

THE OFFICIAL TEXAS

# HURRICANE GUIDE

HOUSTON/GALVESTON WORKSHOP EDITION





# Introduction

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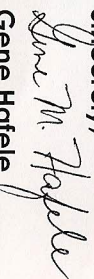
Welcome to the 2012 Houston/Galveston Area Annual Hurricane Workshop. The purpose of our workshop and of this hurricane guide is to increase public awareness of hurricane hazards and give citizens useful information on how to prepare for and respond to a land falling hurricane.

CenterPoint Energy and the City of Houston have created a private/public partnership to assist the Houston/Galveston National Weather Service (NWS) in conducting this annual workshop for the last 7 years. In 2011, around 5000 citizens from throughout southeast Texas attended the event. In addition, 30,000 copies of this guide were distributed to local partners and industry. At this year's workshop we will continue to feature emergency managers and meteorologists from the NWS and from the Houston broadcast stations who will discuss the upcoming hurricane season and how to be prepared. There will be numerous activities for the entire family including a Kids' Zone and various vendors with hurricane preparedness related items. Bill Read, the outgoing Director from the National Hurricane Center, will be our keynote speaker. Bill will preview the 2012 hurricane season and offer advice on how to best be prepared.

A catastrophic hurricane making landfall along the Texas coast continues to be the greatest natural threat the State of Texas faces each year. The social and economic impacts can be tremendous as we all experienced with Hurricane Ike in 2008. Hurricanes can be powerful with devastating impacts from storm surge, high winds, tornadoes, and flooding from heavy rains. To reduce these potentially deadly effects, it is imperative to prepare for each type of hurricane hazard. Advanced planning and preparation are essential to protecting property, reducing risk and ultimately saving lives. Taking the time to develop a family disaster plan, reviewing emergency preparations and checklists, making a disaster supply kit, and staying aware of current weather situations will improve your level of preparedness. This Texas Hurricane Guide is designed to enable you to focus your activities before, during and after the storm, and to easily locate specific instructions. This Hurricane Guide presents a roadmap that lays out what you will need to have and need to do.

We believe you will find the workshop and guide informative and helpful. Thank you for attending the workshop and reviewing the guide.

Sincerely,



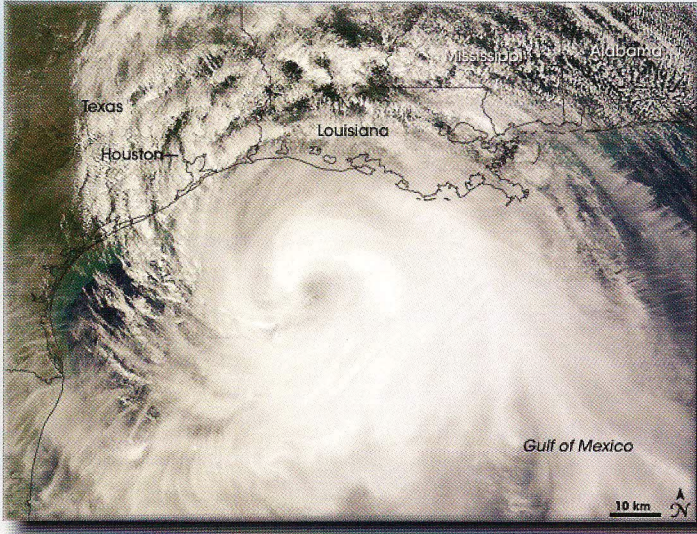
Gene Hafele  
Meteorologist in Charge  
National Weather Service Houston/Galveston

Front cover graphic design courtesy of:





# About the Hurricane



**H**urricanes form over warm ocean waters, like those found in the Gulf of Mexico. The hurricane season starts June 1 and ends November 30. The peak threat for the Texas coast exists from August through September. Hurricanes can strike the Texas coast during every month of the hurricane season.

*Left: High resolution satellite image of Hurricane Ike over the northwest Gulf of Mexico. Image--NASA*

Since 1851, 63 hurricanes have struck the Texas coast. That is **one every three years** on average.

## Definitions to Know

**L** **TROPICAL DEPRESSION:** An organized system of persistent clouds and thunderstorms with a closed low-level circulation and maximum winds of 38 mph or less.

**TROPICAL STORM:** An organized system of strong thunderstorms with a well defined circulation and maximum sustained winds of 39 to 73 mph.

**HURRICANE:** An intense tropical weather system with a well defined circulation and sustained winds of 74 mph or higher.

**TROPICAL CYCLONE:** A general term used to describe a tropical depression, tropical storm, or hurricane.

**HURRICANE/TROPICAL STORM WATCH:** Hurricane or Tropical Storm conditions are possible in the watch area within 48 hours.

**HURRICANE/TROPICAL STORM WARNING:** Hurricane or Tropical Storm conditions are possible in the warning area within 36 hours.

## Saffir Simpson Hurricane Wind Scale

- Category 1 Winds 74 to 95 mph
- Category 2 Winds 96 to 110 mph
- Category 3 Winds 111 to 129 mph
- Category 4 Winds 130 to 156 mph
- Category 5 Winds greater than 156 mph

<http://www.nhc.noaa.gov/aboutsshws.shtml>



# Storm Surge

**S**torm surge is a large dome of water that sweeps across the coastline. The surge is greatest along and to the right of where the eye makes landfall and occurs generally where the highest wind speeds are located in the eye wall. Higher storm surge is correlated with stronger hurricane winds and larger hurricanes. Storm surge poses the greatest threat to life and property for coastal communities. Ninety percent of hurricane fatalities are related to the storm surge.

## Some Damage Photos From the Storm Surge from Hurricane Ike

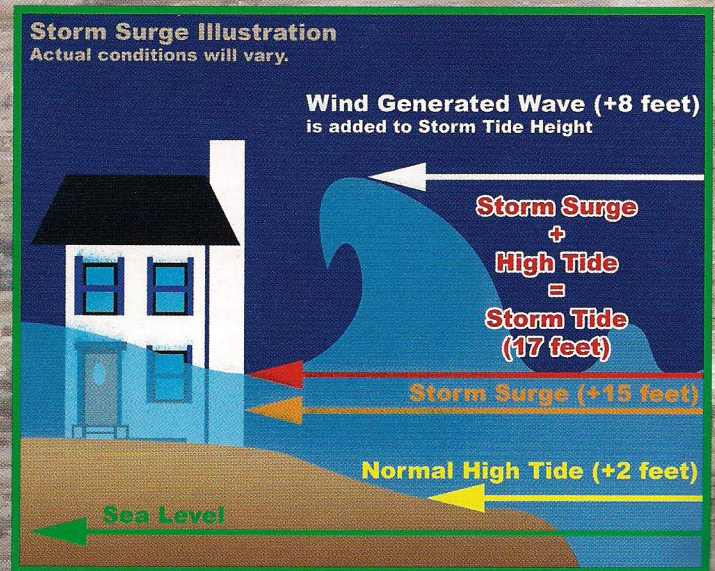


Home flooded by the storm surge from Hurricane Ike in Bridge City, TX. -- TX DPS



Home destroyed by storm surge from Hurricane Ike near Caplen, TX.

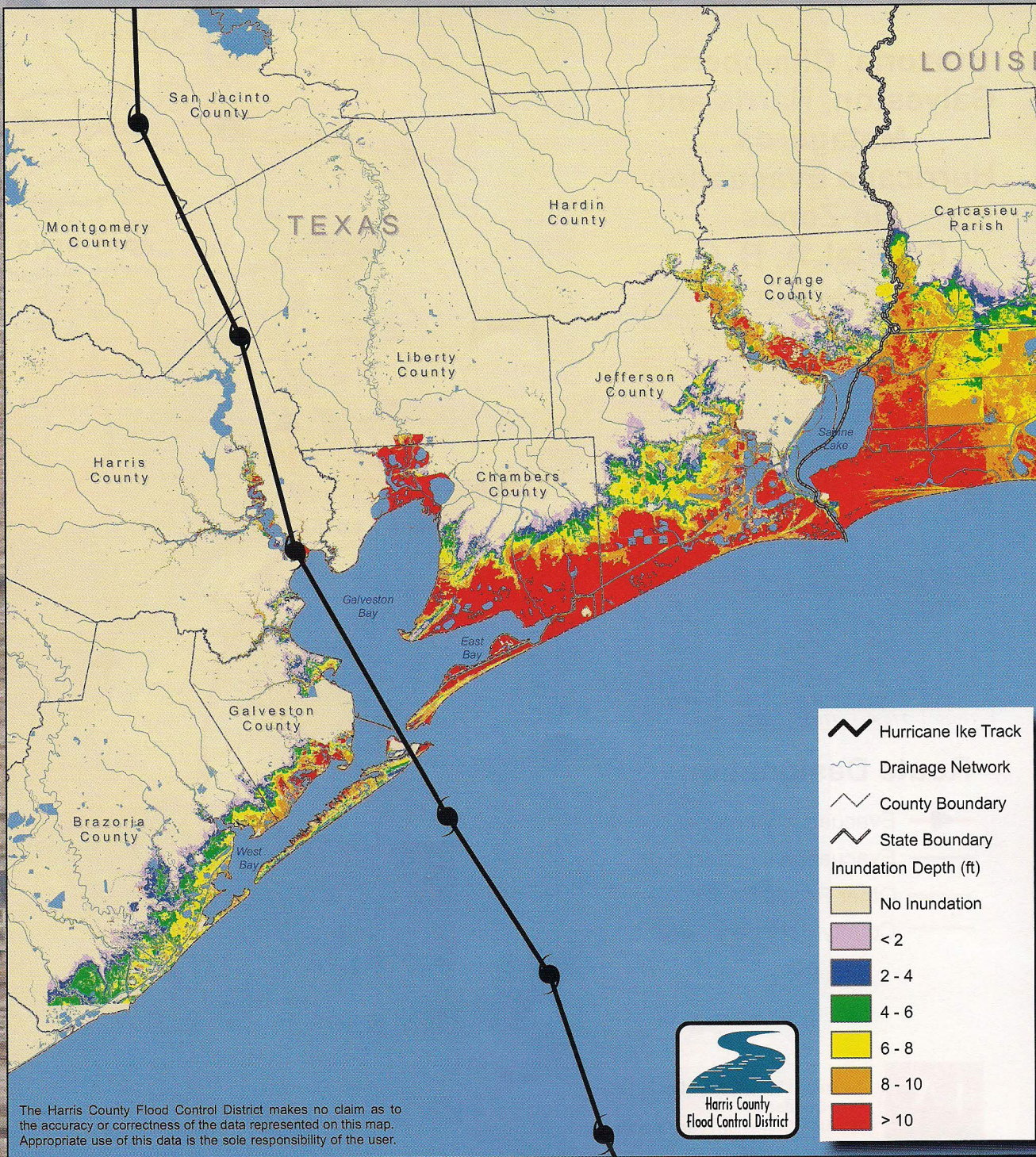
The storm surge associated with a hurricane landfall can have a tremendous impact on a low-lying coastal community. For Hurricane Ike, surge values were generally 10 to 15 feet over Galveston Island and along the western shore of Galveston Bay, and 14 to 18 feet across the Bolivar Peninsula and Chambers County, leading to widespread damage.



At least 12 people lost their lives, mainly on the Bolivar Peninsula, due to the storm surge. Water levels often begin to rise 24 hours or more prior to the arrival of the storm and can cut off escape routes. To avoid losing your life in surge prone areas, it is important to evacuate inland when advised to do so by local officials.



