause significant damage. They are commonly found in the right front quadrant of an approaching storm. Although these tornadoes are not as intense as those that form in the Midwest tornado belt they can still inflict tremendous damage with little or no warning. There were four reports of tornadoes as Hurricane Bob came ashore.

**Heavy Rain:** Torrential rains are associated with slow moving or stationary tropical weather systems. In addition to flooding residences and businesses, heavy rain may overcome the Cape's storm drain systems and cause severe flooding or structural failure of roads or culverts.

**Storm Surge:** Rapidly rising storm surge is the hurricane's main threat to life. Storm surge is a dome of water that moves ashore to the right of the hurricane eyewall. It can be the primary risk to life if adequate evacuations are not done. In the case of Cape Cod Bay, storm surge will actually affect the shoreline, and particularly Wellfleet Harbor, shortly *after* the storm has passed. Residents and visitors should be aware to remain well above surge elevations until all threats have passed. Storm surge causes salt water flooding that can render evacuation routes impassible, cripple communications, cause sewers and storm water basins to back up, and contaminate drinking water supplies. Storm surge flooding can wash out roads and leave streets filled with sand and debris, rendering them impassible long after surge waters have receded.

The *Southeastern Massachusetts Hurricane Evacuation Study* was conducted in December 1994 by the U.S. Army Corps of Engineers, New England Division, in conjunction with the Federal Emergency Management Agency, for the Massachusetts Emergency Management Agency. This study produced two atlases that identify hurricane evacuation zones and SLOSH zones.

The SLOSH (Sea, Lake, and Overland Surges from Hurricanes) Model is a computer model that was designed by the National Weather Service to forecast surges that could occur from wind and pressure forces of hurricanes. The model is applied to the Cape to estimate potential flooding from hurricanes that may make landfall in New England. Surge limits shown on the community maps represent potential flooding that may occur from critical combinations of hurricane track direction, forward speed,

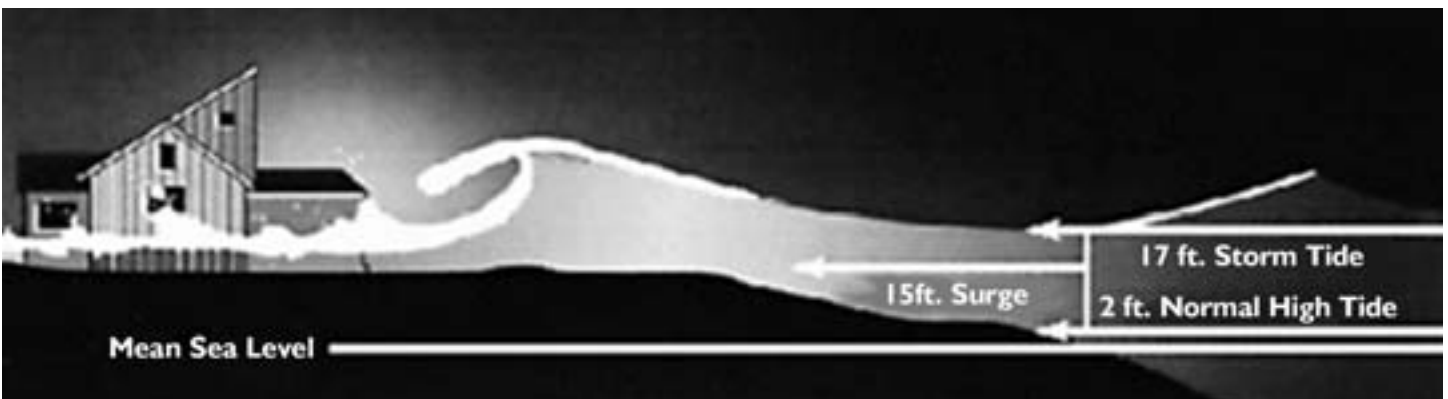
### SAFFIR/SIMPSON SCALE

To make the predicted hazards of an approaching storm easier to understand, forecasters and engineers have created this *disaster potential* scale, which assigns hurricanes to five categories of hurricane intensity.

