Storm Signals

Houston/Galveston National Weather Service Office

Volume 79 Summer 2008

New Meteorologist-In-Charge

Gene Hafele has been selected as the new Meteorologist In Charge (MIC) of the Houston/Galveston National Weather Service (HGX). It was announced by Bill Proenza on April 15th at the Emergency Management Luncheon during the Hurricane Awareness Tour at Moody Gardens in Galveston.

Gene began his National Weather Service (NWS) career in July 1974 in Fort Worth, Texas after graduating from Texas A&M University with a Bachelor of Science Degree in Meteorology. In 1977, Gene transferred to the Houston Weather Service Office (WSO) which was located in Alvin, Texas at the time. Gene's job title was the Disaster Preparedness Meteorologist. In 1979, Gene was promoted to the MIC of the Galveston WSO which was located on Galveston Island. Gene was the MIC of the Galveston WSO when Tropical Storm Claudette made landfall and dumped 43 inches of rain in Alvin in 24 hours. In 1980, Gene moved back to Fort Worth to become a journeyman forecaster at the Weather Service Forecast Office. In 1981, Gene left Fort Worth again to become one of the first forecasters to work at the newly established National Aviation Weather Unit in Kansas City, Missouri. In 1984, Gene moved back to Texas to work at the Spaceflight Meteorology Group at the Johnson Space Center in Houston. In this position, Gene was a lead forecaster that provided weather support for the landing of the space shuttle. Gene provided this specialized support for nearly 10 years.

In the fall of 1993, Gene became the Warning and Coordination Meteorologist (WCM) at HGX. Gene remained the WCM at HGX for the last 15 years. During those 15 years as WCM, Gene led a very aggressive outreach program that involved many members of the staff. This program provided meteorological support to the emergency management community in 23 counties of southeast Texas. Gene became acquainted with all of the emergency managers in all 23 counties that HGX was responsible for by providing hazardous weather support. The outreach program provided by HGX was recognized as one of the most aggressive in the Southern Region of the United States.

Under Gene's leadership as the new MIC, he plans to continue the aggressive outreach program. One of the first objectives will be to hire a new WCM that will lead the outreach program to higher levels and involve more of the staff. The new WCM will be onboard in early August before the heart of the hurricane season begins along the upper Texas coast.

Gene has enjoyed being the WCM at HGX for the past 15 years. He says it has been fun and challenging. He looks forward to being the new MIC for HGX. As the MIC, he plans on continuing to serve the citizens of southeast Texas by providing them information that will allow them to protect their property and lives from hazardous weather.

In this Issue:

2008 Atlantic Basin Hurricane Season Outlook
Issued May 22, 2008

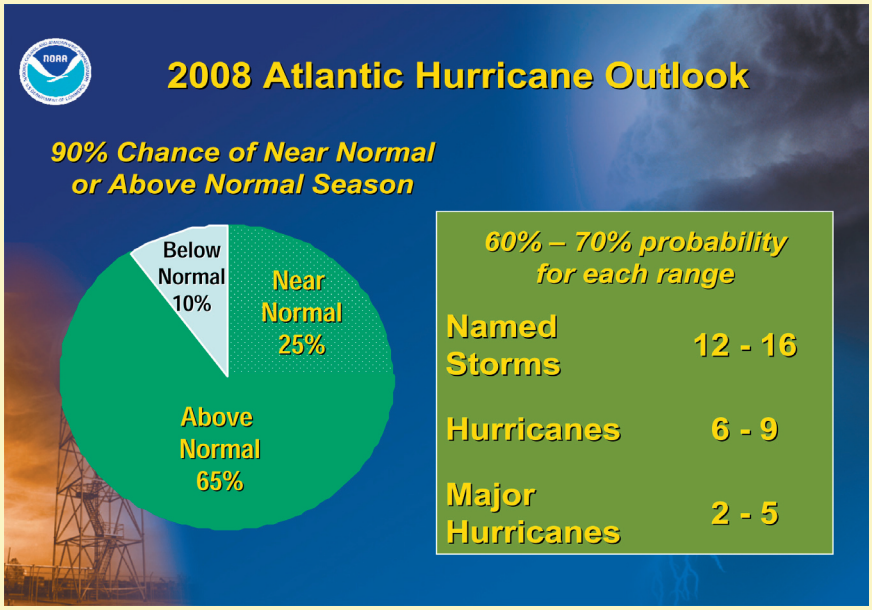
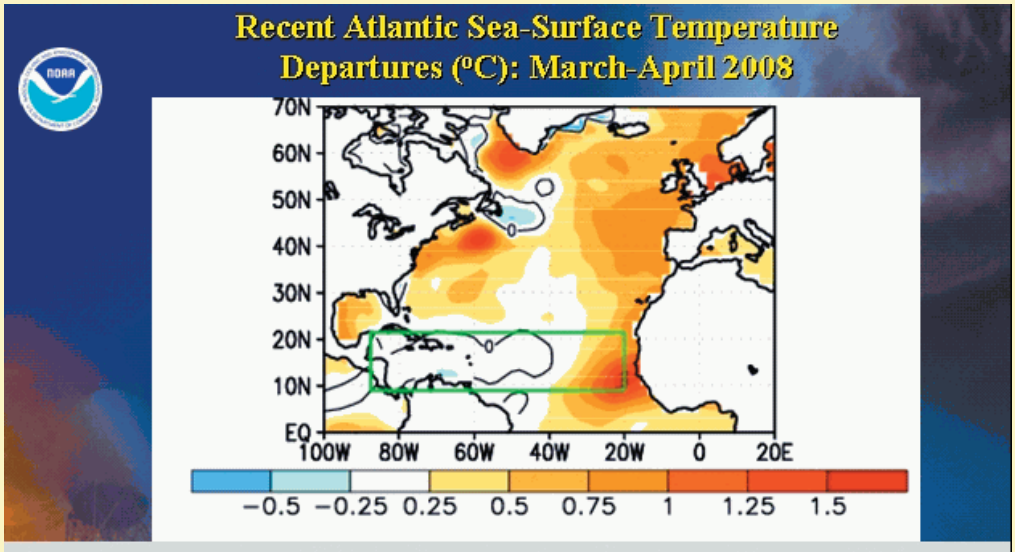


Figure 1 showing CPC's 2008 Atlantic Basin Hurricane Season Outlook.