# Hurricane Ike Inundation



**Inland penetration of the storm surge associated with Hurricane Ike showing depth of water above ground level.**







# Zip Zone Evacuation

## Brazoria, Chambers, Galveston, Harris and Matagorda Hurricane Evacuation Zip-Zones Coastal, A, B, C

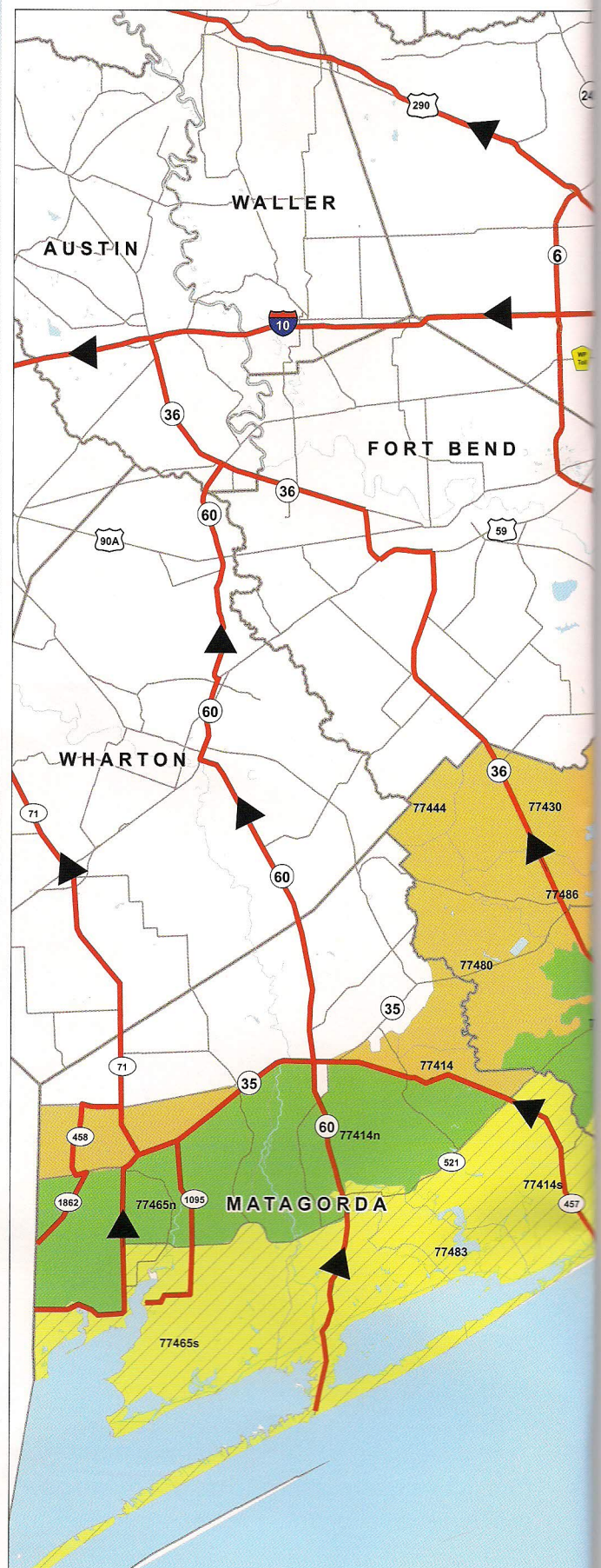
Zip-Zone Coastal				
77414s	77483	77550	77577s	77650
77422s	77534s	77551	77617	
77465s	77541	77554	77623	
Zip-Zone A				
77058s	77518	77565	77586	
77510	77539	77568	77590	
77514s	77563	77573	77591	
Zip-Zone B				
77058n	77507	77522	77560	77661
77059	77511	77523	77566	77665
77062	77514n	77531	77571	
77414n	77515	77534n	77577n	
77422n	77517	77546n	77597	
77465n	77520	77546s	77598	
Zip-Zone C				
77011	77034	77444	77505	77562
77012	77049	77463	77506	77578
77013	77061	77480	77521	77581
77015	77075	77486	77530	77583
77017	77087	77502	77535	77584
77023	77089	77503	77536	77587
77029	77430	77504	77547	

### Route Designation

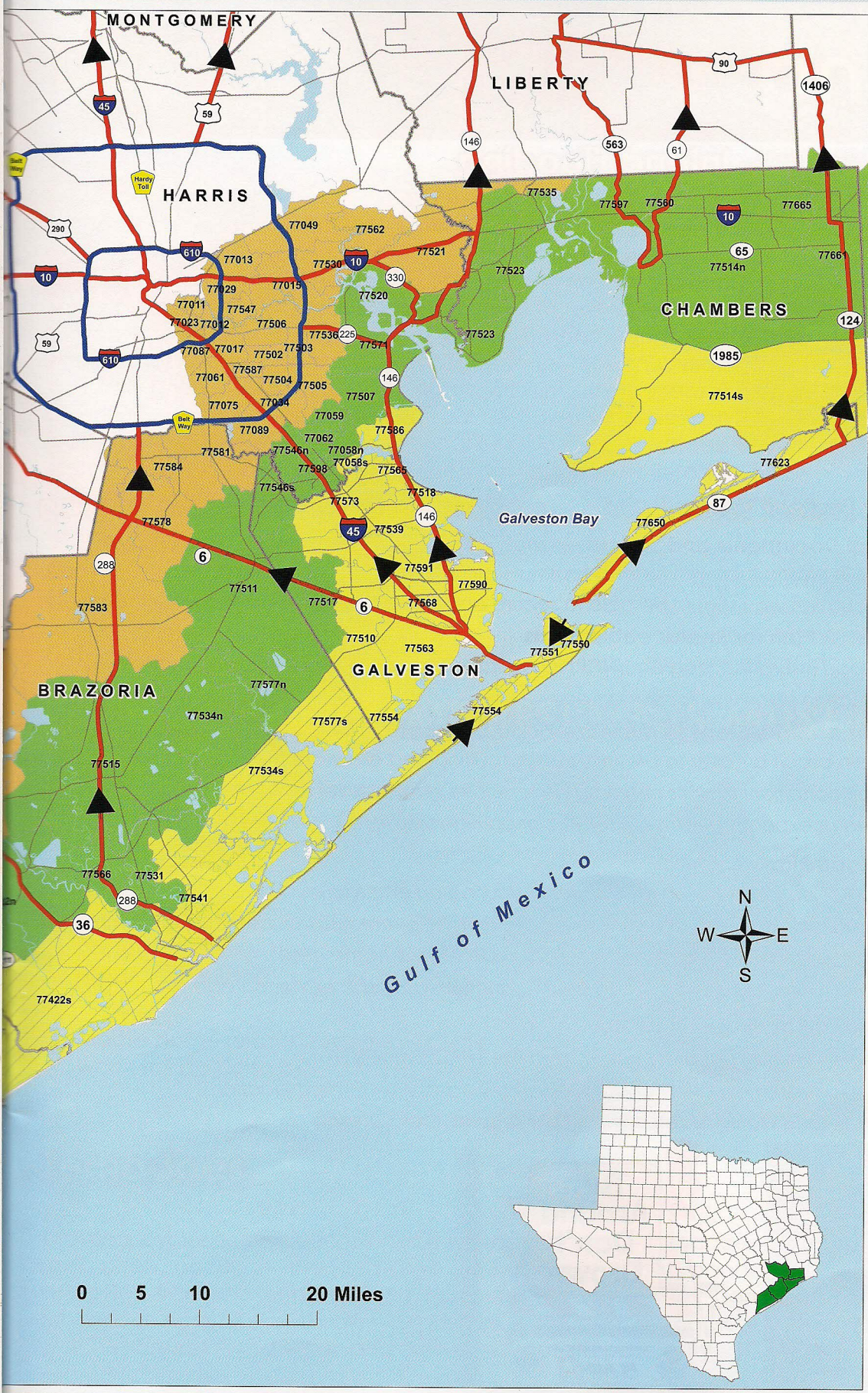
-  Evacuation Corridors
-  Evacuation Connections
-  Other Roads
-  County Boundary



Expiration Date: December 2012  
 Map Created by:  
 Houston-Galveston Area Council









# Flooding



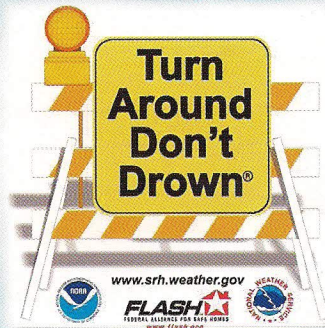
Photo: Harris County Flood Control District

## Inland Flooding

There are numerous examples of significant flooding caused by land-falling tropical cyclones in Texas. Storms with a slow forward motion are the most dangerous as heavy rains persist for a longer period of time. Tropical Storm Allison was such a storm. Allison meandered across Southeast Texas for several days in early June 2001, dumping 35 to 40 inches of rainfall in some areas. These extreme rainfall totals produced devastating flooding, especially across the Houston metropolitan area. Of the 23 deaths attributed to Allison in Texas, 20 were related to persons who drowned while driving or walking through flood waters.

## Five Practical Ways to Protect Yourself and Others From the Dangers of Inland Flooding

- **Protect Your Personal Documents and Special Items**
  - ✓ Store valuables in plastic tubs with locking tops
  - ✓ In case of evacuation, you should be able to secure and move all your valuables within 15 minutes
- **Buy Flood Insurance: A Plan for Replaceable Items**
  - ✓ The National Flood Insurance Program (NFIP) is available from an insurance agent or the NFIP
  - ✓ For more information see [www.floodsmart.gov](http://www.floodsmart.gov)
- **Flood Proof Your Home - Take Steps to Minimize Flood Damage**
  - ✓ Shut off the main circuit breaker to prevent short circuiting and eliminate the threat of electrocution
  - ✓ Raise outside air conditioning units onto platforms above ground level
  - ✓ Store rarely used or expensive items in the attic or on high shelves
- **Develop a Family Flood Plan**
  - ✓ Develop a plan of action to keep from panicking during an emergency
  - ✓ Have an evacuation route and alternatives planned in the event you are asked to evacuate
  - ✓ Communicate your plans with friends or family outside of your home area
  - ✓ Battery powered radios or televisions can be used in the event of a power outage
- **Never Drive on Flooded Roads**
  - ✓ Driving into flooded roadways puts your life and the lives of others at risk
  - ✓ Unless told to evacuate, you are probably safest staying at your current location
  - ✓ **If you encounter flood waters when driving, Turn Around, Don't Drown!**





# Destructive Winds and Tornadoes



**Above:** Wind damage to a billboard from Hurricane Lili in October 2002.

**H**urricane force winds of 74 mph or more can destroy buildings, mobile homes, trees and power poles. Debris such as signs, roofing material, siding, and small items left outside become flying missiles in a hurricane. The strongest winds occur in a region of the hurricane called the eyewall. Wind gusts in the right side of the eyewall are the most destructive. Hurricane force winds can be felt as far as 150 miles from the coast.

It is imperative to ensure your home or business is well constructed to minimize the damage from the wind. See the Planning and Preparing section in this guide for cost effective home improvement tips that can help you reduce your damage from a hurricane.



## MOBILE HOME RESIDENTS MUST EVACUATE!

- No mobile home or manufactured home - no matter how new it is - can provide safe shelter from hurricane force winds.
- Straps or other tie-downs ***will not*** protect a mobile home from the high winds associated with a hurricane.
- Mobile home residents ***must evacuate*** when told to do so by local authorities.



