Hurricanes...

Unleashing Nature's Fury

FEMA

Hurricane Katina, August 28, 2005/NOAA

NOAA

A PREPAREDNESS GUIDE

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service

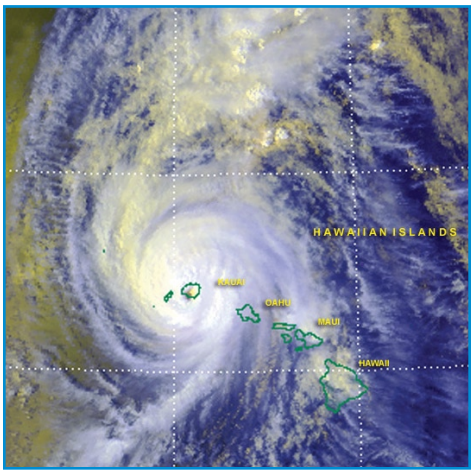
Revised September 2006

FEMA

American Red Cross

What is a Hurricane?

The term hurricane has its origin in the indigenous religions of past civilizations. The Mayan storm god was named *Hunraken*. A god considered evil by the Taino people of the Caribbean was called *Huracan*. Hurricanes may not be considered evil but they are one of nature's most powerful storms. Their potential for loss of life and destruction of property is tremendous. Those in hurricane-prone areas need to be prepared for hurricanes and tropical storms. Even inland areas, well away from the coastline, can experience destructive winds, tornadoes and floods from tropical storms and hurricanes.



Hurricane Iniki, September 11, 1992/NOAA

A hurricane is a type of tropical cyclone–an organized rotating weather system that develops in the tropics. Hurricanes rotate counterclockwise in the Northern Hemisphere. Tropical cyclones are classified as follows:

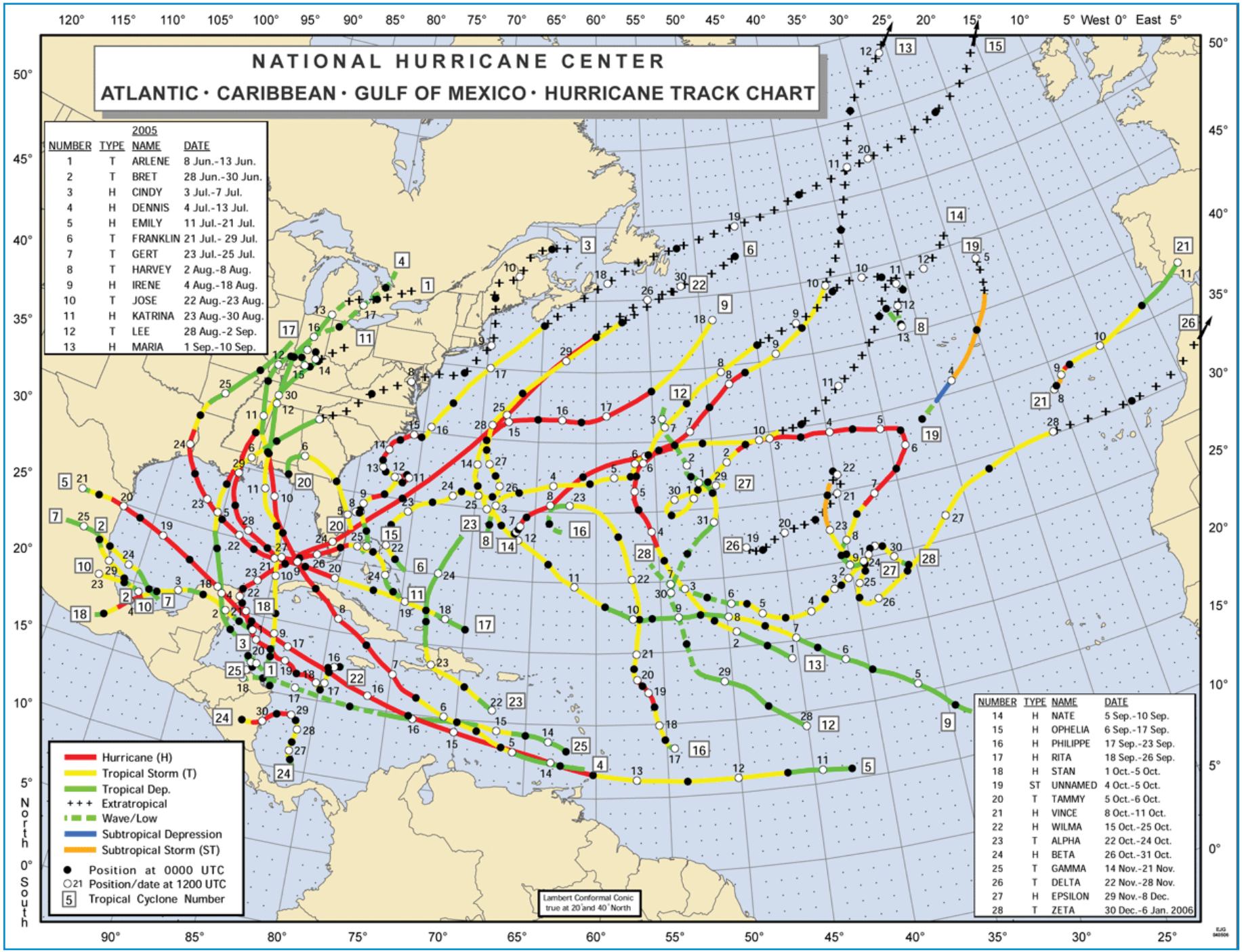
- **Tropical Depression**—An organized system of persistent clouds and thunderstorms with a closed low-level circulation and maximum *sustained* winds of 38 mph (33 knots) or less.
- **Tropical Storm**—An organized system of strong thunderstorms with a well defined circulation and maximum *sustained* winds of 39 to 73 mph (34-63 knots).
- **Hurricane**—An intense tropical weather system with a well defined circulation and *sustained* winds of 74 mph (64 knots) or higher. In the western North Pacific, hurricanes are called typhoons, and similar storms in the Indian Ocean are called cyclones.

On average each year, 11 tropical storms, 6 of which become hurricanes, develop in the Atlantic Ocean, Caribbean Sea or Gulf of Mexico. In a typical 3-year span, the U. S. coastline is struck on average five times by hurricanes, two of which are designated as major hurricanes.

While hurricanes pose the greatest threat to life and property, tropical depressions and tropical storms can also be devastating. Floods from heavy rains and severe weather, such as tornadoes, can cause extensive damage and loss of life. Tropical storm Allison produced over 40 inches of rain in the Houston area. All hurricanes and tropical storms should be taken seriously.

Tropical cyclones are sometimes steered by weak and erratic winds, making forecasting a challenge. Warnings issued from the National Oceanic and Atmospheric Administration's (NOAA) National Hurricane Center and Central Pacific Hurricane Center continue to improve and provide timely predictions to help reduce loss of life and mitigate property loss in the United States. Despite improved warnings, property damage continues to increase due to growing population on our coastlines. Federal agencies, such as the Federal Emergency Management Agency (FEMA), and organizations such as the American Red Cross, have combined with state and local agencies, rescue and relief organizations, the private sector and the news media to improve preparedness efforts.