NOAA's Climate Prediction Center (CPC) indicates that projected climate conditions point to a near normal or above normal hurricane season in the Atlantic Basin this year. The CPC outlook calls for considerable activity with a 65 percent probability of an above normal season and a 25 percent probability of a near normal season. This means there is a 90 percent chance of a near or above normal season (see Figure 1).

The climate patterns expected during this year's hurricane season have in past seasons produced a wide range of activity and have been associated with both near-normal and above-normal seasons. For 2008, the outlook indicates a 60 to 70 percent chance of 12 to 16 named storms, including 6 to 9 hurricanes and 2 to 5 major hurricanes (Category 3, 4 or 5 on the Saffir-Simpson Scale). Most of this activity is expected during August through October, the peak months of the Atlantic hurricane season. An average season has 11 named storms, including six hurricanes for which two reach major status. This outlook is a general guide to the overall seasonal hurricane activity – it does not predict whether, where or when any of these storms may hit land.

The science behind CPC's seasonal outlooks is rooted in the analysis and prediction of current and future global climate patterns as compared to previous seasons with similar conditions. The main factors influencing this year's seasonal outlook are the continuing multi-decadal signal (the combination of ocean and atmospheric conditions that have spawned increased hurricane activity since 1995), and the anticipated lingering effects of La Niña. One of the expected oceanic conditions is a continuation since 1995 of warmer-than-normal temperatures in the eastern tropical Atlantic (see Figure 2).



•Sea-surface temperatures (SSTs) in the eastern Main Development Region (MDR, green box) were above average during March and April 2008.

•Slightly below average SST in the central and western MDR are related to La Niña, and to strong northeasterly winds. SSTs are expected to warm in this region during the summer.

•SST also remain well above average at higher latitudes.

Figure 2 showing eastern tropical Atlantic above normal temperatures during March-April 2008.

Other ongoing regional features expected during the 2008 hurricane season include 1) lower surface air pressure and increased moisture across the tropical Atlantic, 2) an amplified ridge at upper levels across the central and eastern subtropical North Atlantic, 3) reduced vertical wind shear in the deep tropics over the central North Atlantic, which results from an expanded area of easterly winds in the upper atmosphere (green arrows in Figure 3) and weaker easterly trade winds in the lower atmosphere (dark blue arrows in Figure 3), and 4) weaker easterly winds in the middle and lower atmosphere, resulting in a configuration of the African easterly jet (wavy blue arrow in Figure 3) that favors hurricane development from tropical waves moving westward from the African coast (see Figure 3).

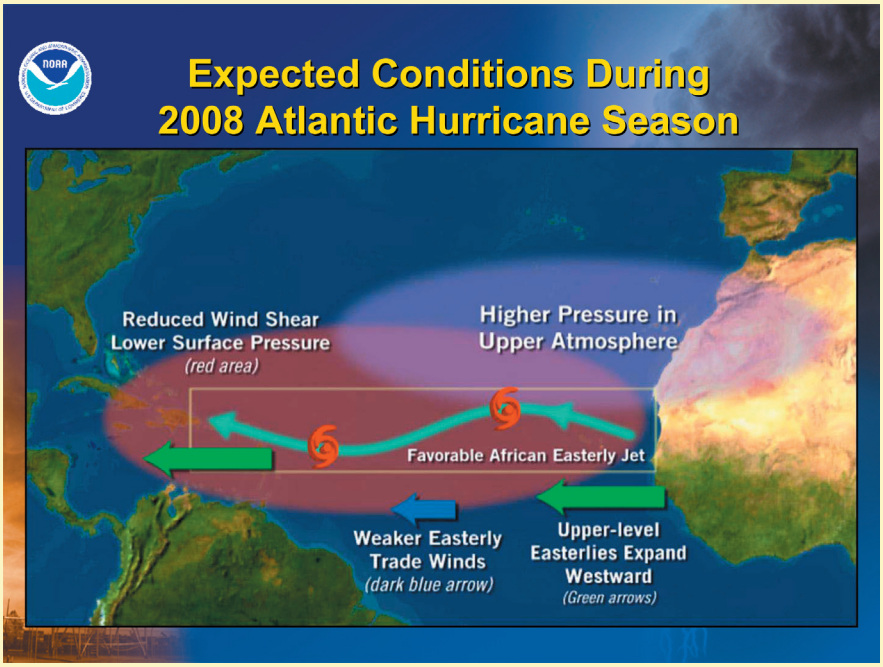


Figure 3 showing expected conditions during the 2008 Atlantifc Basin Hurricane Season that favor hurricane development from tropical waves moving westward from the African coast.

An important measure of the total seasonal activity is NOAA's Accumulated Cyclone Energy (ACE) index, which accounts for the collective intensity and duration of named storms and hurricanes during the season. Based on the above factors, CPC estimates a 60%-70% chance the 2008 seasonal ACE range will be 100%-210% of the median. This range can be satisfied even if the numbers of named storms, hurricanes, or major hurricanes fall outside their likely ranges. If La Niña persists, the probability increases that the activity could be at or above the high end of the indicated ACE range (see Figure 4).

CPC notes that their outlook provides the public with a general guide to the expected overall nature of the upcoming hurricane season. It is not a seasonal hurricane landfall forecast, and it does not imply levels of activity for any particular region. Hurricane disasters can occur whether the season is active or quiet. Residents, businesses, and government agencies of coastal and near-coastal regions should prepare for every hurricane season regardless of any issued seasonal outlook. It only takes one tropical storm or hurricane to cause a disaster.

NOAA's Atlantic hurricane season outlook will be updated on August 7th, just prior to what is historically the peak period for hurricane activity.