## Tornadoes

**T**ropical cyclones can also produce tornadoes. These tornadoes most often occur in thunderstorms embedded in rain bands well away from the center of the hurricane; however, they can also occur near the eyewall. Tornadoes produced by tropical cyclones are relatively weak and short-lived, but still pose a threat.





# Planning and Preparing

## Preparing Your Home Before the Storm

Proper hurricane preparations made ahead of time will not completely protect your property from damage. However, following a few simple tips may greatly reduce the damage to your home and property.

**Right:** Hurricane clips attaching roof trusses to side walls.



## Important Home Preparation Tips

### Elevation Matters

- Know the elevation of your home! Are you in a surge, flood and/or evacuation zone?

### Mobile Homes

- Check tie-downs for rust or breakage.
- Residents of mobile homes must evacuate when told to do so!!

### Landscaping

- Trim trees, shrubbery and dead limbs, especially ones close to your home.
- Repair or replace broken or damaged fences.
- Shredded bark is preferred instead of small gravel or stone bedding.

### Roofing

- Inspect the roof for loose tiles, shingles or debris. Consider replacing old or damaged shingles with new ones rated for hurricane force winds.
- Check for and/or install hurricane clips to secure roof trusses to side walls.
- Clear loose and clogged rain gutters and downspouts.

### Doors

- Reinforce garage doors and tracks or replace with a hurricane tested door. (See above image)
- Reinforce double entry doors with heavy duty foot and head bolts.
- Use a security dead bolt with a one inch minimum bolt length.
- Doors may be shuttered, but one entry must be left easily accessible.

### Windows

- If possible, install tested/manufactured hurricane shutters.
- Inspect existing shutters to ensure they are in good working order.
- Alternative: Use 5/8" or greater exterior grade plywood secured by 2 1/2" screws and/or special clips. Obtain wood and fasteners, cut wood to size, pre-drill holes and place anchors on homes.
- Store shutters or plywood lying flat to avoid warping when not in use.



# Planning and Preparing



## Business and Employee Preparation



### Tips for Businesses

- Establish a temporary location for business operations in case your facility is damaged.
- Give employees enough time to secure their homes and families.
- Consider paying employees before they leave to prepare their homes.
- Identify and protect vital records. Backup and store key files off site.
- Protect electronic equipment from possible water damage.
- Have extra cash and blank checks in case extra money is needed after the storm.
- Identify a safe room for employees who must remain in the building.
- Develop a 24-hour emergency contact with phone numbers of key employees.
- Set up telephone numbers for employees to check in and receive company information.

## Protecting Your Boat - Marine Preparations



### Tips for Boat Owners

- Check your marina contract for policies and procedures for hurricanes.
- Check with the manufacturer for proper ways to secure your boat during a storm.
- Consider moving arrangements well in advance of an approaching storm.
- Trailer boats should be removed from the water and securely stored at least 48 hours before a hurricane is expected to make landfall.
- Purchase necessary hurricane materials such as additional mooring lines, crew anchors, fenders, fender boards, chafing gear, and anchors.
- Safe storm moorings should consist of good condition ropes of sufficient diameter and length, with at least three or four substantial anchor points.
- Do not moor parallel to bank. Receding tides often capsize boats in this type of anchorage.





# Special Needs

## Preparations for People With Medical or Functional Needs



FEMA News Photo

**P**reparation in advance of hurricane season is essential, especially for people with special needs. It is essential that a destination is identified ahead of time that can accommodate people with special needs. Shelters should be considered as a **last resort** when people with special needs evacuate because many shelters cannot provide the attention required. Assisting elderly neighbors and acquaintances with pre-hurricane preparations is encouraged.



## Important Special Needs Tips

- Identify with whom you will stay in the event an evacuation becomes necessary.
- Make arrangements for transportation in the event you evacuate. Make sure your transportation can accommodate any equipment or other supplies that need to be taken with you.
- Make sure you have the following items that should be stored in advance:
  - ✓ Extra copies of your prescriptions in case your physician's office is damaged and not operational.
  - ✓ At least a 1 month supply of medications.
  - ✓ Identification.



## Transportation Assistance Registry

**If you will need help evacuating when a hurricane threatens, dial 2-1-1 to register in advance**

### Dial 2-1-1 as soon as possible...

- Before the start of hurricane season (June 1)
- If you cannot drive and cannot arrange transportation
- If you have a disability or special health care need and require assistance to get out
- If you do not have a vehicle and you have no one else to help you evacuate

### **Is someone going to pick me up or call me when a hurricane threatens?**

Emergency evacuations are handled different in every community. When a major hurricane threatens, local emergency managers will make every attempt to evacuate someone who does not have the ability to evacuate themselves, if there is enough time to do so safely. Please contact your local office of Emergency Management to find out what type of assistance is offered in your jurisdiction.





# Pets and Livestock

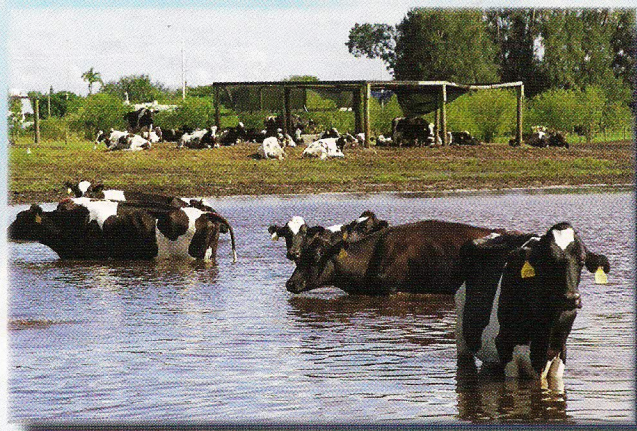
## Preparing for Your Pet's Safety

Your pet should be part of your overall hurricane preparation plans. Below are a few important things to help you prepare:

- Make sure your pet's vaccinations are current and have proof they are current. **DO NOT** assume that a public shelter or hotel will accept your pet.
- Be sure to have a current photo of your pet.
- Each animal should have a properly sized pet carrier. The carrier should be large enough for the animal to stand up and turn around.
- Make sure your pet has a proper ID collar.
- Pack enough food and bottled water for the duration of your evacuation. **DO NOT** let your pet eat food or drink water from outside that may have become contaminated.
- Be sure to pack all medications your pet may need along with a muzzle, collar, leash, paper towels, and trash bags.



## Preparations for Livestock



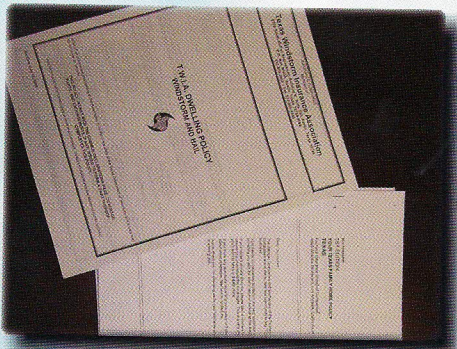
- Ensure all animals have some form of visible identification.
  - Evacuate animals whenever possible. Arrangements for evacuation, including routes and host sites, should be made in advance.
  - The evacuation sites should have or be able to readily obtain food, water, veterinary care, handling equipment and facilities.
  - Obtain vehicles and trailers needed for transporting each type of animal. Also make available experienced handlers and drivers.
- If evacuation is not possible, a decision must be made whether to move large animals to available shelter or turn them outside. This decision should be determined based on soundness and location of the shelter (structure).
  - When necessary, move livestock to higher ground and deny access to flood prone pastures, barns, and other structures.
  - It is important that livestock have plenty of food and clean water.



# Insurance Tips

## Insurance Tips - Before the Storm

- When shopping for insurance, get quotes from different companies and consider financial strength and history of complaints from each company.
- Ask agents for discounts if available.
- New and existing policies **will not be written or modified** when a storm nears the Gulf of Mexico.
- Make sure you fully understand what perils are covered and excluded in your policy.
- Make sure your coverage is adequate to replace your home and contents in today's dollar.
- Determine whether your policy covers additional living expenses for a temporary residence if you are unable to live in your home because of damage from a disaster.
- **DO NOT** cancel an old policy until you have a new policy in effect.
- Before hurricane season, prepare detailed written and/or photographic inventory of your home's contents and store it in a safe place with your policy.
- If you evacuate or choose to leave your home for safety, make sure to take the written and photo inventory with you, as well as all insurance policies (auto, home, life, etc.)
- If your insurance company does not cover flood or windstorm perils, ask about coverage through the Texas Windstorm Insurance Association or the National Flood Insurance Program.



## Important Web Information

**National Flood Insurance Program**

[www.floodsmart.gov](http://www.floodsmart.gov)

**Texas Windstorm Insurance Association**

[www.twia.org](http://www.twia.org)

**Texas Department of Insurance**

[www.tdi.state.tx.us/consumer](http://www.tdi.state.tx.us/consumer)

1-800-252-3539 (Consumer Help Line)

## Insurance Tips - After the Storm

- Give prompt written notice to your insurance company.
- If you cannot be easily contacted, give your insurance company the contact information of a trusted friend or relative who can reach you if necessary.
- Photograph or videotape damaged structures and all damaged property. Make a list of damaged or lost items.
- **DO NOT** throw out damaged property before your adjuster has inspected the debris unless it is a health hazard or impedes local cleanup.
- Protect your property from further damage.
- Keep an accurate record of temporary repair and living expenses if a loss of use is suffered.
- Along with insurance adjuster estimate for repairs to home, obtain two or more contractor estimates. Estimates must be broken down per line item.
- Claim advancements are made to the policy holder for home repairs, personal property and living expenses. Final payments are made only after completed repairs and adjuster review.



# Contact Info/Supply Kit

The Greater Houston Area Chapter of the American Red Cross recommends that you have the following items in your Hurricane Supply Kit. Do not forget to have a family meeting before hurricane season and review your communication information and evacuation plan. Make sure the contact information such as home, work, school, cell phone numbers, and your "Out of Town" contact person's information is current.



**American  
Red Cross**

## Emergency Contact Information

Out of Town Contact Address: \_\_\_\_\_  
Out of Town Contact Phone Number: \_\_\_\_\_  
Work Telephone Number: \_\_\_\_\_  
Cell Number/Spouse Cell Number: \_\_\_\_\_  
Children Cell Number: \_\_\_\_\_  
School Telephone Number: \_\_\_\_\_  
Doctor Telephone Number: \_\_\_\_\_  
Bank/Credit Card Telephone Number: \_\_\_\_\_  
Insurance Company Information: \_\_\_\_\_



## HURRICANE SUPPLY KIT



- At least a 7-day supply of non-perishable food and a manual can opener
- At least a 7-day supply of water. One gallon per person per day is recommended
- Battery powered portable television or radio with extra batteries
- Flashlight with extra batteries
- First Aid kit and manual
- Sanitation and hygiene items such as instant hand sanitizing gel, moist towelettes, toilet paper, and feminine hygiene products
- Matches in a waterproof container
- Whistle
- Kitchen accessories and cooking utensils
- Cash
- Extra clothing, blankets, and sleeping bags
- Photocopies of identification, insurance, prescriptions, household inventory, credit cards, and your latest utility bill
- CD or photocopies of important documents such as birth/marriage certificates and titles
- Prescription medications, eyeglasses, contact lens solution, and hearing aid batteries
- Formula, baby food, diapers, and pacifiers
- Pet carriers, leashes, shot records, and food for each animal evacuating with you
- A good map showing county roads and highways
- Tire repair kit, booster cables, pump, and flares
- White distress flag
- Toys and games for children
- List of family phone numbers and addresses outside the area



# ATLANTIC HURRICANE TRACKING CHART

**Always remember**

If you live along the coast or in a low-lying area, if you live in a mobile home in an area subject to hurricane water or wind, or if authorities tell you to... Go!