Damage from Hurricane Camille, August 17, 1969/NOAA


NATIONAL HURRICANE CENTER
ATLANTIC · CARIBBEAN · GULF OF MEXICO · HURRICANE TRACK CHART
2005
NUMBER TYPE NAME DATE
1 T ARLENE 8 Jun.-13 Jun.
2 T BRET 28 Jun.-30 Jun.
3 H CINDY 3 Jul.-7 Jul.
4 H DENNIS 4 Jul.-13 Jul.
5 H EMILY 11 Jul.-21 Jul.
6 T FRANKLIN 21 Jul.- 29 Jul.
7 T GERT 23 Jul.-25 Jul.
8 T HARVEY 2 Aug.-8 Aug.
9 H IRENE 4 Aug.-18 Aug.
10 T JOSE 22 Aug.-23 Aug.
11 H KATRINA 23 Aug.-30 Aug.
12 T LEE 28 Aug.-2 Sep.
13 H MARIA 1 Sep.-10 Sep.
NUMBER TYPE NAME DATE
14 H NATE 5 Sep.-10 Sep.
15 H OPHELIA 6 Sep.-17 Sep.
16 H PHILIPPE 17 Sep.-23 Sep.
17 H RITA 18 Sep.-26 Sep.
18 H STAN 1 Oct.-5 Oct.
19 ST UNNAMED 4 Oct.-5 Oct.
20 T TAMMY 5 Oct.-6 Oct.
21 H VINCE 8 Oct.-11 Oct.
22 H WILMA 15 Oct.-25 Oct.
23 T ALPHA 22 Oct.-24 Oct.
24 H BETA 26 Oct.-31 Oct.
25 T GAMMA 14 Nov.-21 Nov.
26 T DELTA 22 Nov.-28 Nov.
27 H EPSILON 29 Nov.-8 Dec.
28 T ZETA 30 Dec.-6 Jan. 2006
Hurricane (H)
Tropical Storm (T)
Tropical Dep.
Extratropical
Wave/Low
Subtropical Depression
Subtropical Storm (ST)
Position at 0000 UTC
21 Position/date at 1200 UTC
5 Tropical Cyclone Number
Lambert Conformal Conic
true at 20°and 40° North
120° 115° 110° 105° 100° 95° 90° 85° 80° 75° 70° 65° 60° 55° 50° 45° 40° 35° 30° 25° 20° 15° 10° 5° West 0° East 5°
50° 45° 40° 35° 30° 25° 20° 15° 10° 5° North 0° South
90° 85° 80° 75° 70° 65° 60° 55° 50° 45° 40° 35° 30° 25°

Saffir-Simpson Hurricane Scale

The *Saffir-Simpson Hurricane Scale* is a 1 to 5 rating based on the hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes or Typhoons reaching Category 3 and higher are considered *major* hurricanes because of their potential for loss of life and damage. Category 1 and 2 storms are still very dangerous and warrant preventative measures. In the western North Pacific, the term "Super Typhoon" is used for tropical cyclones with sustained winds exceeding 150 mph. For more information on the *Saffir-Simpson Hurricane Scale*, go to **www.nhc.noaa.gov/aboutsshs.shtml**.

Saffir-Simpson Hurricane Scale

Scale Number (Category)	Sustained Winds (MPH)	Types of Damage Due to Hurricane Winds and Storm Surge	Hurricanes
1	74-95	**Minimal:** *Damage primarily to shrubbery, trees, foliage and unanchored mobile homes. No real damage to other structures. Storm surge typically 4-5 ft. above normal.*	***Irene, 1999***
2	96-110	**Moderate:** *Some trees blown down. Major damage to exposed mobile homes. Some damage to roofing materials, windows and doors. Storm surge typically 6-8 ft. above normal.*	***Georges, 1998 Floyd, 1999***
3	111-130	**Extensive:** *Large trees blown down. Mobile homes destroyed. Some structural damage to roofing materials of buildings. Some structural damage to small buildings. Storm surge typically 9-12 ft. above normal.*	***Katrina, 2005 Alicia, 1983***
4	131-155	**Extreme:** *Trees blown down. Complete destruction of mobile homes. Extensive damage to roofing materials, windows and doors. Complete failure of roofs on many small residences. Storm surge typically 13-18 ft. above normal.*	***Hugo, 1989 Charley, 2004***
5	>155	**Catastrophic:** *Complete failure of roofs on many residences and industrial buildings. Extensive damage to windows and doors. Some complete building failure. Storm surge typically greater than 18 ft. above normal.*	***Andrew, 1992 Camille, 1969 Florida Keys Hurricane, 1935***

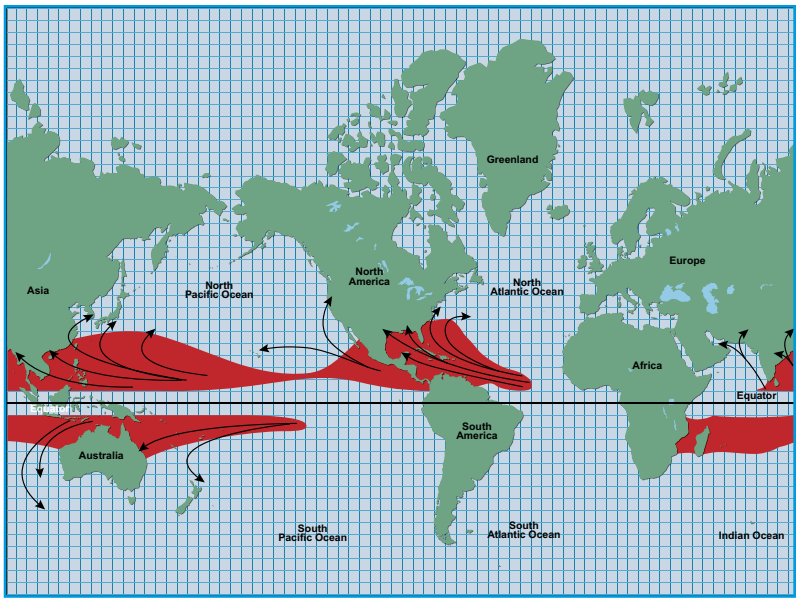
NOTE: *Damage can vary greatly and may not apply to all areas, such as Hawaii.*

How Hurricanes Form

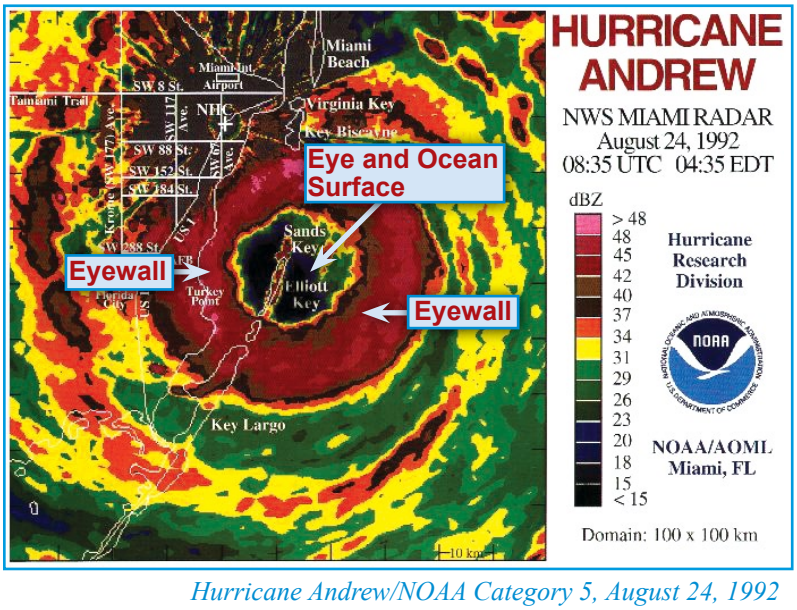
Breeding Grounds

Hurricanes are products of a tropical ocean and a warm, moist atmosphere. Powered by heat from the sea, they are typically steered by the surrounding deep layer (from the ocean's surface to 8 miles up) easterly winds, generally south of 25° north latitude and by high-level westerly winds north of 25° north latitude.