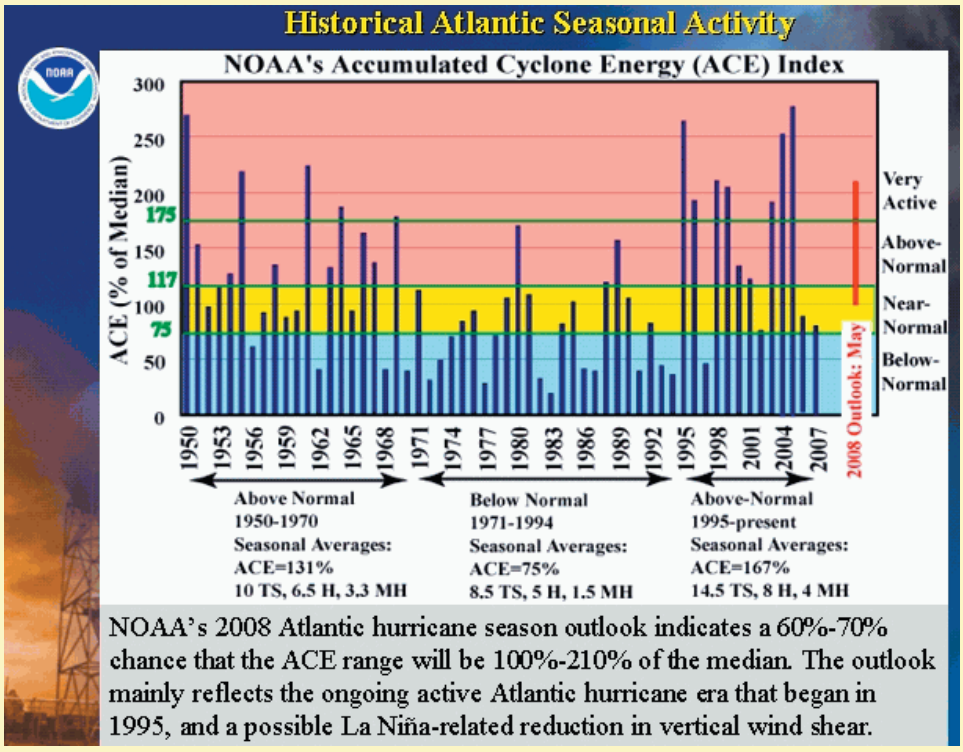


Figure 4 showing NOAA's seasonal ACE Index averages during the below nomal period of 1971-1994 and above normal periods of 1950-1970 and 1995-present.

The NWS Inundation Flood Mapping Program

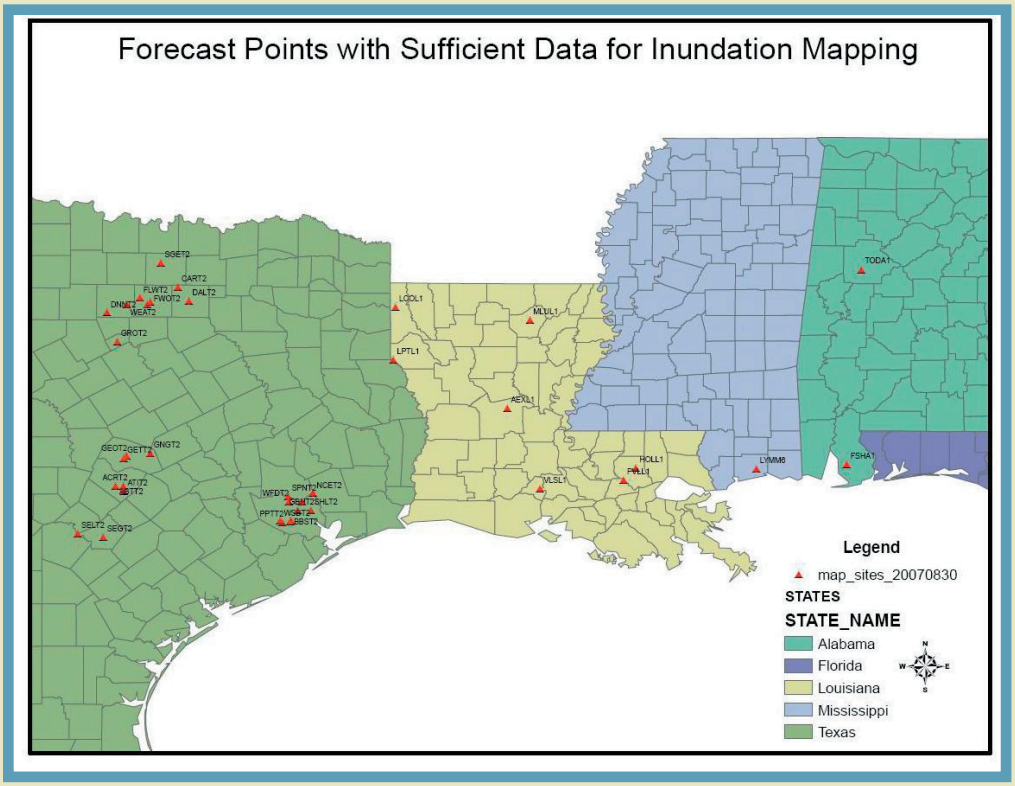
By David C. Schwertz, CFM
Senior Service Hydrologist

On average, over the past 20 years, flooding has annually claimed over 90 U. S. lives and caused in excess of $7 billion in property damage. Flooding can occur in all 50 states at any time of year and is responsible for more fatalities than any other severe weather related phenomena. And more than half of these deaths are the result of motorists being swept away in their vehicles. For over 30 years, the National Weather Service (NWS) has utilized a three tiered, impact based flood severity scale. Flood stages associated with each flood severity category (minor, moderate, and major) are established in cooperation with local public officials for each NWS river forecast point location. Through customer surveys, users are telling us they understand and are familiar with NWS flood severity categories. Users find them useful and do not want changes made to the existing flood severity indices. On the other hand, they think the use of inundation graphic maps will better communicate the flood risk.