**Storm Surge**

A storm surge is a dome of water often 50 miles wide that comes sweeping across the coastline near the area where the eye of the hurricane makes landfall. The surge, aided by the hammering effect of breaking waves, acts like a giant bulldozer sweeping away everything in its path. Nine out of ten hurricane deaths are caused by storm surge. That's why it's important to leave well before a hurricane may come your way.

**Wind Damage**

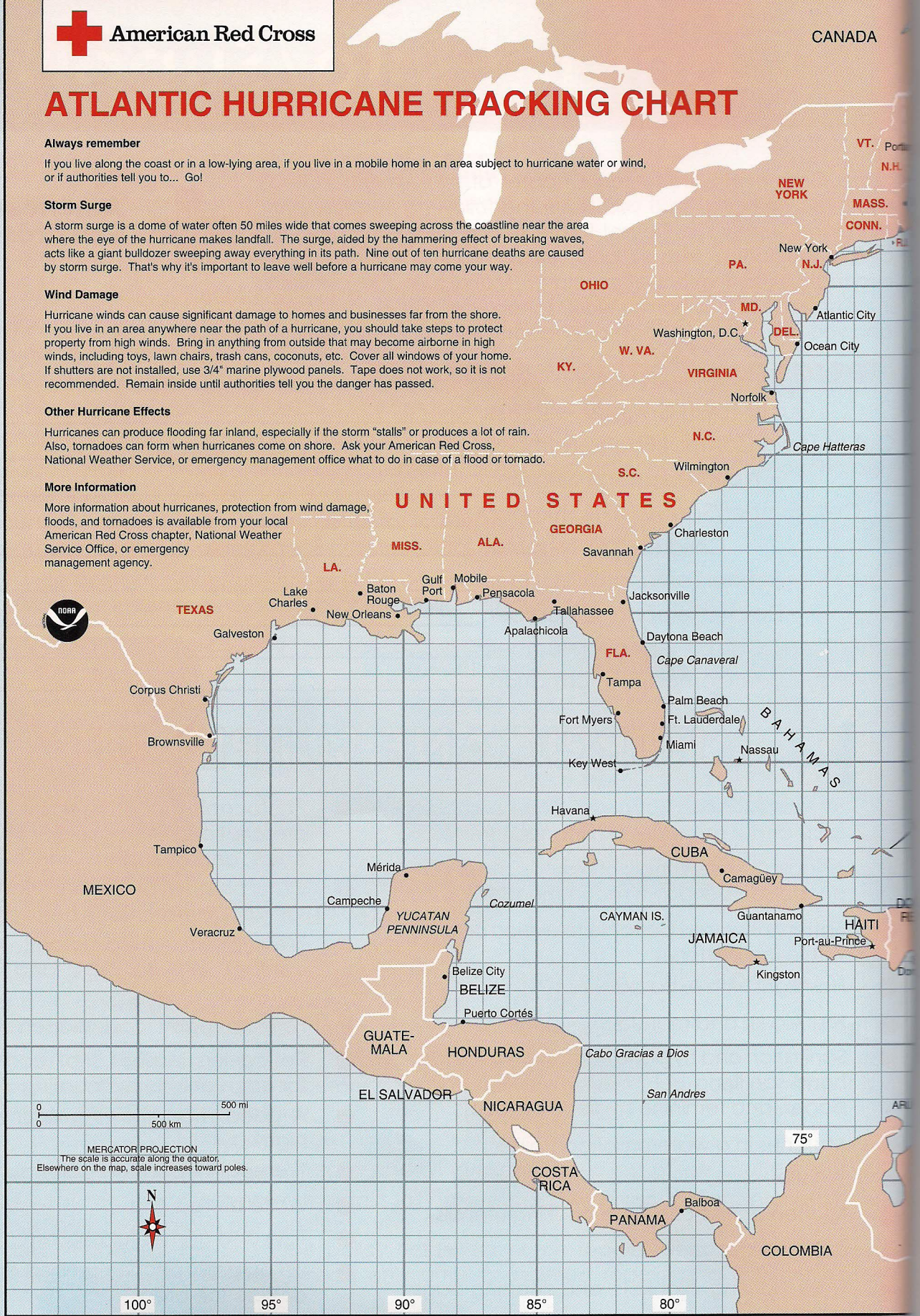
Hurricane winds can cause significant damage to homes and businesses far from the shore. If you live in an area anywhere near the path of a hurricane, you should take steps to protect property from high winds. Bring in anything from outside that may become airborne in high winds, including toys, lawn chairs, trash cans, coconuts, etc. Cover all windows of your home. If shutters are not installed, use 3/4" marine plywood panels. Tape does not work, so it is not recommended. Remain inside until authorities tell you the danger has passed.

**Other Hurricane Effects**

Hurricanes can produce flooding far inland, especially if the storm "stalls" or produces a lot of rain. Also, tornadoes can form when hurricanes come on shore. Ask your American Red Cross, National Weather Service, or emergency management office what to do in case of a flood or tornado.

**More Information**

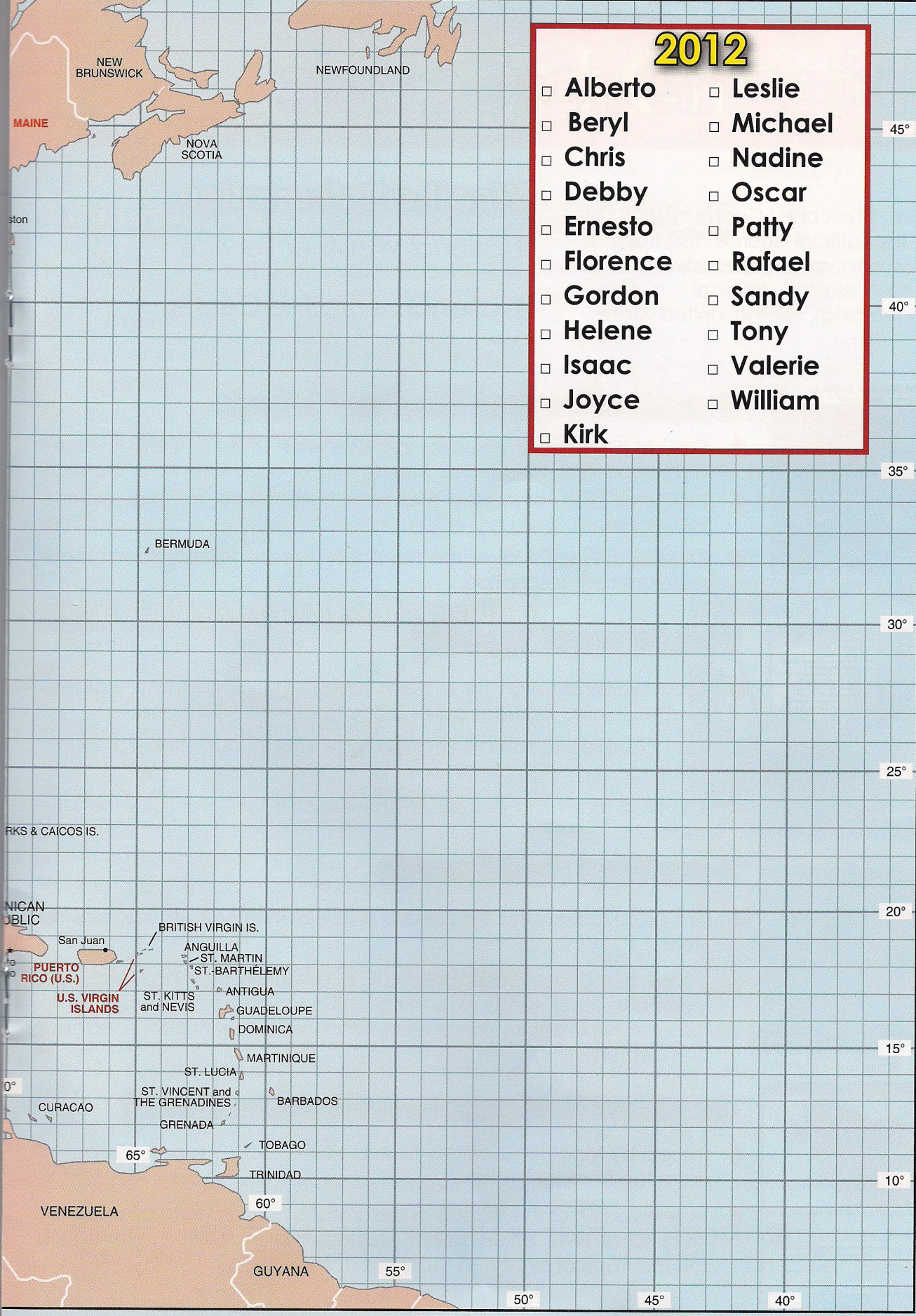
More information about hurricanes, protection from wind damage, floods, and tornadoes is available from your local American Red Cross chapter, National Weather Service Office, or emergency management agency.





# 2012

- |                                   |                                  |
|-----------------------------------|----------------------------------|
| <input type="checkbox"/> Alberto  | <input type="checkbox"/> Leslie  |
| <input type="checkbox"/> Beryl    | <input type="checkbox"/> Michael |
| <input type="checkbox"/> Chris    | <input type="checkbox"/> Nadine  |
| <input type="checkbox"/> Debby    | <input type="checkbox"/> Oscar   |
| <input type="checkbox"/> Ernesto  | <input type="checkbox"/> Patty   |
| <input type="checkbox"/> Florence | <input type="checkbox"/> Rafael  |
| <input type="checkbox"/> Gordon   | <input type="checkbox"/> Sandy   |
| <input type="checkbox"/> Helene   | <input type="checkbox"/> Tony    |
| <input type="checkbox"/> Isaac    | <input type="checkbox"/> Valerie |
| <input type="checkbox"/> Joyce    | <input type="checkbox"/> William |
| <input type="checkbox"/> Kirk     |                                  |





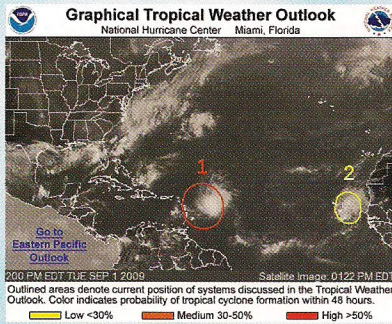
# Hurricane Forecasts

The National Hurricane Center (NHC) in Miami, FL is the official source for tropical cyclone advisories and forecasts and is responsible for issuing tropical cyclone watches and warnings for the United States.

## Weather Information

National Weather Service  
[www.weather.gov/houston](http://www.weather.gov/houston)

National Hurricane Center  
[www.hurricanes.gov](http://www.hurricanes.gov)



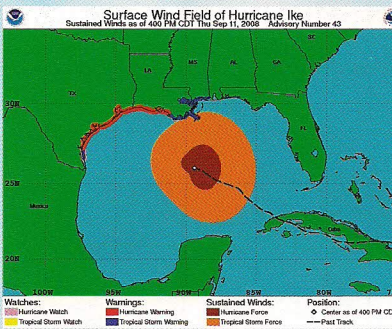
## Graphical Tropical Weather Outlook

- New NHC product provides an overview of all tropical cyclone activity.
- Indicates areas of interest that have potential for tropical cyclone development.
- Moving the cursor over the highlighted areas will provide a more detailed text description.