The Atlantic hurricane season starts on June 1. For the United States, the peak hurricane threat exists from mid-August to late October, although the official hurricane season extends through November 30. Over other parts of the world, such as the western North Pacific, typhoons can occur year-round.



NOAA



Hurricane Andrew/NOAA Category 5, August 24, 1992

Storm Structure

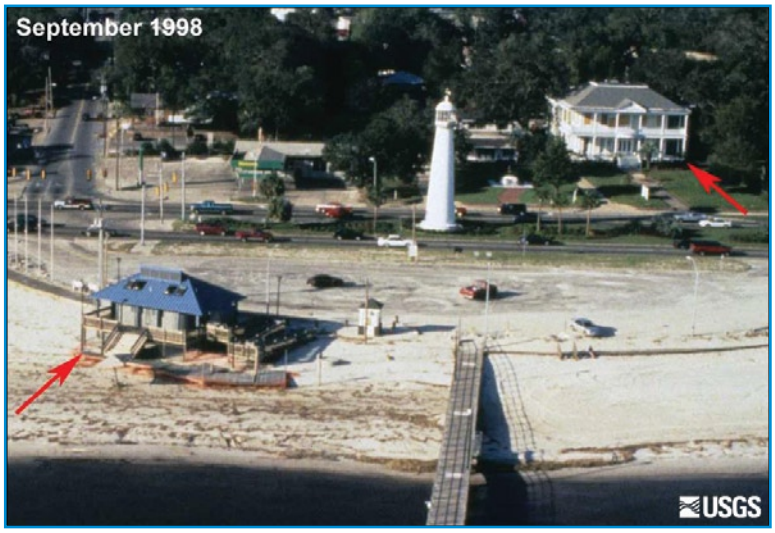
The process by which a disturbance forms and strengthens into a hurricane depends on at least three conditions. First, a disturbance gathers heat and energy through contact with warm ocean waters. Next, added moisture evaporated from the sea surface powers the seedling tropical storm like a giant heat engine. Third, the seedling storm forms a wind pattern near the ocean surface that spirals air inward. Bands of thunderstorms form, allowing the air to warm further and rise higher into the atmosphere. If the winds at these higher levels are relatively light, this structure can remain intact and further strengthen the hurricane.

The center, or eye, of a hurricane is relatively calm with sinking air, light winds and few clouds. The most violent winds and rain take place in the eyewall, the ring of thunderstorms immediately surrounding the eye. At the top of the eyewall (about 50,000 feet), most of the air is propelled outward, increasing the air's upward motion. Some of the air, however, moves inward and sinks into the eye, creating a cloud-free area.

Hurricane Impacts

Storm Surge

Storm surge can be thought of as the surface of the sea being raised due to the force of the hurricane's winds spiraling in toward the center. It is important to note that a hurricane is not a point and that the surge has both vertical and horizontal dimensions. In the vertical, the surge can reach heights of more than 20 feet near the center of a category 5 hurricane. Horizontally, the surge can fan out over several hundred miles of coastline gradually diminishing well away from the center in very large hurricanes. In any case, whether in the area of extreme danger to the right in the northern/left in the southern hemisphere of where the center moves ashore, or well away from the center on the fringes of the storm, the surge of high water topped by battering waves can be devastating. It is important to note that the stronger and larger the size of the hurricane and the shallower the offshore water, the higher the surge will be. Storm surge is by far the greatest threat to life and property along the immediate coast.

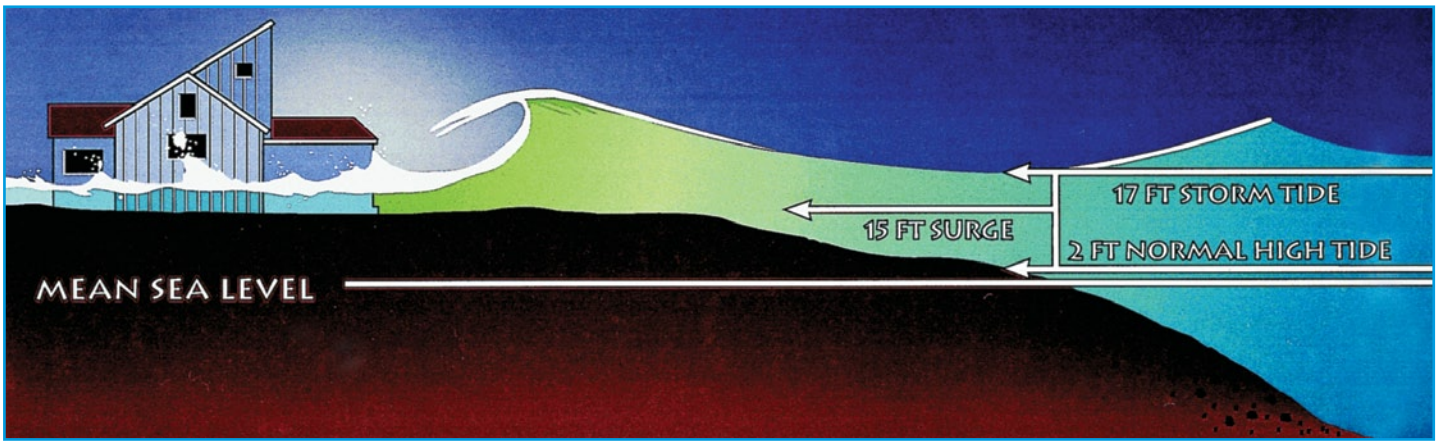


Before Hurricane Katrina, September 1998—Biloxi, MS/USGS

After Hurricane Katrina August 31,2005—Biloxi, MS/USGS

Storm Tide

The storm tide is the combination of the storm surge and the astronomical tide. If the storm surge arrives at high tide, the water height will be even greater. For example, as a hurricane moves ashore, a 15-foot surge added to the 2-foot high tide creates a storm tide of 17 feet. This mass of water, topped by battering waves, moves ashore along an area of the coastline as much as 100 miles wide. The combination of the storm surge, battering waves and high winds can be deadly and can cause great property damage.



Storm Tide Facts

- More than 8,000 people were killed in the 1900 Galveston hurricane, most by the storm tide.
- Hurricane Camille in 1969 produced a 24-foot storm tide in Mississippi.
- Hurricane Hugo in 1989 generated a 20-foot storm tide in South Carolina.
- Hurricane Katrina in 2005 generated a 27-foot storm tide in Mississippi.

- **Hurricane Andrew**—August 16-28, 1992: Destroyed over 25,000 homes and damaged over 100,000 others - primarily through wind-caused damage. Wind gusts in south Florida were estimated to be at least 175 mph.
- **Hurricane Hugo**—September 10-22, 1989: Wind gusts reached nearly 100 mph as far inland as Charlotte, North Carolina. Hugo sustained hurricane-strength winds until shortly after it passed west of Charlotte.
- **Hurricane Ivan** —September 2-24, 2004: Generated 117 tornadoes (a record number in the United States) in nine different states, in addition to devastating storm surge and wind-caused damages along the coasts of Alabama and northwest Florida.
- **Hurricane Katrina**—August 23-30, 2005: Damage in the U.S. estimated at 81 billion, making Katrina the most expensive hurricane in U.S. history.