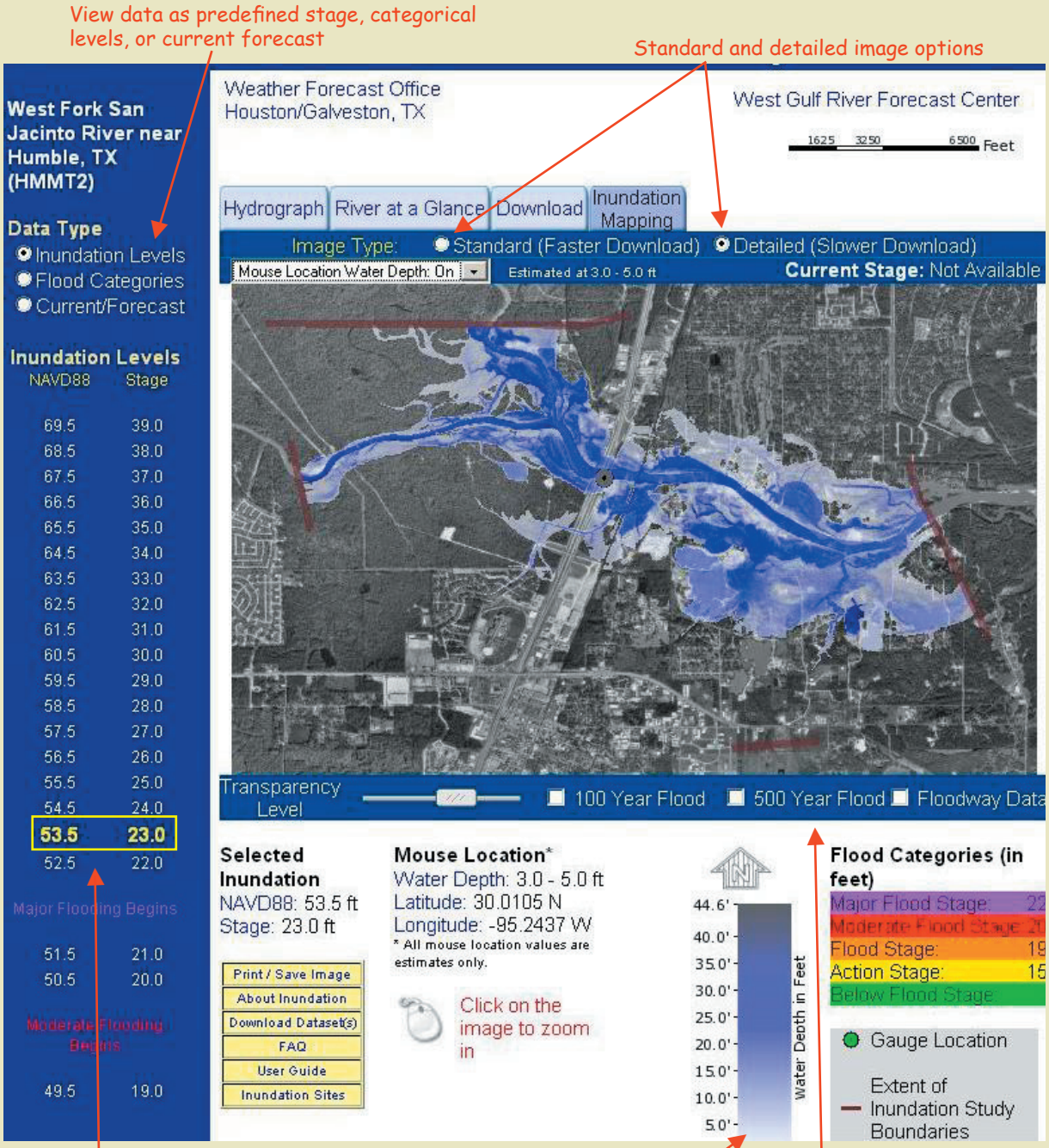
In September 1999, Hurricane Floyd produced devastating flooding across eastern North Carolina. This was the fourth hurricane to impact the North Carolina coast since 1996 and resulted in over 4,000 homes and business being destroyed. As a result, the governor requested a program to address flood mapping since there was no detailed flood data for specific waterways. FEMA and the North Carolina Department of Emergency Management contracted for hydraulic studies to establish approximate base flood elevations 1% (100 year) flood. Watershed Concepts was sub-contracted to complete these studies for seven eastern North Carolina counties. Additionally, the NWS was working with FEMA's Flood Mapping Modernization team to determine the feasibility of developing static flood inundation map libraries for water levels above flood stage to enhance the communication of flood risk. These maps would be linked with observed and forecast river stages, and include NWS flood severity categories as well as regulatory FEMA flood frequency events. In 2000, the NWS formally agreed to partner with the North Carolina Flood Mapping Project (NCFMP), FEMA, and the USGS to develop prototype graphics to better convey the flood threat. Initial efforts concentrated on the Tar River in eastern North Carolina, the object being to provide real time flood inundation maps to emergency managers during flood events. Using partnered data (LIDAR, etc.) from FEMA and the NCFMP, an unsteady hydraulic model was developed for 73 miles of the Tar River. The flood forecasts were mapped in a GIS and presented the results on an easy to read format over the web. These maps were used operationally by the Southeast River Forecast Center during Hurricane Isabel in September 2003. As of October 2007, flood inundation map libraries for 16 North Carolina river forecast points have been available on the web.

Following the success of the Tar River Project, Hurricane Katrina and Hurricane Rita supplemental funds are being used to create an additional 25 to 35 libraries in four gulf coast states (see image below).

Criteria for selection of these sites included a significantly long period of record, updated topographical (LiDAR) data, and updated hydraulic models. For the Houston/Galveston Weather Service office a total of nine sites, all in Harris County, which met these criteria, were selected. The first of these maps, Buffalo Bayou at Piney Point Drive, Buffalo Bayou at Shepherd Drive,



The NWS Inundation Flood Mapping Program



Example of Flood Inundation Map and Associated Features

Cypress Creek at I-45, and the West fork of the San Jacinto River at U.S Highway 59 are due to come online approximately June 30, 2008. Features to be included on these maps include standard and detailed image options, predefined river stage levels and associated NAVD88 water surface elevations, mouse over water depth, categorical flood inundation levels, and flood frequency and floodway data. Flood inundation maps are also a useful tool when used in conjunction with contingency forecasts. One can look at a range of forecasts for various rain scenarios and examine the associated inundation levels.