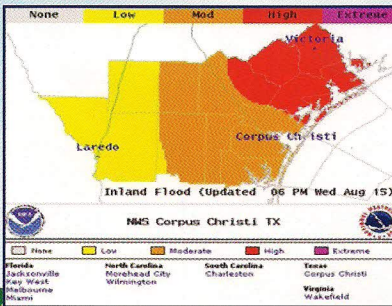
## NHC Forecast Advisory

- Most recent position for a storm along with all coastline watches and warnings. Includes a 3 or 5 day track with error cone.
- Error cone represents a 5 year average error. Storms only stay within the error cone 67% of the time.
- DO NOT focus too closely on the exact track forecast - the little black line.



## Storm Wind Field Graphic

- This graphic illustrates the size and shape of the tropical cyclone wind field.
- Some hurricanes have a broad and extensive wind field, with hurricane force winds extending well away from the center, while others have small circulations with hurricane force winds confined near the center.



## Graphical Hurricane Local Statement (HLS)

- Issued by local NWS offices to summarize local impacts expected from the tropical cyclone.
- A text version of the Hurricane Local Statement is also available from your local NWS office which provides more detailed information on the tropical cyclone's local impacts.



# Final Checklists

## Actions to Take When a Storm is in the Gulf

- Listen frequently to radio, TV, or NOAA weather radio for bulletins and forecasts of the storm's progress.
- Double check items in your emergency supply kit.
- Fuel and service your vehicles.
- Inspect and secure mobile home tie-downs.
- Make sure you have supplies to survive on your own for at least one week if you plan on staying.
- Board up windows (if shutters do not exist) in case storm moves quickly and you have to leave.  
**TAPE PROVIDES NO PROTECTION!**
- Store lawn furniture and other loose, light weight objects, such as garbage cans and garden tools.
- Get plenty of extra cash in case power goes out and ATMs do not work.
- Garage or store vehicles that are not being used.
- Follow instructions issued by local officials. **EVACUATE IMMEDIATELY IF ORDERED TO DO SO!**

## Final Actions to Take if Leaving

- Turn off propane tanks.
- Unplug small appliances.
- Empty refrigerator and freezer.
- Turn off utilities if ordered to do so.
- Notify family members of your evacuation plans.
- Lower water level in swimming pool by one foot.
- Lock home securely.
- Board up remaining doors and brace garage door.
- Take pets with you.



## Final Actions to Take if Staying

- Close storm shutters.
- Turn refrigerator or freezer to coldest setting and open only if necessary. (25 pounds of dry ice will keep a 10-cubic foot freezer below freezing for 3-4 days.)
- Follow instructions from emergency managers and be prepared to turn off utilities if ordered to do so.
- Board up remaining doors, brace garage door, and remain inside. Stay away from boarded up windows.
- Beware of the calm winds in the eye of the storm and do not venture outside. Some of the strongest winds may occur shortly after the eye passes.
- **DO NOT EXPECT EMERGENCY RESPONDERS TO BE OF ANY ASSISTANCE DURING A LANDFALLING HURRICANE!**



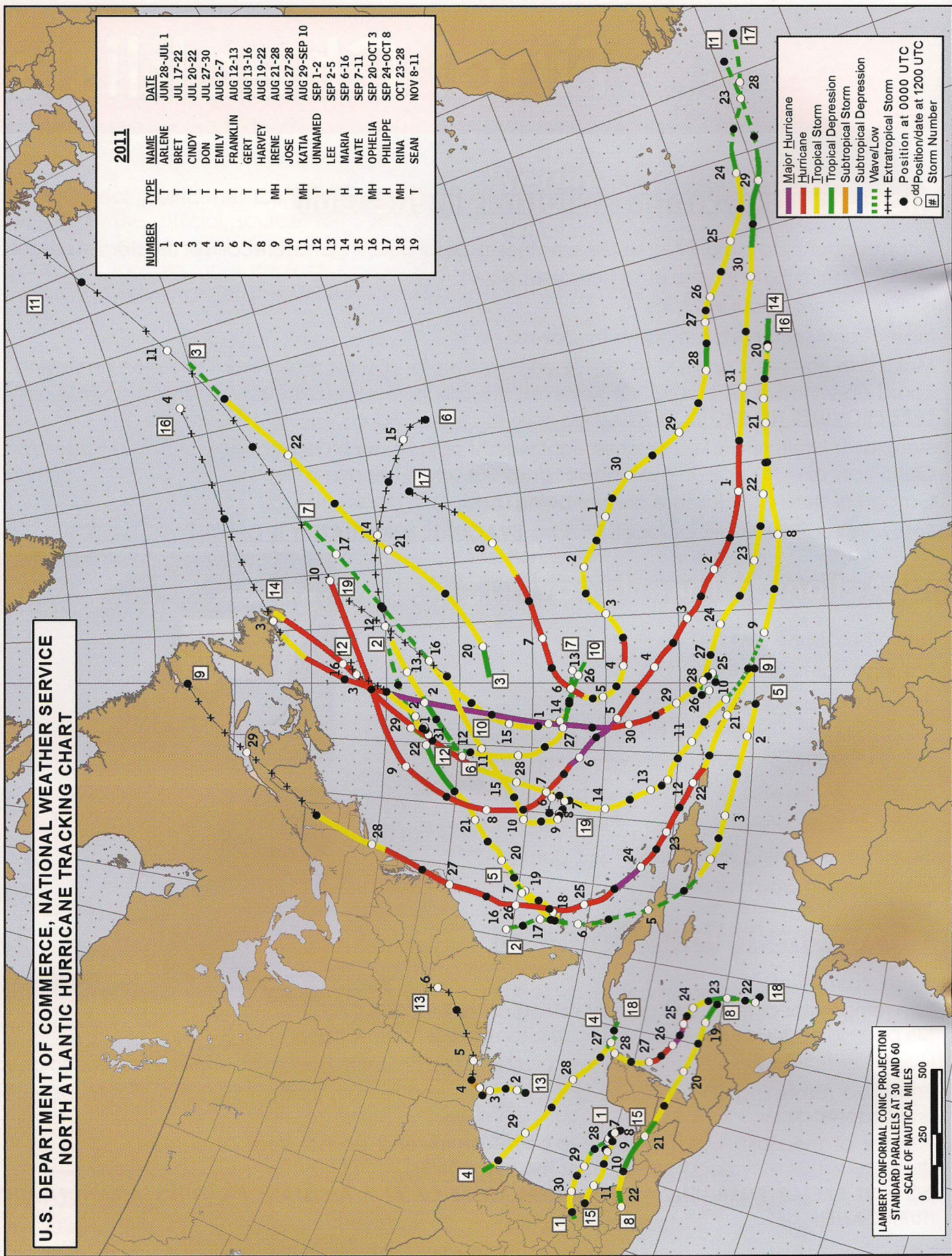
**U.S. DEPARTMENT OF COMMERCE, NATIONAL WEATHER SERVICE  
NORTH ATLANTIC HURRICANE TRACKING CHART**

NUMBER	TYPE	NAME	DATE
1	T	ARLENE	JUN 28-JUL 1
2	T	BRET	JUL 17-22
3	T	CINDY	JUL 20-22
4	T	DON	JUL 27-30
5	T	EMILY	AUG 2-7
6	T	FRANKLIN	AUG 12-13
7	T	GERT	AUG 13-16
8	T	HARVEY	AUG 19-22
9	MH	IRENE	AUG 21-28
10	T	JOSE	AUG 27-28
11	MH	KATIA	AUG 29-SEP 10
12	T	UNNAMED	SEP 1-2
13	T	LEE	SEP 2-5
14	H	MARIA	SEP 6-16
15	H	NATE	SEP 7-11
16	MH	OPHELIA	SEP 20-OCT 3
17	H	PHILIPPE	SEP 24-OCT 8
18	MH	RINA	OCT 23-28
19	T	SEAN	NOV 8-11

**2011**

- Major Hurricane
- Hurricane
- Tropical Storm
- Tropical Depression
- Subtropical Storm
- Subtropical Depression
- Wave/Low
- Extratropical Storm
- Position at 0000 UTC
- Position/date at 1200 UTC
- Storm Number

LAMBERT CONFORMAL CONIC PROJECTION  
STANDARD PARALLELS AT 30 AND 60  
SCALE OF NAUTICAL MILES  
0 250 500



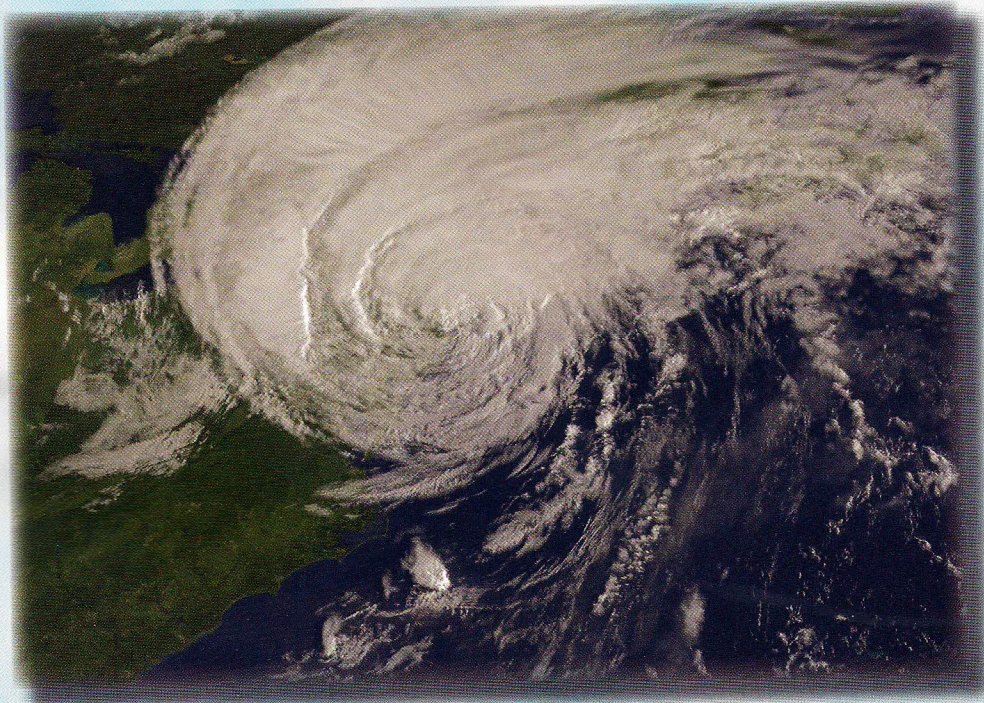


# 2011 Atlantic Hurricane Season

The 2011 Atlantic hurricane season was very active with the development of 19 tropical storms, seven of which became hurricanes with 4 reaching major hurricane status (category 3 or higher on the Saffir-Simpson Hurricane Wind Scale). The 19 named storms is the third-highest total since records began back in 1851. This number equals the number from the previous year, 2010, and is also tied with 1887 and 1995.

This season included Hurricane Irene, the first hurricane to make a United States landfall since Hurricane Ike came ashore as a strong category 2 storm near Galveston back in September 2008. Irene made landfall around Cape Lookout North Carolina as a category 1 storm then made its way up the East Coast bringing high winds, storm surge and heavy rains to coastal areas from the Mid Atlantic to New England. The flooding was especially severe over interior sections of New England, especially in the mountainous areas of New York and southern Vermont. There were 41 deaths in the U.S. directly attributable to Irene, 21 of those due to flash flooding from the rainfall. Mandatory evacuations were ordered for portions of New York City for the first time in history due to the threat of storm surge and winds from Irene.