| Category | Wind Speed and Potential Effects  | Storm Surge |
|----------|---|-------------|
| 1        | <b>Winds 74-95 mph:</b> No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs. Also, some coastal road flooding and minor pier damage.  | 4 – 5 ft.   |
| 2        | <b>Winds 96- 110 mph:</b> Some roofing material, door, and window damage to buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Small craft in unprotected anchorages break moorings.   | 6 – 8 ft.   |
| 3        | <b>Winds 111-130 mph:</b> Some structural damage to small residences and utility buildings with a minor amount of curtain wall (a nonbearing exterior wall) failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by battering from floating debris. | 9 – 12 ft.  |
| 4        | <b>Winds 131-155 mph:</b> More extensive curtain wall (a nonbearing exterior wall) failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Major damage to lower floors of structures near the shore.  | 13 – 18 ft. |
| 5        | <b>Winds greater than 155 mph:</b> Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Massive evacuation of residential areas on low ground may be required.   | 18+ ft.     |

landfall location, and high astronomical tide. **Cape residents should review these SLOSH maps to understand the potential for storm surge in their area and the potential need for evacuation.**

Sources:  
[www.nesec.org](http://www.nesec.org);  
[www.erh.noaa.gov/box/HurricaneInfo.shtml](http://www.erh.noaa.gov/box/HurricaneInfo.shtml);



Storm Surge Model, courtesy FEMA

# Hurricane Preparations for Home and Family

## BEFORE THE HURRICANE SEASON...

### Securing and Retrofitting Your Home

The best time to plan for the protection of buildings is probably during the construction process. Through careful design of buildings, stresses can be reduced and damage minimized. Roof pitch, structural fasteners, window size and placement all can have a dramatic effect on the amount of damage done by a storm. You can also plan, and build in anchors for shutters or boards. They may be hidden in many ways, yet be easy to find and use when a storm threatens.

Most of us are not dealing with construction plans. **We are looking at protecting our existing homes and buildings from storm damage.** The most important precaution you can take to reduce damage to your home and property is to protect the areas where wind may enter. According to recent wind technology research, it's important to strengthen the exterior of your house so wind and debris do not tear large openings in it. You can do this by protecting and reinforcing in five critical areas: roofs, straps, shutters, doors, and garage doors.

### Here are some actions you should take:

- Locate a safe place outdoors to store and anchor gas grills and propane or LP gas tanks. If damaged in a storm they can become a leaking, potential BOMB or flying missile.
- Keep outside areas free of loose objects. Any object outside should be considered a storm threat; either tie it down or find some other way to secure it.
- Make repairs to your home when necessary. Replace worn or rotted wood, seal cracks in concrete block, and otherwise block potential openings caused by wear.
- Keep your trees healthy. Make them more wind resistant by removing diseased and damaged limbs. Strategically

remove branches so that wind can blow through.

- Strap and secure your oil tank to the wall or foundation. If your basement floods and the tank breaks free significant environmental contamination can result to complicate your clean-up.
- Elevate your utility box out of the basement or above flood elevation.
- Become familiar with removable equipment such as window air conditioners and roof turbines, so they may be removed quickly and the openings secured.
- **Window Protection.** Professionally installed, permanent impact-resistant shutters or laminated window systems (a plastic safety film mounted directly to your windows) are ideal for buildings in vulnerable areas. As an alternative to shutters and window film, properly attached, exterior grade plywood offers excellent storm protection. A minimum thickness of 5/8 inch is recommended.

Prepare the boards with reinforcement where necessary. If you install permanent anchors, prepare and mark each board for a specific location. Store boards in a cool, dry

place, and have fasteners on hand. Pressure equalization holes in the center of the boards are essential! Masking or duct tape may control window shattering somewhat, but will not prevent breakage of glass, nor will tape keep out wind and water damage once the glass has broken.