Tornadoes

Hurricanes and tropical storms 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. Usually, tornadoes produced by tropical cyclones are relatively weak and short-lived, but still pose a threat.

Hurricane Frances tornado damage, Sumter County, SC September 6, 2004/ Photo by Marvin Nauman/FEMA

Hurricane Isabel wind damage, Colonial Beach, VA September 30, 2003/ Photo by Andrea Booher/FEMA

Winds

Hurricane-force winds, 74 mph or more, can destroy buildings and mobile homes. Debris, such as signs, roofing material, siding, and small items left outside, become flying missiles in hurricanes. Winds can stay above hurricane strength well inland. Hurricane Hugo (1989) battered Charlotte, North Carolina—about 175 miles inland—with gusts to near 100 mph, downing trees and power lines.

Inland/Freshwater Flooding

All tropical cyclones can produce widespread torrential rains often in excess of 6 inches. This rain can produce deadly and destructive floods. Heavy rain can trigger landslides and debris flows, especially in mountainous regions. Flooding is the major threat from tropical cyclones to people well inland. Flash flooding, a rapid rise in water levels, can occur quickly due to intense rainfall. Longer term flooding on rivers and streams can persist for several days after the storm.

Intense rainfall is not directly related to the winds of tropical cyclones but rather to the speed of movement and geography of the area affected. Slower moving storms produce more rainfall. Mountainous terrain enhances rainfall from a tropical cyclone. Inland flooding can be a major threat to people hundreds of miles from the coast.

Hurricane Ivan flooding, Ashville, NC/ Photo by Leif Skoogfors/FEMA

- **Tropical Storm Allison (2001)** was the most costly tropical storm in U.S. history with more than $5 billion in flood damage to southeast Texas and southern Louisiana. 23 deaths were reported in Texas and one in Louisiana.
- **Hurricane Floyd (1999)** brought extremely heavy rainfall to many locations in the eastern United States. Of the 56 people who perished in this country during Floyd, 50 died from inland flooding, including 35 in North Carolina.
- **Tropical Storm Alberto (1994)** produced tremendous rainfall along the Gulf coasts of Alabama and Georgia, killing 33 people and producing damages exceeding $750 million.
- **Hurricane Agnes (1972)** fused with another storm system, producing floods in the Northeast United States which contributed to 122 deaths and $6.4 billion in damage.
- **Hurricane Camille (1969)** produced maximum rainfall near 30 inches along the eastern slopes of the Alleghenies, resulting in flash floods that took more than 100 lives.

U.S. Hurricane Problem

Waikiki Beach, December 1969/NOAA

Population Growth

The United States has a significant hurricane problem as the coastal population continues to rapidly increase. More than one in six Americans now live in a county abutting the eastern Atlantic or Gulf of Mexico coast, and this does not include those living in Puerto Rico or Hawaii. In the more popular resort areas, numbers can swell 10- to perhaps 100-fold when holiday, weekend, and vacation visitors arrive. From Maine to Texas, our coastlines are filling with new homes, condominium towers and cities built on sand. These homes are waiting for the next storm to threaten its residents' dreams. In fact, the coastal population is expected to double between now and 2010. The most significant danger to coastal citizens is from the hurricane's storm surge.

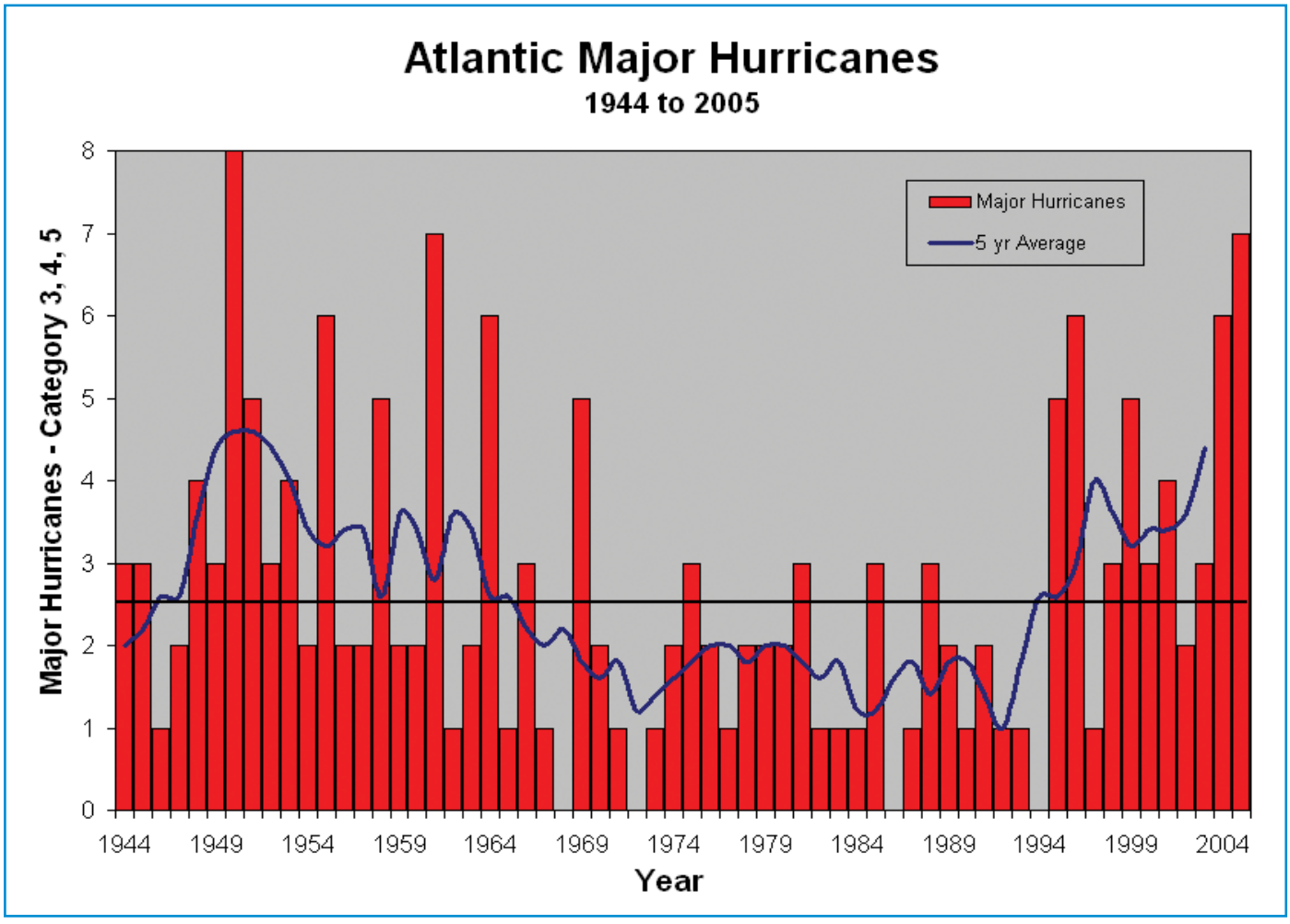
Perception of Risk

Over the past several years, the hurricane warning system has provided adequate time for people on the barrier islands and the immediate coastline to move inland when hurricanes threaten. However, it is becoming more difficult to evacuate people from the barrier islands and other coastal areas because road improvements have not kept pace with the rapid population growth. The problem is further compounded because 80 to 90 percent of the population now living in hurricane-prone areas have never experienced the core of a "major" hurricane. Many of these people have been through weaker storms or only outer rain bands of intense hurricanes. The result is a false impression of a major hurricane's damage potential. This can lead to complacency and delayed actions resulting in injuries and loss of lives.