Texas was largely spared from any significant impacts from hurricanes or tropical storms during 2011. Tropical Storm Don weakened to a tropical depression as it made landfall over South Texas and it brought minimal winds and little rain with no damage reported. Tropical Storm Lee brought rains to portions of far east Texas with some flooding rains and storm surge to southern Louisiana. As Lee moved very slowly along the Louisiana coast the size of its wind field grew and gusty winds extended on its western flank over much of the eastern half of Texas. These gusty winds and dry air on Lee's western flank helped fuel dozens of wildfires over eastern Texas over the Labor Day weekend including the devastating Bastrop and Riley Road fires. The Bastrop fire destroyed 1648 homes and 22 commercial buildings.



**Hurricane Irene**



# A Look Back at Hurricane Andrew on the 20<sup>th</sup> Anniversary

On August 24<sup>th</sup>, 1992, Hurricane Andrew made landfall along the southeast Florida coast as a category 5 hurricane on the Saffir-Simpson Hurricane Wind Scale (SSHWS). The only other cat 5 landfalls on record for the U.S. are Camille (1969) and the 1935 Florida Keys Hurricane. The results were devastating with an estimated 26.5 billion dollars in damage<sup>1</sup> primarily due to high winds but also storm surge. This makes Andrew the third most expensive hurricane in U.S. history.<sup>1</sup> Twenty-six people lost their lives as a direct result of the storm. Because Andrew was a relatively small hurricane, the extreme wind and surge impacts were felt mostly in the eyewall

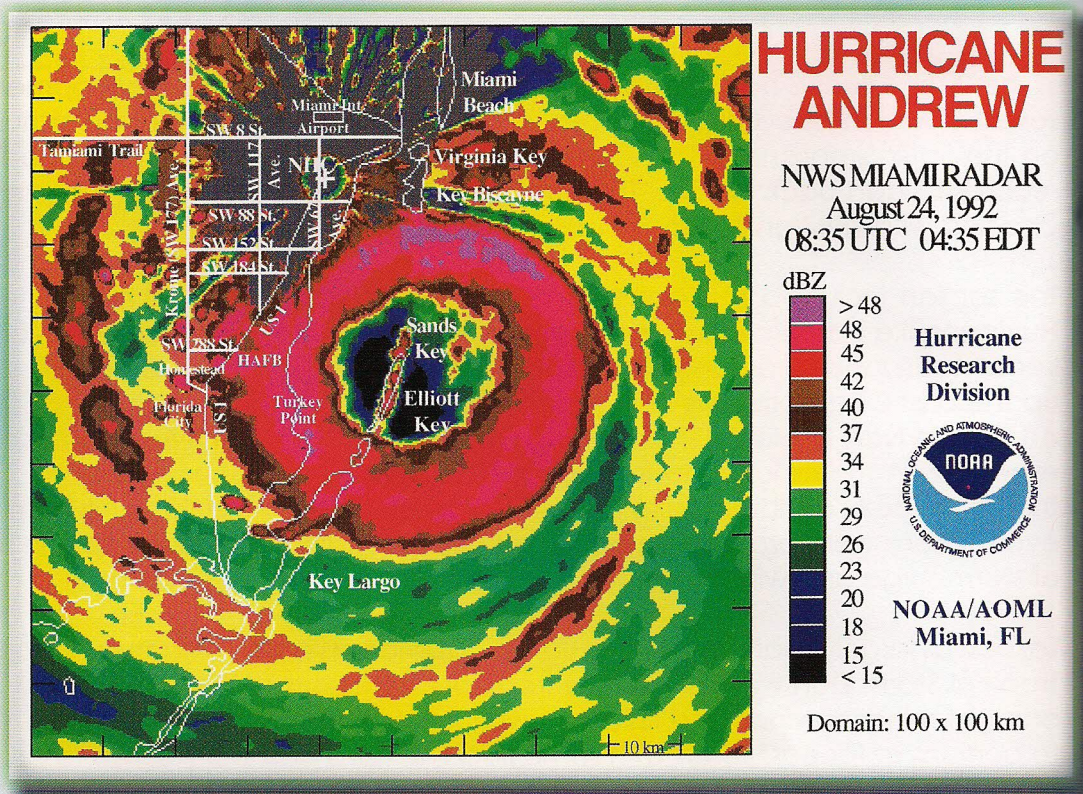


Figure 1

which is the ring of maximum winds around the center of the storm (Figure 1). Maximum sustained speeds of 165 mph with higher gusts were experienced on the northern side of the eyewall as the hurricane made its Florida landfall around 4:30 am that morning. The hurricane then crossed Florida and emerged over the Gulf of Mexico where it intensified again to a category 4 storm before striking a relatively sparsely populated portion of the Louisiana coast (Figure 2). The storm surge with Andrew was also considerable around the center, with around a 17 foot storm tide along portions of Biscayne Bay which is a record for the southeast Florida Peninsula.<sup>2</sup> The relatively small size of the storm likely prevented greater



Figure 2



# A Look Back at Hurricane Andrew on the 20<sup>th</sup> Anniversary

destruction and loss of life as heavily populated areas including downtown Miami, Key Biscayne and Fort Lauderdale were located just outside the relatively compact zone of the most destructive winds.<sup>2</sup>

Comparing Andrew to Ike, Andrew's *maximum* wind speeds were much higher, but Ike was a much larger storm (**Figure 3**) with hurricane force winds extending out much farther than with Andrew. As a result, the maximum severity of wind damage was greater for Andrew, but the areal extent of hurricane force winds and associated damage, and the extent of storm surge was far greater for Ike. While surge impacts were primarily close to the storm with Andrew, they extended over most of the Gulf Coast with Ike (see page 5). Because of this larger footprint, the damage amounts associated with Ike were actually greater, an estimated 29.5 billion, making Ike the second costliest hurricane on record behind only Hurricane Katrina.