For details on how to implement these cost effective security/retrofit measures visit [www.nhc.noaa.gov/HAW2/english/retrofit/secure\\_home\\_printer.shtml](http://www.nhc.noaa.gov/HAW2/english/retrofit/secure_home_printer.shtml), or contact the Cape Cod Chapter of the American Red Cross at (508) 775-1540 for a copy of Against the Wind: Protecting your Home from Hurricane Wind Damage.

### Advanced Preparation for You and Your Family

#### ☐ Things you should know well in advance of a storm:

- Contact your local Emergency Manager (see inside back cover for listings) to learn:
  1. Where your emergency shelter is in case you must evacuate.
  2. Your safe evacuation route.
  3. The elevation of your property above mean sea level.
  4. If you are located in an evacuation zone or SLOSH zone.
- Know where utility lines enter your home so you can avoid the area after a storm.
- Know where the emergency shut-off is for electricity at the main panel, as well as for water, natural and bottled gas lines
- ☐ **Compile your Disaster Survival Kit** (see pages 8 and 9).
- ☐ **Make a disaster plan for your pets.** Pets are not allowed in Red Cross Storm Shelters (see page 24).
- ☐ **Gather important documents** (birth certificates, insurance policies, health records, mortgages, deeds,

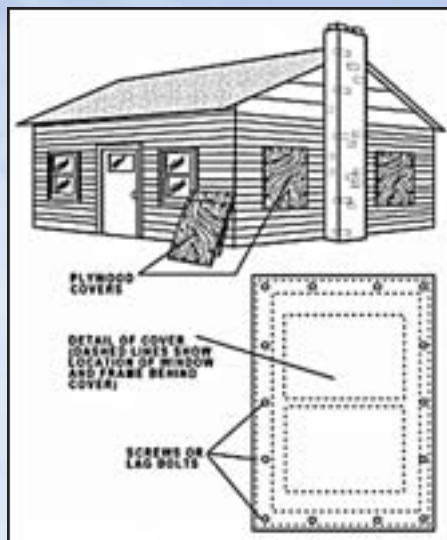




Photo above courtesy of Jim O'Connell, ©2004

titles, financial documents) in one place, ready to take with you. Any documents you may need after a storm or flood should be gathered now and kept in a protected place. Check your insurance policy and understand for what hazards you are and are not covered.

- ❑ **Make your own checklist** of things you'll want or need to do under a watch and a warning. If you are in a highly vulnerable flood zone, plan your evacuation route and a timetable. **Stay familiar with your plan!**
- ❑ **If you plan to evacuate the area,** plan to stay away up to 2-3 weeks. It could take that long or longer for public safety personnel to make the area safe for re-entry. If you have questions about your situation and your plan, ask now! Don't wait until the storm is nearly here, or it may be too late to get an answer.
- ❑ **Prepare your Family Disaster Plan.** Knowledge about hurricanes is not enough to protect you and your family. You must put this information to work. Review what you will need to do to prepare and protect yourself, your family and your property. The following options will help you make the correct choices:

#### Option A – Stay at home

If your home can withstand the anticipated winds, is away from the coast and on fairly high ground, and is not in a flood prone area then plan to stay at home.

#### Option B – Stay with a relative, friend, or hotel located outside the areas required to evacuate

If you expect to stay at someone else's home or a hotel, make advance arrangements. If staying at a friend or relative's home, be certain it is adequately prepared and is located in a safe area. Consider where you will go if the friend or relative is out of town.

#### Option C – Relocate off Cape

Your town's emergency management officials have developed a sheltering and evacuation policy for landfalling storms. If you are visiting the Cape, you may have to travel considerable distances on unfamiliar roads and should include a current road map as a part of your disaster supply kit. Know where you are going and plan, not only the best route, but alternate routes. Leave early to avoid heavy traffic, possible flooding and high winds. If you wait until the Hurricane Warning to leave, you may find heavy traffic congestion and possible closures at the Bourne and Sagamore bridges.

#### Option D – Public shelters

Local Officials will open public shelters in areas outside of the evacuation area. A public shelter should be your last option and used only if you have no other safe place to go. Do not report to a shelter until it has been opened. Consult the map on page 16 for potential shelter sites. Be familiar with their locations and the most direct routes from your home to the shelters. Pets are not allowed in Red Cross shelters and alternative arrangements must be made for them. Do not wait until the last minute to activate your plan. If an evacuation order is given, move quickly but without panic.