Flood inundation maps have proven their usefulness in communicating the threat and severity of flooding. The NWS is now partnering with other agencies, such as the Lower Colorado River Authority, who have shown interest in developing flood inundation maps for their areas of concern.

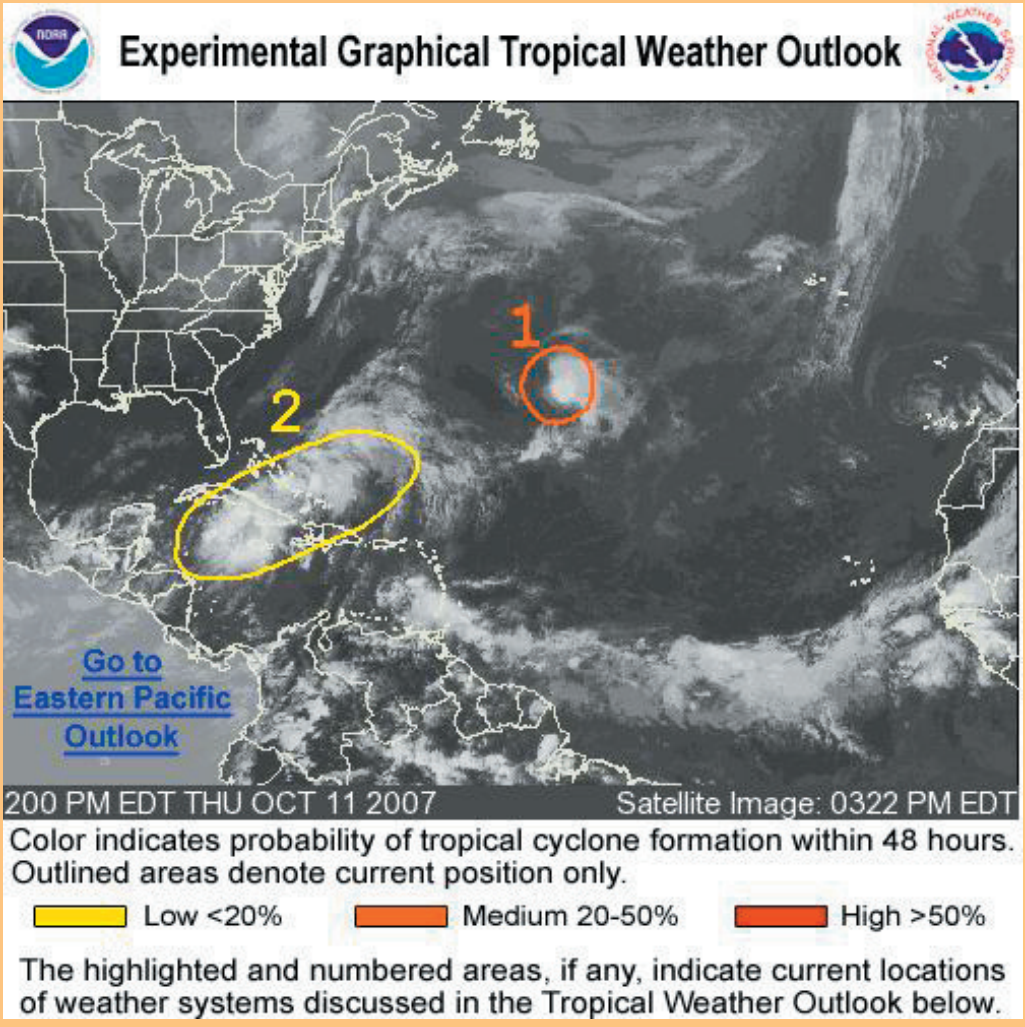
The Graphic Tropical Weather Outlook (GTWO)

http://www.nhc.noaa.gov/gtwo_atl.shtml

By Patrick Blood

During the 2008 hurricane season, the National Hurricane Center (NHC) will continue its experimental issuance of the **Graphical Tropical Weather Outlook** (GTWO). This complimentary graphic is the visual companion product to the **text** Tropical Weather Outlook (TWO).

The GTWO is a web-based graphic that supplements the text-only TWO by showing the most recent satellite imagery and highlighting disturbances of interest within that image. Each disturbance of interest is numbered, with text descriptions of each system provided beneath the graphic. Active tropical cyclones are also shown on the graphic in the form of a cyclone symbol (i.e., an "L" for tropical depressions, a tropical storm symbol or a hurricane symbol as shown later in this article). The text descriptions for the disturbances and active cyclones also appear in a pop-up window whenever you move your mouse pointer over the system of interest.



NHC intends to produce a GTWO (shortly after the text TWO) four times daily; at 0100, 0700, 1300, and 1900 CDT.

The 2008 version of the GTWO will employ a three-tiered, color-coded categorical probability of formation forecast:

Low Probability of Genesis: Less than 20%

Medium Probability of Genesis: From 20% to 50%

High Probability of Genesis: Greater than 50%

A bit of history is that the NHC tested a probabilistic tropical cyclone formation forecast during the 2007 hurricane season. The purpose of this exercise was to determine if there was sufficient accuracy in forecasting the likelihood of tropical cyclone formation and whether such a forecast could be used within the GTWO.

NHC forecasters subjectively assigned a probability of formation (0 to 100%, in 10% increments) to each area of disturbed weather mentioned in the text TWO. The assigned probabilities represented the forecaster's assessment of the chance that tropical cyclone formation would occur during the ensuing 48-hour period. These forecasts were verified based upon actual tropical cyclone development from the center's final best-track data.

The results of these experiments suggest that the NHC does possess adequate skill at categorizing disturbances into three categories based upon their potential for formation (low, medium, and high). In other words, their verification indicates that it is possible to distinguish between three broad categories of formation likelihood in both the Atlantic and Pacific basins. For example, disturbances with a low probability underwent tropical cyclone formation on average less than 10% of the time in both basins, while disturbances in the high category underwent formation greater than 60% of the time on average. In the end, these results were used as the basis for the development of this three-tiered, color-coded system.