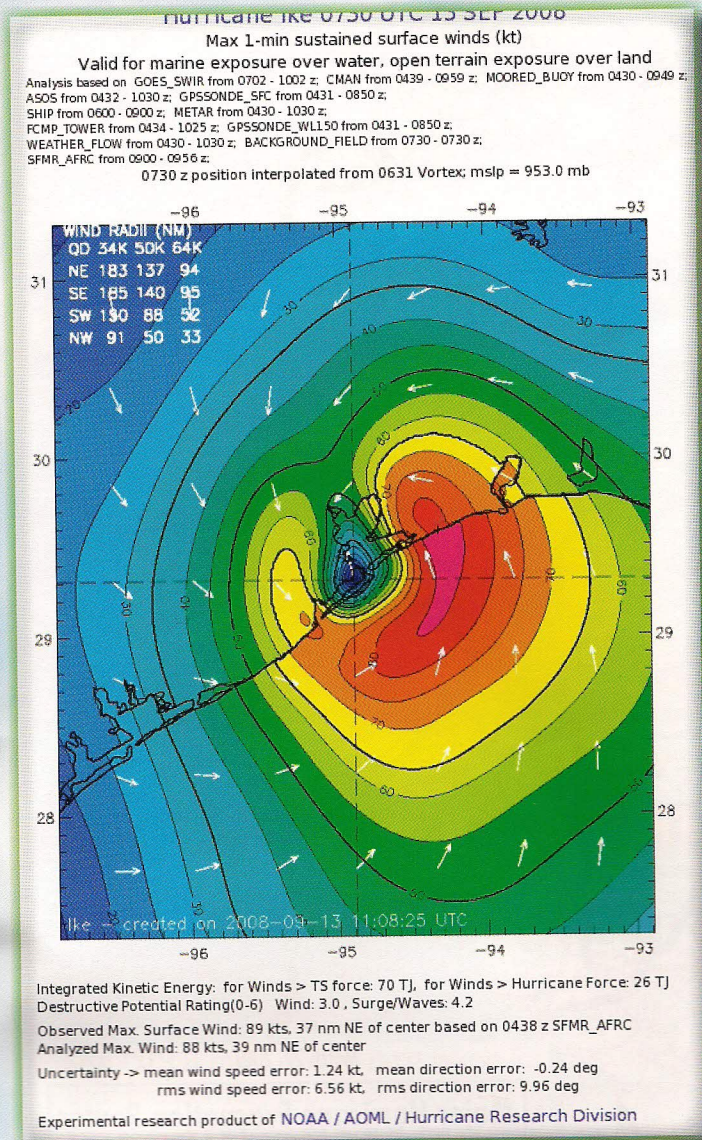


Figure 3

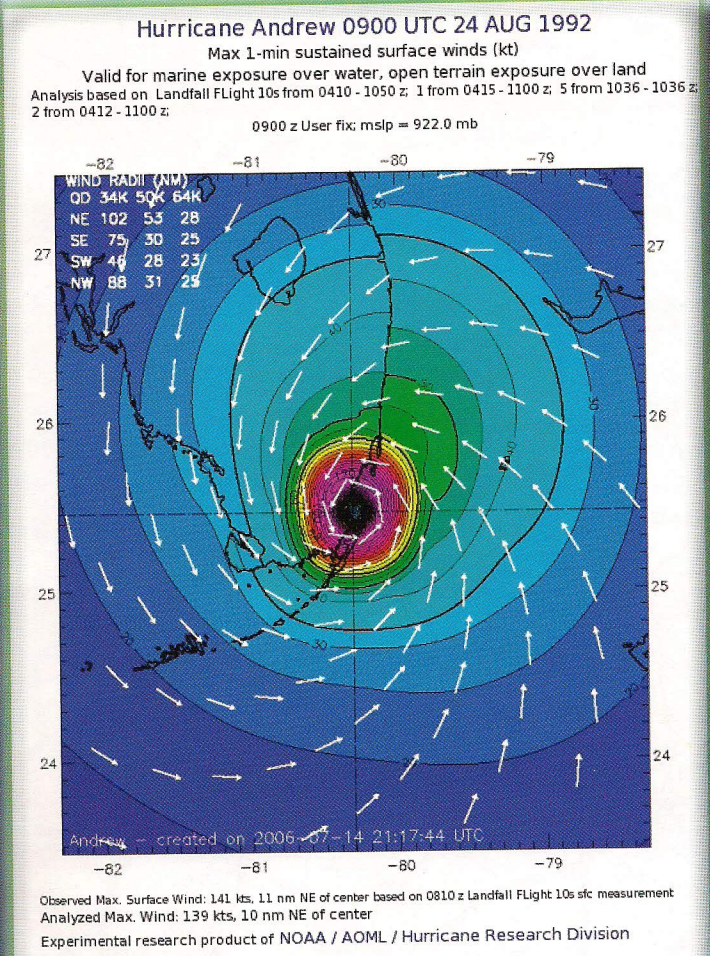


Figure 4

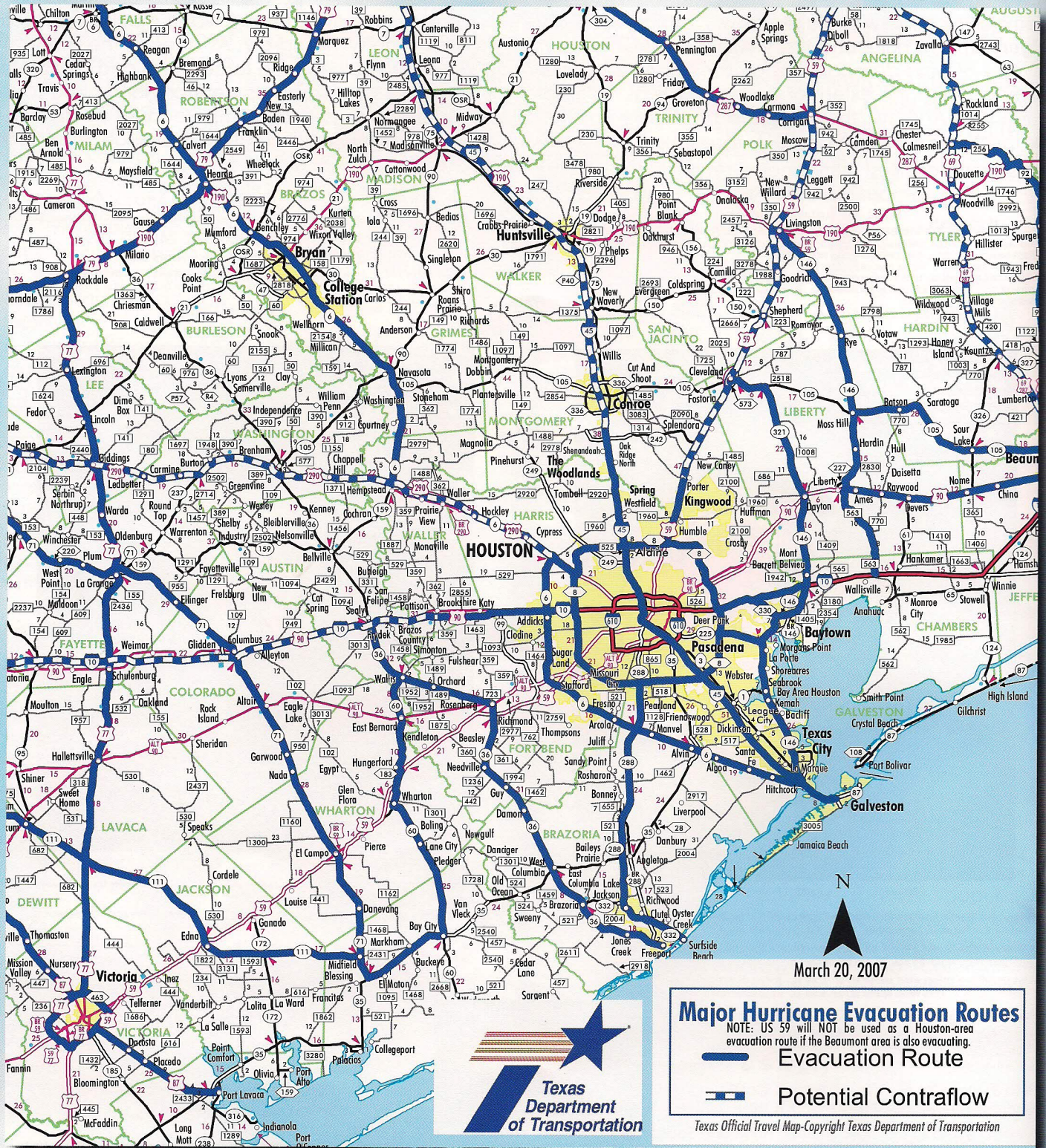
<sup>1</sup> Eric S. Blake et al., The Deadliest, Costliest and Most Intense United States Tropical Cyclones from 1851 to 2010 (and Other Frequently Requested Hurricane Facts), NOAA Tech. Memo., August 2011

<sup>2</sup>Max Mayfield et al., 1994: Atlantic Hurricane Season of 1992. Mon. Wea. Rev., **122**, 517-538.



# Evacuation

## Suggested Evacuation Routes





# Evacuation

**E**vacuees need to consider the projected path of the hurricane when choosing an evacuation route and destination. Evacuation studies estimate that it takes between 23 and 42 hours to evacuate southeast Texas in advance of tropical storm force winds. This underscores the need for coastal residents to have an evacuation plan. When evacuating, be sure to check local weather and highway conditions before departing. When local authorities order an evacuation of your area, leave immediately!



## Texas Road Information

### TXDOT Road Conditions

1-800-452-9292 or [www.txdot.gov](http://www.txdot.gov)

### TXDOT Houston Office

1-713-802-5074



## Final Actions before Evacuating

- Follow evacuation orders provided by your local officials. Once the evacuation order has been given, LEAVE IMMEDIATELY!
- Take your Hurricane Supply Kit with you (as described on page 15).
- Leave as early as possible to avoid heavy traffic and hazardous weather.
- See TXDOT map on the next page for an illustration of primary and alternate evacuation routes. Remember that the primary routes often become congested quickly.
- Do not stay in a mobile home near the coast under any circumstance.
- Remember that large boats and travel trailers may not be allowed to cross the Galveston Causeway or Hartman Bridge once high winds commence.
- Prepare to stay at your evacuation destination for a week or more, as re-entry into the affected area may be restricted.



# Emergency Information

## AUSTIN

- County Emergency Management  
979-865-5911

## BRAZORIA

- County Emergency Management  
979-864-1064
- City of Alvin  
281-388-4230
- City of Angleton  
979-849-2383
- Bailey's Prairie  
979-849-0134
- City of Brazoria  
979-798-2489
- City of Brookside  
281-997-9777
- City of Clute  
979-265-6194
- Danbury  
979-822-1551
- City of Freeport  
979-239-1211
- Hillcrest Village  
281-748-7149
- City of Jones Creek  
979-233-3091
- City of Lake Jackson  
979-415-2500
- Liverpool  
281-581-2342
- Manvel  
281-814-3233
- Oyster Creek  
979-233-8481
- City of Pearland  
281-652-1954
- City of Richwood  
979-265-8157
- Surfside  
979-239-1151
- City of Sweeney  
979-548-0697
- Quintana  
979-233-0848
- City of West Columbia  
979-345-5121

## BRAZOS

- County Emergency Management  
979-821-1010

## BURLESON

- County Emergency Management  
979-567-2008

## CHAMBERS

- County Emergency Management  
409-267-2445

## COLORADO

- County Emergency Management  
979-733-0184

## FORT BEND

- County Emergency Management  
281-342-6185
- Arcola  
281-431-0606
- Beasley  
979-387-2775
- City of Missouri City  
281-403-4309
- City of Richmond  
281-232-6871
- City of Rosenberg  
835-595-3700
- City of Simonton  
281-533-9809
- City of Stafford  
281-261-3950
- City of Sugar Land  
281-275-2853

## GALVESTON

- County Emergency Management  
281-309-5002
- City of Bayou Vista  
409-935-0449
- City of Clear Lake Shores  
281-334-1034
- City of Dickinson  
281-337-4700

## GALVESTON

- City of Friendswood  
281-996-3335
- City of Galveston  
409-765-3710
- City of Hitchcock  
409-986-5559
- City of Jamaica Beach  
409-737-1142
- City of Kemah  
281-334-5414
- City of La Marque  
409-938-9260
- City of League City  
281-554-1000
- City of Santa Fe  
409-925-3092
- City of Texas City  
409-643-5840
- City of Tiki Island  
409-935-1427

## HARRIS

- County Emergency Management  
713-881-3100
- City of Baytown  
281-420-5311
- City of Bellaire  
713-662-8222
- City of Deer Park  
281-478-7298
- City of El Lago  
281-326-1951
- City of Galena Park  
713-672-2556
- City of Houston  
713-884-4500
- City of Jacinto City  
713-674-8424
- City of Humble  
281-446-4928
- City of Jersey Village  
713-466-2100
- City of La Porte  
281-470-0010
- City of Morgan's Point  
281-471-2171
- City of Nassau Bay  
281-336-6298



# Emergency Information

## HARRIS

- *City of Pasadena*  
713-475-5588
- *City of Seabrook*  
281-291-5700
- *City of Shoreacres*  
281-471-2244
- *City of South Houston*  
713-947-7700
- *City of Taylor Lake Village*  
281-326-2843
- *City of Tomball*  
281-290-1301
- *City of Webster*  
281-332-1826

## JACKSON

- *County Emergency Management*  
361-782-3398
- *City of Edna*  
361-782-3122
- *City of Ganado*  
361-771-2800

## LIBERTY

- *County Emergency Management*  
936-334-3219
- *City of Cleveland*  
281-592-2667
- *City of Dayton*  
936-258-7621
- *City of Liberty*  
936-336-8118

## MATAGORDA

- *County Emergency Management*  
979-323-0707

## Madison

- *County Emergency Management*  
936-348-3810

## MONTGOMERY

- *County Emergency Management*  
936-523-3901

## POLK

- *County Emergency Management*  
936-327-6826

## SAN JACINTO

- *County Emergency Management*  
936-653-3395

## WALKER

- *County Emergency Management*  
936-435-2418

## WALLER

- *County Emergency Management*  
979-826-8282

## WASHINGTON

- *County Emergency Management*  
979-277-6200
- *City of Brenham*  
979-337-7300

## WHARTON

- *County Emergency Management*  
979-532-1123
- *City of El Campo*  
979-543-3335
- *City of Wharton*  
979-532-4811 x570

## US Department of Homeland Security

[www.ready.gov](http://www.ready.gov)

## National Red Cross

[www.redcross.org](http://www.redcross.org)

## FEMA

[www.fema.gov](http://www.fema.gov)

**Community Resource Information:  
Do Not Call 911 for Non-Emergencies!**





# Returning Home



**IF YOU EVACUATED THE AREA, WAIT FOR AN ALL CLEAR FROM THE CITY OR COUNTY BEFORE ATTEMPTING TO RETURN TO YOUR HOME. BE PREPARED TO SHOW PROOF OF RESIDENCE BY HAVING A COPY OF YOUR LATEST UTILITY BILL.**



FEMA News Photo



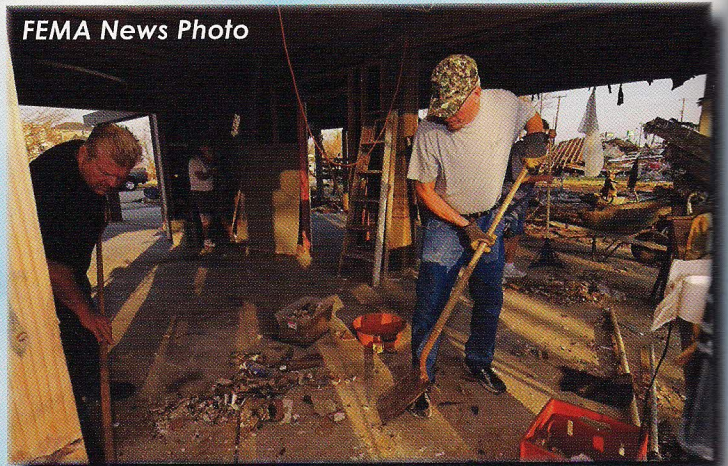
## General Cleanup

- Be cautious of structural damage and downed power lines. Do not attempt to move structural supports or large pieces of debris.
- DO NOT run power generators indoors. Inhalation of carbon monoxide from the exhaust can cause death. Ensure exhaust is well ventilated.
- DO NOT use open flames indoors.
- Restrict your driving to emergency use only. Road conditions may not be safe until road debris is cleared.

## Debris Cleanup

- Cities and counties will publish a schedule for debris pick-up and removal. Debris cannot be removed from private property.
- Construction materials, vegetative debris, household hazardous waste and household appliances will need to be placed into separate piles and moved to the curbside for pick-up.

FEMA News Photo



## Water

- Listen for instructions regarding public water supply. Use only bottled, boiled or treated water until you know that your water supply is safe.
- You can use household chlorine bleach to treat water for drinking or cleaning. Add 1/8 teaspoon of bleach per gallon of clear water or 1/4 teaspoon of bleach per gallon if water is cloudy. Allow water to stand for 30 minutes before using. You can also purify water by boiling for one minute then letting it cool before drinking.