Frequency of Hurricanes

During the ‘70s, ‘80s and ‘90s, major hurricanes striking the United States were less frequent than the previous three decades. With the tremendous increase in population along the high-risk areas of our shorelines, the United States may not fare as well in the future. Some hurricane experts think the frequency of major hurricanes making landfall in the United States will increase over the next few decades.

In the final analysis, the only real defense against hurricanes is the informed readiness of your community, your family and **YOU**.



NOAA

Coastal Areas At Risk

Coastal Areas and Barrier Islands

All Atlantic and Gulf coastal areas as well as the U.S. Pacific Islands are subject to hurricanes/typhoons or tropical storms. Although rarely struck by hurricanes, parts of the southwest United States and Pacific Coast can experience heavy rains and floods from the remnants of hurricanes spawned off Mexico. Hawaii and the U.S. territories, such as Guam, American Samoa and Puerto Rico, are also subject to hurricanes. Hurricane Iniki struck Kauai, Hawaii, on September 11, 1992, resulting in $2.5 billion in damage. During 1992, Guam was battered by five typhoons. On December 16, 1997, Guam was hit by Super Typhoon Paka, causing over $520 million in damage.

Due to the limited number of evacuation routes, barrier islands such as the Outer Banks of North Carolina and areas like the Florida Keys and New Orleans, Louisiana, are especially vulnerable to hurricanes. People living near coastal areas may be asked by local officials to evacuate well in advance of a hurricane landfall. **If you are asked to leave your home, do so IMMEDIATELY!**

Miami Beach, FL/NOAA

Hurricane landfalls in the U.S. since 1950-2005/National Climatic Data Center/NOAA

Tracking the Storm

Geostationary Operational Environmental Satellite/NOAA

Satellite

Geostationary satellites from space at an altitude of about 22,000 miles above the equator provide imagery day and night. This satellite imagery is a valuable tool helping to provide estimates of the location, size and intensity of a storm and its surrounding environment.

Reconnaissance Aircraft

The U.S. Air Force Reserve provides most of the hurricane reconnaissance used by the National Hurricane Center. Pilots fly the planes into the core of a hurricane to measure wind, pressure, temperature and humidity as well as to provide an accurate location of the center of the hurricane. NOAA also flies aircraft into hurricanes to aid scientists in better understanding these storms and to improve forecast capabilities.

WC-130H, Hurricane Hunters/ U.S. Air Force Reserve

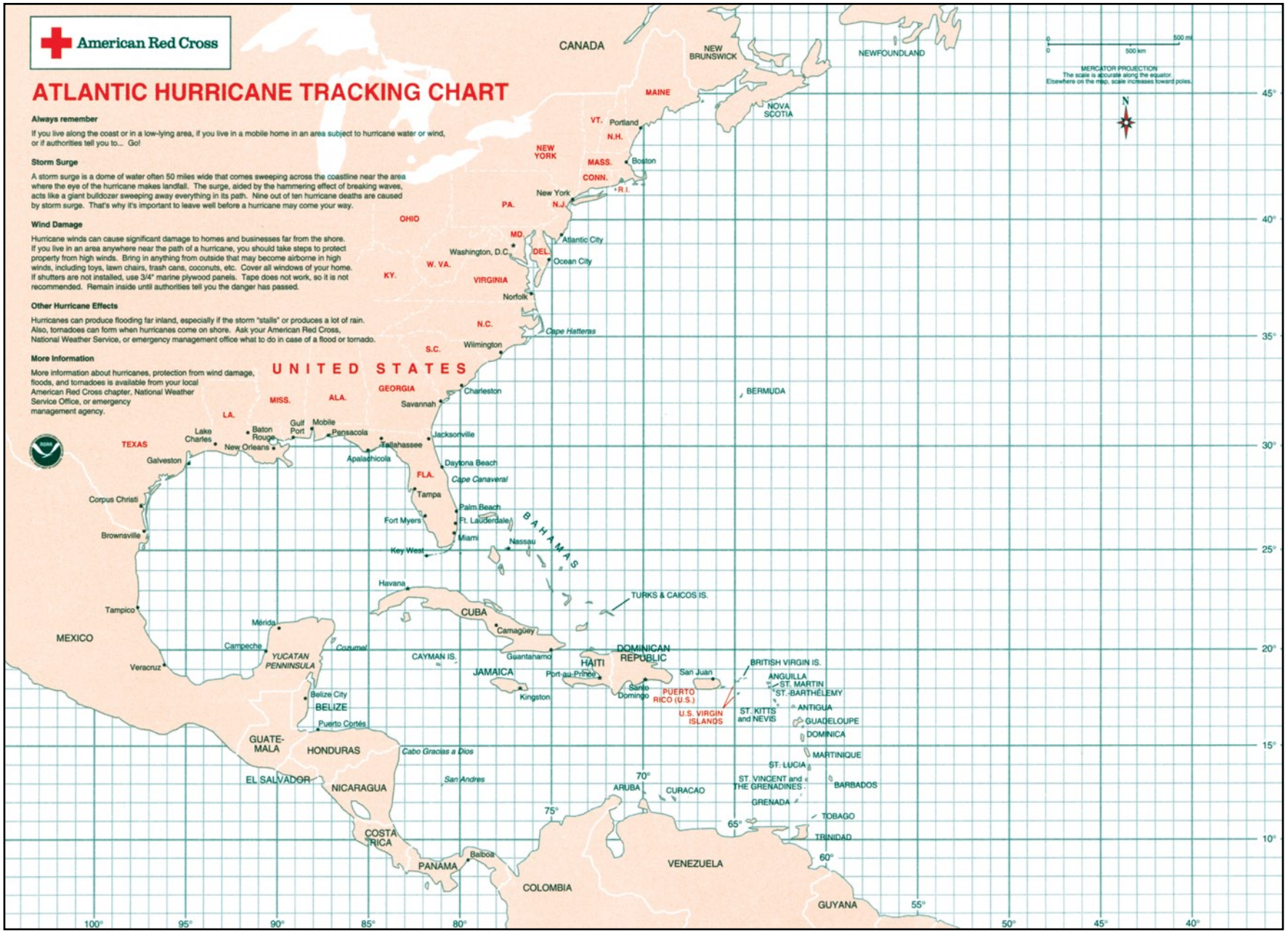
WSR-88D Radar/NOAA

Radar

When a hurricane gets close to the coast, it is monitored by land-based weather radars. The NWS Doppler weather radars, equipped with the latest advanced technology, add new dimensions to hurricane warning capabilities. It provides detailed information on hurricane wind fields and its changes. Local NWS offices are able to provide accurate short-term warnings for floods, inland high winds and any other weather hazards associated with a tropical cyclone.