GTWO Cyclone Symbols:

Tropical Depression

Tropical Storm

Hurricane

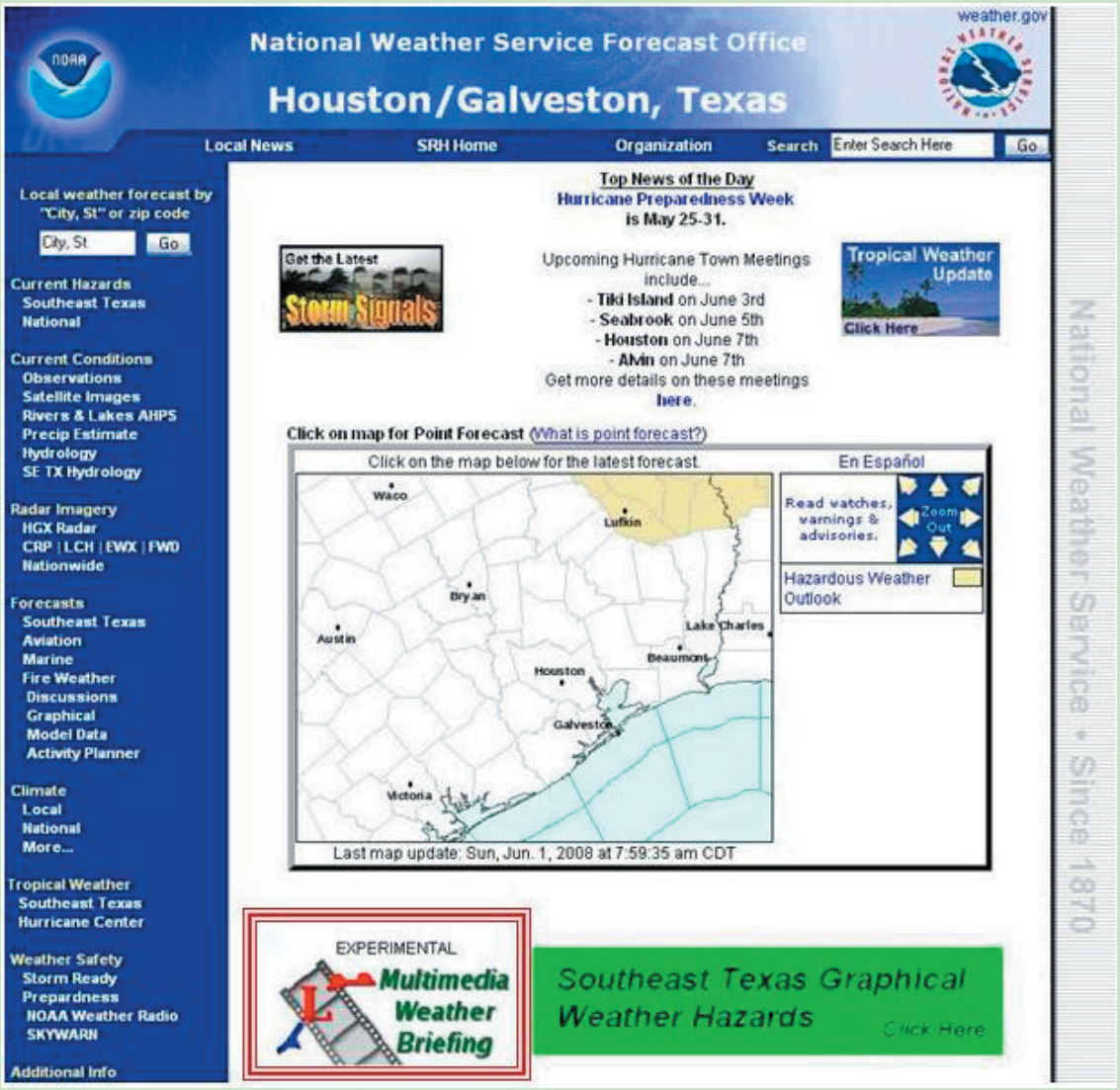
The ultimate goal for this GTWO product is to enhance the understanding and utility of the operational text TWO. The text TWO discusses areas of disturbed weather and the potential for tropical cyclone development during the next 48 hours. This supplementary GTWO is especially useful for visually representing the current location of a disturbance (or active cyclone).

The text TWO typically only provides a single geographic reference for disturbances and active cyclones. However, the main strength of the GTWO is that it will allow you to visually determine the proximity of a disturbance (or active system) relative to your specific geographic area of interest. The quantitative probabilistic assessment of future tropical cyclone development within the GTWO's three-tier, color coded categorization may also be useful for planning purposes used by officials at all levels, emergency managers, and the general public.

Multi-Media Weather Briefing - New Webpage Product

By Scott Overpeck

Last year, we introduced the "Southeast Texas Graphical Weather Hazards" webpage designed to be a "one stop shop" of weather information about any upcoming weather hazards. Users of the webpage should be able to look at a couple of graphics to understand any hazardous weather situations as well as being able to look up a forecast from the point and click map.



This year, we are introducing the "Weekly Multi-Media Weather Briefing" webpage which provides a weather briefing on a weekly basis for planning purposes. Users can view the briefing by clicking on the briefing link next to the hazards link and below the point and click forecast. It is outlined by the red box in the image above. As with the hazards webpage, the idea is to present any upcoming weather hazards, forecast uncertainty and changes, and even preparedness information. This is an attempt to present more of the "Why?" of the forecast, and what parts of the forecast could change especially in the extended forecast. Typically, each briefing will have about three slides, sometimes more, to explain any upcoming weather situations. The briefing should be about three to five minutes long. The briefing is presented in the Adobe Flash format for ease of use, and for portability between web browsers (Internet Explorer, Firefox, etc.) and operating systems (Windows, Mac OS, Linux/Unix). The webpage also has an mp3 audio file and a text summary of the briefing for the hearing and seeing impaired. We hope to add a captioning feature to the briefing in the future to better serve our users with disabilities. Typically, the briefing will be updated by each Monday for the start of the work week. The briefing may be updated during the week should a weather event require it, but otherwise the briefing may be removed after a few days of play time if the weather is quiet.