### BEFORE THE COMING STORM... When a WATCH is Issued

- Stay tuned to a NOAA weather radio, radio, or TV for official bulletins of the storm's progress (see inside back cover for listings).
- Fill up the gas tanks in your cars and have extra cash on hand (for evacuation or use after the storm). Service stations and bank machines run on electricity and may be out of service for a while.
- Inspect and secure mobile home tie downs.
- Prepare to cover all windows and doors with shutters or plywood.
- Locate your family's Disaster Kit or **STOCK UP NOW** if not already prepared.
- Tie down or bring inside all outdoor loose objects that could blow away or become dangerous projectiles (grills, lawn furniture, garden tools, toys, etc.). **Make sure your neighbors are doing the same!**
- Boat owners – activate your storm plan now – haul it, move it to a safe harbor, check the mooring, or secure the lines (see page 22).
- Plan to leave if you live in a mobile home, live on the coastline, in a surge zone, or flood plain.
- Check your neighborhood for anyone who might need extra help. Be particularly aware of people

living alone or who are in poor health and may be in serious difficulty if a power outage occurs.

## **DURING THE STORM...** **When a WARNING is Issued** **– Act Promptly!**

### **If you remain at home:**

- Listen to the advice of local officials, and **evacuate if so advised**.
- Complete preparation activities.
- Stay indoors, away from windows.
- Bring your pets indoors. Secure them inside — they may become agitated and not act as you may expect.
- Turn your refrigerator to the maximum setting and don't open it unless necessary.
- Fill all airtight containers with drinking water. Fill up bathtubs or large containers for use in flushing toilets.
- Stay on the leeward or downwind side of your house. As wind direction changes, move to an "inside" room, and stay there.
- Be aware that the calm "eye" is deceptive; the storm is not over. Do NOT go outside. The worst part of the storm will happen once the eye

passes over and the winds blow from the opposite direction. Trees, shrubs, buildings, and other objects damaged by the first winds can be broken or destroyed by the second winds.

- Be alert for tornadoes. Tornadoes can happen during a hurricane and after it passes over. Remain indoors, in the center of your home, in a closet or bathroom without windows.

### **If you must evacuate:**

- Leave early for the shelter – in daylight if possible. Don't travel any farther than absolutely necessary.
- Lock all windows and doors at your property.
- Turn off water and electricity at main shut-off valves to your house.
- Take your family's Disaster Kit with you to the shelter. You cannot bring your pets and need to execute the plan you have made for them at this time.

## **AFTER THE STORM...**

- Stay away from flood waters. If you come upon a flooded road, turn around and go another way. If you are caught on a flooded road and waters are rising rapidly around you, get out of the car and climb to higher ground.

- Do not touch or approach any loose or dangling wires. Report them to 9-1-1 immediately.
- Keep listening to your NOAA weather radio and local radio or TV stations for instructions (*see inside back cover for listings*).
- If you are evacuated, return home only when local officials tell you it is safe to do so.
- Inspect your home for damage.
- Use flashlights at all times; avoid using candles or other open flames.
- Use only the water that you've taken with you or stored before the storm or that has been declared safe by public health officials.
- Don't eat food that was opened or damaged in any way by the storm.
- Stay alert to announcements on where to apply for assistance if you suffered losses.
- Contact your insurance company to report property damage.

#### **Sources:**

[www.ibhs.org](http://www.ibhs.org); [www.lope.state.la.us/factsheets/WindShutter&WindowCovers.htm](http://www.lope.state.la.us/factsheets/WindShutter&WindowCovers.htm); [www.nhc.noaa.gov/HAW2/english/retrofit/secure\\_home\\_printer.shtml](http://www.nhc.noaa.gov/HAW2/english/retrofit/secure_home_printer.shtml); American Red Cross publications #4454, 5023, 5030, 5040.



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