Tropical Prediction Center's Use of Hurricane Forecast Models

The NWS National Hurricane Center and Central Pacific Hurricane Center use several different numerical computer and statistical models to aid in forecasting the path, speed and strength of hurricanes. Data from weather satellite sensors, reconnaissance aircraft and other sources are fed into these computer models. The National Hurricane Center also has a computer storm surge model. This model provides guidance on storm surge height and the extent of flooding it will cause.



NOAA PA 96071

http://www.nws.noaa.gov/om/brochures/atlchartshpmillclr.pdf

Don’t Focus on the Skinny Black Line!!!

Weather forecasting has never been and will likely never be an exact science. Thus, the ability to forecast the exact track of a hurricane will always present a challenge for hurricane forecasters and more importantly those who use hurricane track forecasts as guidance to make decisions on evacuations. The two graphics presented on the next page are examples of two highly used forecast products issued by the Tropical Prediction Center in Miami Florida. These are the actual Tropical Prediction Center forecast products for track and wind swath produced for what was at the time Tropical Storm Katrina. As we all know, Katrina went on to become the infamous monster that unleashed terrible destruction on the Gulf Coasts of Louisiana and Mississippi in August of 2005. First off, while it is apparent in figure 1 that the center of Katrina was denoted as a point, the reality is that a tropical storm or hurricane in NOT a point on a map and that storm surge damage, wind damage and in fact loss of life can occur many miles from the center of the storm. At the time that these forecast products were issued, areas which would in fact take the brunt of the storm were on the edge of the “cone of uncertainty” denoted by the hatched area. Anyone living in Biloxi or New Orleans who made the mistake of focusing strictly on the skinny black line denoting the forecast track of the center of Katrina, probably assumed that the worst of the storm would remain to their east. As it turned out, it would have been far better to focus on the entire cone of uncertainty since in reality, Katrina tracked very close to the western edge of the cone.

In figure 1, the white and hatched regions briefly explained are the cone of uncertainty which show the average track errors during the last ten years superimposed on the “skinny black line” which represents the forecast track for the center of the storm. Because of improvements in forecasts, the forecast track today remains within the cone for the entire five days about two-thirds of the time. This means that if your area lies within the cone, it is wise to assume that you could easily take a direct hit, and even if your area does not take a direct hit, you could still be in serious danger.

Figure 2, is a new product that provide the actual chance for every location of experiencing at least tropical storm (39 mph or greater) sustained winds over the following five days. This new tool is an improvement over what has been made available in that it takes into account uncertainty in track, peak winds, and the size of the storm. This is the first product that explicitly gives information about the possible wind impact at individual locations.

The main point to consider is the eventual track of Katrina was well to the west of the “skinny black line” and the catastrophic damage that was inflicted during landfall fell well within the cone of uncertainty several days after these forecast products. Based on this, the best advice to residents facing a potential land falling hurricane is; a hurricane is not a point on a map, the dangerous effects of a hurricane reach well away from the center so “Don’t Focus On The Skinny Black Line!!”

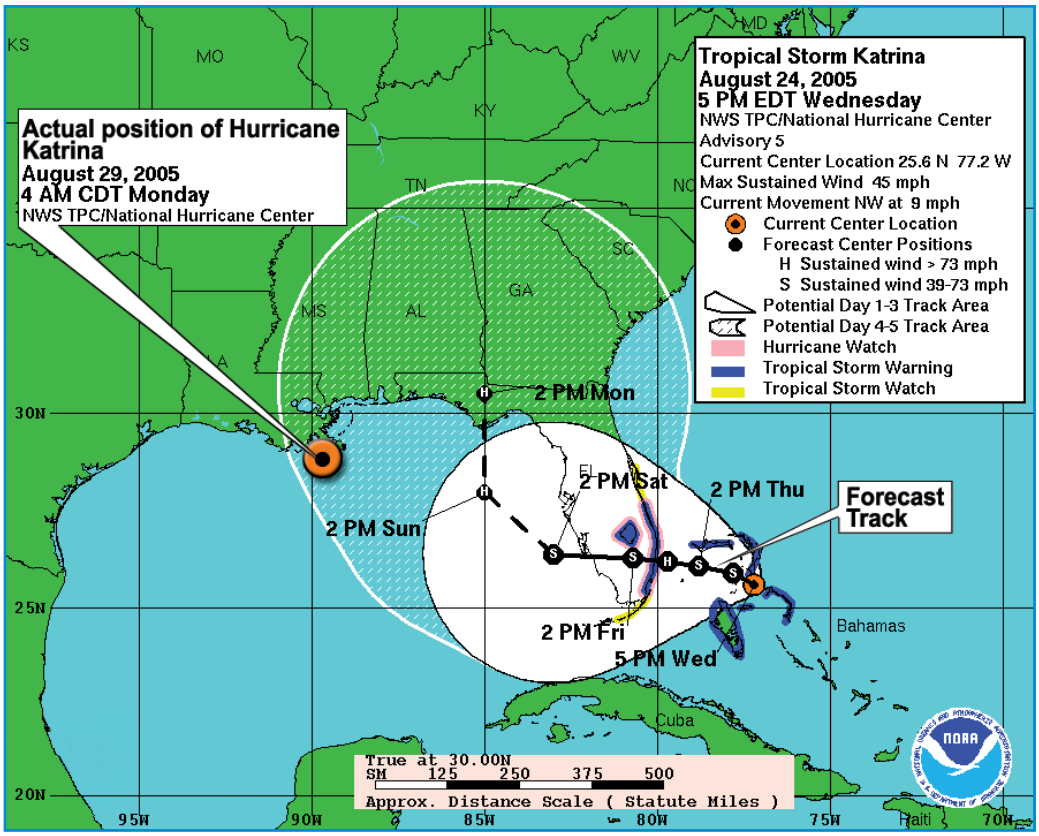


Figure1. Coastal Watches/Warnings and 5-Day Cone Forecast for Katrina issued 5 PM Wednesday, August 24, 2005/NOAA