We hope that the briefing will be a tool to keep users of the webpage informed of any developing weather situation. Please be patient with us as we work out any issues with the briefing as it is experimental. We hope to make it a full time feature. The online survey is available for you to tell us what you think about this product so we can make improvements.

January Through June - A Look Back

By Charles Roeseler

2008 started out on a cool note but temperatures rebounded during the second half of January. The average temperature during the month was near to just slightly below normal. A series of coastal low pressure systems brought abundant moisture to coastal communities with lesser rainfall amounts inland. Episodes of sea fog plagued coastal communities periodically. Fire weather dangers were also heightened a bit over the extreme western edge of Southeast Texas due to high winds and lower rainfall totals.

Temperatures were very warm during February averaging three to five degrees warmer than normal. Rainfall was heavier over the northwest half of the region and lighter totals were noted along the coast. Strong storms brought heavy rain and hazardous weather to Southeast Texas from the 11th through the 15th. Golf ball sized hail pummeled parts of Montgomery county and wind damage was reported in Wharton and Pasadena.

Rainfall in March was similar to February. The heaviest rainfall totals were again over the north and northwest half of the region with lighter totals toward the coast. Temperatures were warmer than normal and there was a mid-month heat wave. Hazardous weather was limited in scope. Cut and Shoot received wind damage and Wharton received golf ball sized hail.

April began quite warm but temperatures cooled over the second half of the month to yield monthly temperatures near or just a bit warmer than normal. Rainfall was below normal area wide. The heavier totals were over the north and southwest portions of the region. Large hail pummeled parts of Burleson, Grimes and Polk counties on the 4th.

May averaged about two degrees warmer than normal but the real story was the lack of rainfall across the region. Areas along the coast were extremely dry with many locations receiving less than a quarter inch of rain. Areas south of I-10 and along the coast were classified as severe to moderate drought and many counties had instituted burn bans.

The first half of June was also very dry and many locations went 25 days without measurable rain. Burn bans continued through mid-month for several counties south of I-10. Conditions modified mid-month as thunderstorms over north Texas moved southeast and collided with the sea breeze. Some of the storms produced very large hail and strong gusty winds. The heaviest rain fell along the I-10 corridor and areas north and south of this area received considerably less rainfall. The heaviest rainfall during the month fell in Pearland with over ten inches of rain. College Station received the least rainfall with only 0.29 inches.

Here are the tables with 2008 temperature and rainfall data for a few sites across Southeast Texas:

Houston Intercontinental Airport

Month	Avg High	Avg Low	Avg daily	Dep	Rain	Dep
January	62.0	42.4	52.2	+0.4	4.62	+0.94
February	72.1	48.0	60.1	+4.7	4.00	+1.02
March	75.0	52.1	63.6	+1.3	2.41	-0.95
April	80.4	58.4	69.4	+0.9	1.46	-2.14
May	87.1	68.5	77.8	+2.0	4.57	-0.58
June	95.1	74.0	84.5	+3.2	2.06	-3.29

Galveston Scholes Field

Month	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
January	61.1	49.0	55.1	-0.7	6.04	+1.96
February	68.4	54.0	61.2	+3.2	1.32	-1.29
March	71.4	58.2	64.8	+0.7	1.88	-0.88
April	78.0	65.5	71.8	+1.8	0.66	-1.90
May	84.0	73.8	78.9	+2.0	0.02	-3.68
June	90.8	78.9	84.9	+2.7	1.06	-2.98

College Station Easterwood Field

Month	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
January	60.3	39.6	49.9	-0.2	2.06	-1.26
February	71.0	45.4	58.2	+3.7	3.29	+0.91
March	73.6	50.9	62.2	+0.6	3.81	+0.97
April	79.5	57.7	68.6	+0.7	2.74	-0.46
May	85.8	67.4	76.6	+1.3	4.30	-0.75
June	96.3	74.6	85.4	+3.8	0.29	-3.50

Houston Hobby Airport

Month	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
January	62.8	45.5	54.1	-0.2	6.55	+2.29
February	72.3	51.7	62.0	+4.3	4.01	+1.00
March	74.6	55.2	64.9	+0.7	2.96	-0.23
April	80.7	61.7	71.2	+1.2	1.91	-1.55
May	87.6	71.4	79.5	+2.5	0.99	-4.12
June	93.5	75.8	84.7	+2.4	8.34	+1.50

January Through June - A Look Back continued

Here are a few other supplemental ASOS sites:

January						
Site	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
CXO	60.6	38.6	49.6	-0.3	3.54	-0.67
UTS	59.1	38.9	49.0	+0.2	2.09	-2.19
PSX	62.7	42.9	52.8	-0.1	5.62	+2.44
SGR	62.6	43.2	52.9	-1.2	3.60	-0.36
LBX	62.6	43.7	53.1	-1.1	8.03	+3.27
DWH	61.6	40.8	51.2	-2.9	3.89	+0.85
LVJ	63.6	45.6	54.6	-0.2	6.51	+3.49
HGX	60.4	44.4	52.4	-1.0	7.11	+1.68

February						
Site	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
CXO	70.9	42.5	56.7	+3.1	3.85	+0.94
UTS	69.9	44.1	57.0	+4.0	2.63	-0.51
PSX	70.8	51.0	60.9	+5.1	0.81	-1.64
SGR	72.2	49.2	60.7	+4.7	2.54	-0.58
LBX	71.4	48.2	59.8	+3.5	2.42	-2.34
DWH	71.9	46.6	59.2	+4.3	3.29	+0.40
LVJ	72.9	51.6	62.2	+6.2	2.74	-0.08
HGX	69.9	49.9	59.9	+3.2	2.99	-0.46