FEMA News Photo





# Returning Home

## Utility Cleanup

FEMA News Photo



- Check for gas leaks. If you smell or hear gas leaking, leave immediately. DO NOT use the phone or turn on lights in your home. Call the gas company from a neighbor's phone.
- Report any visible damage of power lines to the electric company. Turn off power at main breaker if any electrical equipment or circuits have been exposed to water.
- DO NOT connect generators to your home's electrical circuits. If a generator is on line when electrical service is restored, it can become a major fire hazard. Also, line workers working to restore power will be endangered if a generator is hooked up to the home's circuits.
- It is likely that an electric company other than your own will reconnect the lines to your home; however, they can not turn the service back on. Only your electric company can actually turn the power back on to your house.

## Sewage Cleanup

- If you suspect water or sewage lines are damaged, do not use your plumbing (toilets, sinks, etc.). Contact the water company or a plumber for repairs.
- A chemical portable commode can be created by the following:
  - ✓ Use 5 gallon buckets with tight lids, lined with heavy duty plastic garbage bags.
  - ✓ Add kitty litter to the bucket as a disinfectant and deodorizer. Keep lids on firmly.
  - ✓ Keep buckets in a cool, dark place. Clean and disinfect buckets immediately.
- Your toilet can also be used by flushing until the bowl has no water. Then, line with heavy duty trash bags and disinfect with chlorine bleach after each use. Remove waste to an outside location.
- If significant sewer outages have occurred, instructions for disposal of human wastes will be announced.
- DO NOT dispose of human waste through your regular trash!

## Interior Cleanup

- Disinfect and dry interior buildings and items inside. This will prevent growth of some bacteria, viruses, mold, and mildew that can cause illness.
- Clean walls, floors, and counter tops with soap and water. Disinfect them with a solution of 1 cup of bleach to 5 gallons of water.
- Wash all clothes and linens in hot water. Air dry and spray all unwashable items with disinfectant. Steam clean carpets. Throw away all items touched by water that cannot be disinfected.



# Rip Current Safety

## Hurricane Surf

**H**urricanes bring large waves to nearby beaches that are dangerous for beach goers. High waves, when combined with the high tide, storm surge, and wind and wave setup, can create a serious threat to both lives and property. Jetties and piers typically amplify the size of the waves, causing an even more dangerous situation. Hurricane waves can injure or drown those who enter the water, so **remember: If in doubt, don't go out!**

## RIP CURRENTS Break the Grip of the Rip!

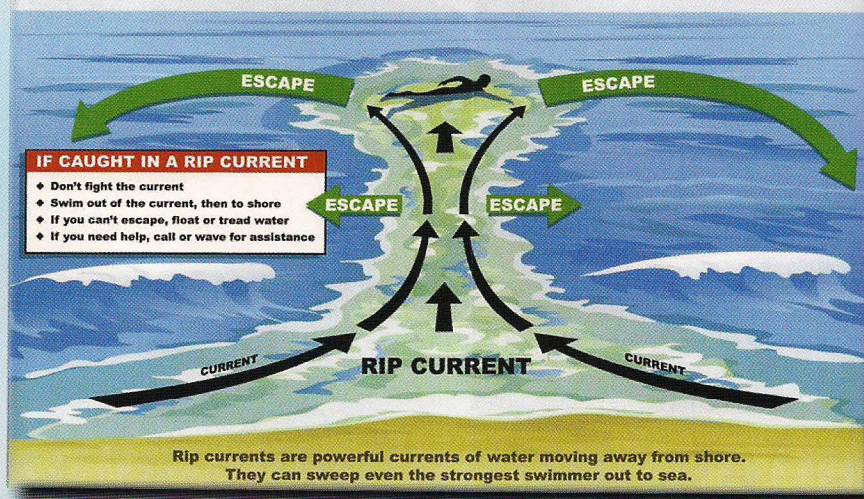
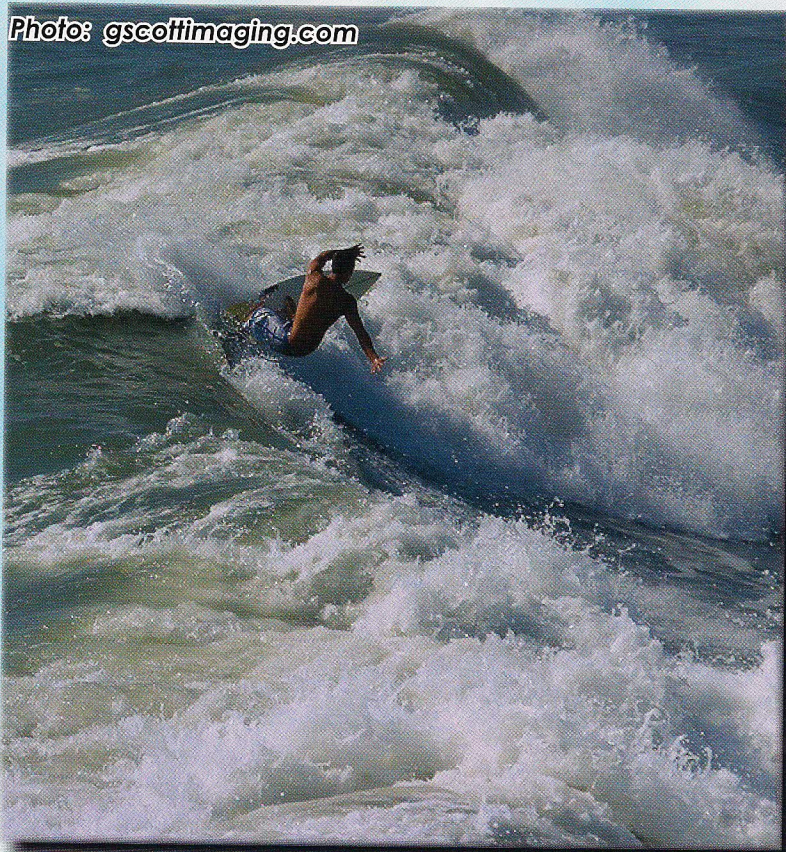


Photo: [gscottimaging.com](http://gscottimaging.com)



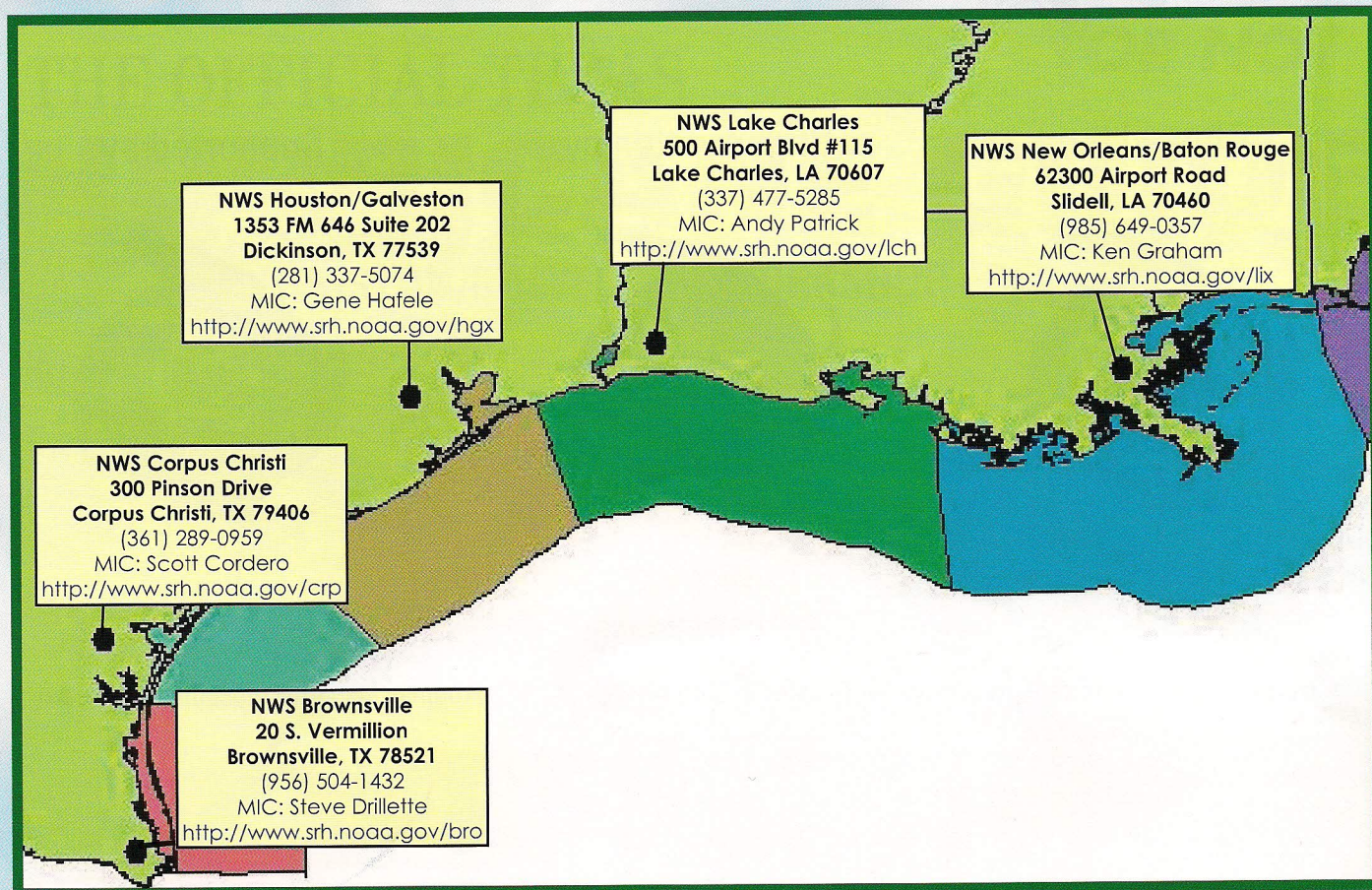
## Rip Currents

**A**long with big surf come strong rip currents. Rip currents are the leading surf hazard for all beach goers and result in over 100 drownings every year in the United States. The strength and size of rip currents are related to the size of the surf and wave period. Rip currents typically form at the low spots in the surf, at the breaks in the sandbars, and near jetties and piers.

If caught in a rip current, don't panic, but swim parallel to the shore. The current is usually only about 50 feet wide and you should be able to swim out of it. At that point, you can swim back to shore. If you are still unable to reach the shore, draw attention to yourself: face the shore, wave your arms, and yell for help.



# Regional National Weather Service Offices



## Hurricane Preparedness and Weather Sites on the Internet

**National Hurricane Center**  
<http://www.nhc.noaa.gov>

**Federal Emergency Management Agency**  
<http://www.fema.gov/hazard/hurricane>

**NWS Southern Region Headquarters**  
<http://www.srh.noaa.gov>

**Harris County Homeland Security and  
Emergency Management**  
<http://www.hcoem.org>

**Storm Prediction Center**  
<http://www.spc.noaa.gov>

**City of Houston Office of Emergency Management**  
<http://www.houstonoem.net>

**Historical Hurricane Tracks**  
<http://csc-s-maps-q.csc.noaa.gov/hurricanes>

**Galveston County Office of Emergency Management**  
<http://www.gcoem.org>

**EMWIN Houston**  
<http://houston.emwin.org>

**American Red Cross**  
<http://www.redcross.org>

**Klotzbach and Gray Hurricane Forecasts**  
<http://hurricane.atmos.colostate.edu/forecasts>

**Hurricane Workshop**  
<http://hurricaneworkshop.com>