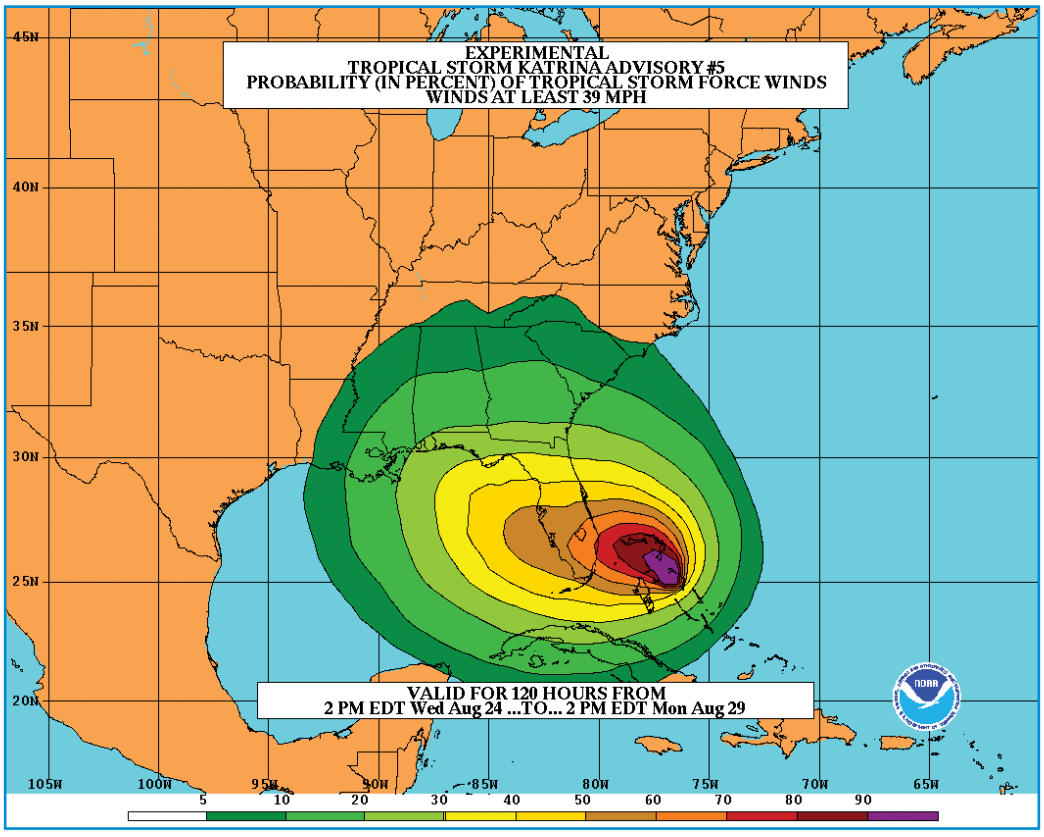


Figure2. Tropical Storm Force Wind Speed probabilities - 120 hour, for Katrina issued 5 PM Wednesday, August 24, 2005/NOAA

*** These products can be found at **http://www.nhc.noaa.gov**

Stay Informed!

NOAA Weather Radio All Hazards

NOAA Weather Radio All Hazards (NWR) is the prime National Weather Service (NWS) delivery system of alerts and critical information directly to the general public. NWR broadcasts warnings, watches, forecasts and other hazard information 24 hours a day. Known as the "voice of the NWS," the NWR network has more than 950 stations, reaching over 97 percent of the population of the 50 states, along with the adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands and U.S. Pacific territories.

Most weather radio receivers are equipped with a special alarm tone feature that will sound day or night when a warning or watch is issued for your area, giving you immediate information about potentially life-threatening situations. Newer weather radios use Special Alert Message Encoding (SAME), which allows you to specify the particular area (normally a county or group of counties) for which you wish to receive alerts. Some weather radio receivers allow people with hearing and visually impaired to connect devices such as strobe lights, pagers, bed-shakers, personal computers and text printers.

NWS encourages people to buy a weather radio receiver which carries the "Public Alert" logo. The "Public Alert" standard for weather radios was developed by the Consumer Electronics Association in conjunction with NWS. "Public Alert" certified receivers, produced by several manufacturers, meet several minimum criteria, are equipped with SAME and battery backup (useful for when the power goes out), and have connections for external antennas and the special devices for the hearing and visually impaired.

More information on NOAA Weather Radio All Hazards and "Public Alert" receivers can be found by contacting your local NWS office or on the Internet at: **http://www.nws.noaa.gov/nwr.**

All Hazards NOAA Weather Radio
NOAA National Weather Service™

Emergency Managers Weather Information Network

The Emergency Managers Weather Information Network (EMWIN) offers an economical way to receive all products available on NWWS, plus graphical forecasts and select satellite data. For details, go to **http://iwin.nws.noaa.gov/emwin/index.htm**.

Interactive Weather Information Network

The Interactive Weather Information Network (IWIN) is a Web site with live data similar to EMWIN. It is open to all users and contains warnings in addition to many routine NWS products. To view IWIN products, go to **http://iwin.nws.noaa.gov**.

Internet Resources

More hurricane information and news is just a click away.

- National Weather Service: www.nws.noaa.gov
- National Hurricane Center: www.nhc.noaa.gov
- Central Pacific HurricaneCenter: www.nws.noaa.gov/pr/hnl/cphc/pages/cphc.shtml

Links to local NWS Offices

- NWS Eastern Region: www.erh.noaa.gov
- NWS Southern Region: www.srh.noaa.gov
- NWS Pacific Region: www.nws.noaa.gov/pr

Historical Information

- Nat'l Climatic Data Center: www.ncdc.noaa.gov
- NOAA Coastal Services Center: hurricane.csc.noaa.gov/hurricanes

Other Emergency Information Sites

- American Red Cross: www.redcross.org
- FEMA: www.fema.gov
- U.S. Geological Survey: www.usgs.gov/hurricanes

What To Listen For

- **HURRICANE/TROPICAL STORM WATCH:** Hurricane/tropical storm conditions are possible in the specified area of the **Watch**, usually within 36 hours. During a **Watch**, prepare your home and review your plan for evacuation in case a Hurricane/Tropical Storm **Warning** is issued.

- **HURRICANE/TROPICAL STORM WARNING:** Hurricane/tropical storm conditions are expected in the specified area of the **Warning**, usually within 24 hours. Complete storm preparations and leave the threatened area if directed by local officials.

- **SHORT TERM WATCHES AND WARNINGS:** These warnings provide detailed information on specific hurricane threats, such as floods and tornadoes.

- **FLOOD/FLASH FLOOD WATCH:** This product informs the public and cooperating agencies of *possible* flooding. If you are in a **Watch** area, check flood action plans, keep informed and be ready to act if a warning is issued or you see flooding.

- **FLOOD/FLASH FLOOD WARNING:** A flood/flash flood **Warning** is issued for specific communities, streams or areas where flooding is imminent or in progress. Persons in the warning area should take precautions IMMEDIATELY!

National Hurricane Center and Central Pacific Hurricane Center Products

PUBLIC ADVISORIES offer critical hurricane watch, warning and forecast information.

FORECASTS/ADVISORIES provide detailed hurricane track and wind field information.

PROBABILITIES OF HURRICANE/TROPICAL STORM CONDITIONS offer locally specific chances of experiencing tropical storm, strong tropical storm, and hurricane force winds out to five days to better know if one will be impacted and when these conditions may occur.

Local NWS Office Products

HURRICANE LOCAL STATEMENTS give greater detail on how the storm will impact your area.

NON-PRECIPITATION WEATHER PRODUCTS provide watches and warnings for inland areas which could experience tropical storm or hurricane force winds.

All of the above information must be used to make an informed decision on your risk and what actions should be taken. Remember to listen to your local official's recommendations and to NOAA Weather Radio for the latest hurricane information.

Are You Ready?

Before the Hurricane Season

- ✔ Determine safe evacuation routes inland.
- ✔ Learn location of official shelters.
- ✔ Make emergency plans for pets.
- ✔ Check emergency equipment, such as flashlights, generators and battery-powered NOAA Weather Radio All Hazards and cell phones.
- ✔ Buy food that will keep and store drinking water.
- ✔ Buy plywood or other material to protect your home.
- ✔ Clear loose and clogged rain gutters and downspouts.
- ✔ Trim trees and shrubbery.
- ✔ Decide where to move your boat in an emergency.
- ✔ Determine where to move your boat in an emergency.
- ✔ Review your insurance policy.

Terms to Know

Hurricane Watch: Hurricane conditions are *possible* in the specified area of the watch, usually within 36 hours.

Hurricane Warning: Hurricane conditions are *expected* in the specified area of the warning, usually within 24 hours.

Tropical Storm Watches and Warnings: Take these alerts seriously. Although Tropical Storms have lower wind speeds than hurricanes, they often bring life-threatening flooding and dangerous winds. Take precautions!

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During the Storm

When in a Watch Area...

- ✔ Frequently listen to radio, TV or NOAA Weather Radio for official bulletins of the storm's progress.
- ✔ Fuel and service family vehicles.
- ✔ Inspect and secure mobile home tie downs.
- ✔ Have extra cash on hand.
- ✔ Prepare to cover all windows and doors with shutters or other shielding materials.
- ✔ Check batteries and stock up on canned food, first-aid supplies, drinking water and medications.
- ✔ Bring in light-weight objects such as garbage cans, garden tools, toys and lawn furniture.

Plan to leave if you...

- ✔ Live in a mobile home. They are unsafe in high winds no matter how well fastened to the ground.
- ✔ Live on the coastline, an offshore island, or near a river or a flood plain.
- ✔ Live in a high-rise building. Hurricane winds are stronger at higher elevations.

When in a Warning area...

- ✔ Closely monitor radio, TV or NOAA Weather Radio All Hazards for official bulletins.
- ✔ Close storm shutters.
- ✔ Follow instructions issued by local officials. **Leave immediately if ordered!**
- ✔ If evacuating, leave as soon as possible. Stay with friends or relatives, at a low-rise inland motel or at a designated public shelter outside the flood zone.
- ✔ **DO NOT** stay in a mobile or manufactured home.
- ✔ Notify neighbors and a family member outside of the warned area of your evacuation plans.
- ✔ Take pets with you if possible, but remember, most public shelters do not allow pets other than those used by the handicapped. Identify pet-friendly motels along your evacuation route.

If Staying in a Home...

- ✔ Turn refrigerator to maximum cold and keep closed.
- ✔ Turn off utilities if told to do so by authorities.
- ✔ Turn off propane tanks.
- ✔ Unplug small appliances.
- ✔ Fill bathtub and large containers with water in case tap water is unavailable. Use water in bathtubs for cleaning and flushing only. Do NOT drink it.

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What to Bring to a Shelter

- First aid kit
- Medicine, prescriptions
- Baby food and diapers
- Games, books, music players with headphones
- Toiletries
- Battery-powered radio and cell phone
- Flashlights
- Extra batteries
- A blanket or sleeping bag for each person
- Identification
- Copies of key papers such as insurance policies
- Cash, credit card

REMINDER: If you are told to leave, do so immediately!

If Winds Become Strong...

- ✔ Stay away from windows and doors, even if they are covered. Take refuge in a small interior room, closet or hallway.
- ✔ Close all interior doors. Secure and brace external doors.
- ✔ If you are in a two story house, go to an interior 1st floor room.
- ✔ If you are in a multi-story building and away from water, go to the 1st or 2nd floor and stay in the halls or other interior rooms away from windows.
- ✔ Lie on the floor under a table or other sturdy object.

Be Alert For...

- ✔ Tornadoes. They are often spawned by hurricanes.
- ✔ The calm “eye” of the storm. It may seem like the storm is over but after the eye passes, the winds will change direction and quickly return to hurricane force.
- ✔ Storm surge flooding. These high waves can be more deadly than hurricane winds. Leave the coast and stay away from low lying areas, creeks, streams and other inland waterways.

After the Storm

- ✔ Keep listening to radio, TV or NOAA Weather Radio.
- ✔ Wait until an area is declared safe before entering.
- ✔ Watch for closed roads. If you come upon a barricade or a flooded road, **Turn Around Don't Drown!™**
- ✔ Avoid weakened bridges and washed out roads.
- ✔ Stay on firm ground. Moving water only 6 inches deep can sweep you off your feet. Standing water may be electrically charged from power lines.
- ✔ Once home, check gas, water and electrical lines and appliances for damage.
- ✔ Use a flashlight to inspect for damage. Never use candles and other open flames indoors.
- ✔ Do not drink or prepare food with tap water until officials say it is safe.
- ✔ If using a generator, avoid carbon monoxide poisoning by following manufactuer's instructions
- ✔ Avoid electrocution by not walking in flooded areas with downed power lines.

NWS hurricane links, forecasts, assessments:
http://www.weather.gov/os/hurricane

NOAA Weather Radio All Hazards:
http://www.weather.gov/nwr

National Hurricane Center:
http://www.nhc.noaa.gov

Central Pacific Hurricane Center:
http://weather.gov/cphc

NOAA Hurricane Website:
http://hurricanes.noaa.gov/

American Red Cross:
http://www.redcross.org

Federal Emergency Management Agency:
http://www.fema.gov

Community Preparedness Plans

Each community subject to a hurricane threat should develop its own hurricane safety plan. After you have developed a personal/family safety plan, find out about your community safety plan. Local officials should have detailed information for your immediate area. Please listen to and follow their recommendations before, during and after the storm.

Is Your Community StormReady?

To help Americans prepare for the ravages of hazardous weather, the National Weather Service has designed StormReady, a program aimed at arming America's communities with the communication and safety skills necessary to save lives and property. More information is available at **www.nws.noaa.gov/stormready**.

StormReady
NATIONAL WEATHER SERVICE ®

Family Disaster Plan

Prepare for hazards that could affect your area with a family disaster plan. Where will your family be when disaster strikes? They could be at work, school or in the car. How will you find each other? Will you know if your children are safe? Disaster may force you to evacuate your neighborhood or confine you to your home. What would you do if basic services—water, gas, electricity or telephones—were cut off?

Steps to Take

I **Gather information about hazards.** Contact your local National Weather Service office, emergency management office, and American Red Cross chapter. Find out what type of disasters could occur and how you should respond. Learn your community's warning signals and evacuation plans. Assess your risks and identify ways to make your home and property more secure.

II **Meet with your family to create a disaster plan.** Discuss your plan with your family. Pick two places to meet: a spot outside your home for an emergency, such as fire, and a place away from your neighborhood in case you can't return home. Choose an out-of-state friend as your "family check-in contact" for everyone to call if the family gets separated. Discuss what you would do if advised to evacuate.

III **Implement your plan.**

1. Post emergency telephone numbers by the phone.
2. Install safety features in your house, such as smoke alarm and fire extinguishers.
3. Inspect your home for potential hazards (items that can move, fall, break or catch fire) and correct them.
4. Have your family learn basic safety measures, such as CPR and first aid; how to use a fire extinguisher; and how and when to turn off water, gas and electricity in your home.
5. Teach children how and when to call 911 or your local Emergency number.
6. Keep enough supplies in your home for at least 3 days. Assemble a disaster supplies kit. Store these supplies in sturdy, easy-to-carry containers, such as backpacks or duffle bags. Keep important documents

A Disaster Supplies Kit Should Include:

- A 3-day supply of water (one gallon per person, per day)
- Non-perishable food
- One change of clothing and shoes per person
- Prescription & non-prescription medicines
- One blanket or sleeping bag per person
- First-aid kit
- Battery-powered NWR and a portable radio
- Emergency tools
- Flashlight, extra batteries
- Extra set of car keys and a credit card or cash
- Special items for infant, elderly or disabled family members

IV **Practice and maintain your plan.** Ensure your family knows meeting places, phone numbers and safety rules. Conduct drills. Test your smoke alarms monthly and change the batteries at least once each year. Test and recharge your fire extinguisher(s) according to manufacturer's instructions. Replace stored water and food every 6 months. Contact your local National Weather Service office, American Red Cross chapter or emergency management office for a copy of "Preparing for Disaster" (Red Cross A4600/ FEMA475).

LOCAL SPONSORSHIP:

American Red Cross A5030 Revised September 2006 NOAA/PA 94050