March						
Site	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
CXO	74.3	48.3	61.3	+0.2	2.52	-0.39
UTS	73.5	50.7	62.1	+1.6	2.19	-1.28
PSX	72.5	54.4	63.5	+1.4	2.22	-0.48
SGR	75.0	53.8	64.4	+1.4	1.64	-0.85
LBX	73.2	52.6	62.9	+0.2	1.59	-3.17
DWH	74.8	50.8	62.8	+0.6	2.28	-0.30
LVJ	75.0	55.6	65.3	+2.5	2.50	+0.35
HGX	72.2	53.7	63.0	+1.3	2.32	-1.19

January Through June- A Look Back continued

April						
Site	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
CXO	79.6	54.6	67.1	-0.2	1.85	-1.99
UTS	79.1	57.5	68.3	+1.1	2.73	-0.77
PSX	78.8	61.5	70.2	+1.7	2.52	-0.28
SGR	81.2	59.5	70.4	-0.2	3.05	+0.43
LBX	79.6	58.3	68.9	-0.9	3.31	-0.46
DWH	80.6	57.1	68.8	-1.1	1.76	-1.16
LVJ	81.0	61.1	71.1	+1.7	1.57	-1.20
HGX	78.1	60.0	69.1	+1.2	2.16	-1.83

May						
Site	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
CXO	86.0	64.6	75.3	+0.7	5.18	-0.44
UTS	86.0	66.5	76.3	+1.9	2.07	-3.01
PSX	85.2	72.0	78.6	+2.9	0.16	-4.39
SGR	87.9	69.7	78.8	+1.6	0.55	-3.07
LBX	85.3	69.2	77.2	+0.9	0.22	-4.54
DWH	86.5	67.3	76.9	+0.8	4.38	NA
LVJ	86.5	70.5	78.5	+2.4	0.48	-3.27
HGX	84.9	69.9	77.4	+2.0	1.16	-3.42

June						
Site	Avg High	Avg Low	Avg Daily	Dep	Rain	Dep
CXO	93.7	70.7	82.2	+1.4	1.82	-2.76
UTS	93.8	73.8	83.8	+3.2	3.00	-1.66
PSX	90.0	78.7	84.3	+3.2	2.37	-1.94
SGR	95.2	74.9	85.0	+3.3	1.89	-3.15
LBX	92.5	74.2	83.3	+2.5	2.35	-2.41
DWH	93.5	72.4	83.0	+2.3	3.56	-3.70
LVJ	91.8	74.1	82.9	+1.6	10.06	+2.61
HGX	90.5	74.7	82.6	+2.3	4.47	-2.89

January Through June - A Look Back continued

Here are some monthly rainfall totals from across Southeast Texas:

Community	Jan	Feb	Mar	Apr	May	June	Total
Alvin	6.71	3.48	2.31	3.52	0.02	3.18	19.22
Anahuac	3.46	3.53	3.77	0.90	2.92	4.34	18.92
Angleton	8.48	2.49	2.93	4.18	0.05	2.57	20.70
Bay City	6.06	1.25	2.34	2.20	0.32	2.22	14.39
Baytown	6.56	4.98	2.60	1.74	5.75	6.54	28.17
Bellville	2.94	2.74	2.22	1.99	2.81	1.75	14.45
Brenham	2.90	2.44	3.28	2.13	4.55	0.51	15.81
Caldwell	1.84	2.05	3.90	2.62	6.30	0.13	6.84
Cleveland	4.11	5.88	2.18	2.51	4.75	2.20	21.63
Clodine	5.00	2.71	2.27	1.82	0.64	2.27	14.71
Corrigan	3.93	5.24	2.00	3.76	2.50	5.84	23.27
Crockett	2.18	5.38	5.42	3.18	2.81	1.26	20.23
Dacus	3.08	5.70	3.28	1.67	4.53	1.03	19.29
Danevang	5.45	5.64	3.16	0.92	0.32	1.32	17.04
Edna	3.77	5.05	3.02	2.15	0.36	1.92	16.27
El Campo	2.50	3.26	2.12	1.72	1.02	5.16	15.78
Freeport	7.31	2.40	3.12	2.92	0.22	1.00	16.97
Hou Heights	6.22	3.38	3.22	1.64	3.60	3.16	21.22
Hou Port	5.89	3.12	3.03	1.40	0.52	4.05	18.01
Hou Westbury	6.05	2.92	2.44	2.29	1.97	1.74	17.41
Katy	4.24	2.77	2.10	1.34	1.09	0.70	12.24
Liberty	3.74	3.98	2.98	2.51	4.76	1.51	19.48
Livingston	5.29	5.26	2.27	0.64	2.90	1.78	18.14
Madisonville	3.49	5.95	4.45	1.76	2.57	0.93	19.15
Matagorda	4.63	0.98	2.40	3.66	0.27	1.09	13.03
Midway	3.07	5.55	3.28	2.54	NA	1.52	18.17
Montgomery	3.46	3.26	2.50	1.23	4.43	1.99	16.87
New Caney	5.44	5.22	2.19	1.06	5.24	2.67	21.82
Pierce	4.74	1.73	2.82	2.00	NA	1.11	12.40
Richards	2.62	3.56	3.21	3.32	4.01	na	16.72
Richmond	3.86	4.14	1.72	1.96	0.17	1.56	13.41
Somerville Dam	2.45	3.88	3.72	3.04	3.13	0.61	16.83
Thompsons	5.65	2.66	2.53	2.69	1.57	1.52	16.62
Tomball	4.00	4.41	2.60	0.97	7.00	1.36	20.34
Washington	2.88	2.79	2.96	2.34	6.24	2.62	19.83
West Columbia	6.57	3.17	3.41	3.46	1.31	1.57	19.49
Wharton	5.13	2.85	2.31	2.29	0.22	2.51	15.31

Heat Waves

Know What These Terms Mean...

* Heat wave: Prolonged period of excessive heat and humidity. The National Weather Service steps up its procedures to alert the public during these periods of excessive heat and humidity.
* Heat index: A number in degrees Fahrenheit (F) that tells how hot it really feels when relative humidity is added to the actual air temperature. Exposure to full sunshine can increase the heat index by 15 degrees F.
* Heat cramps: Heat cramps are muscular pains and spasms due to heavy exertion. Although heat cramps are the least severe, they are an early signal that the body is having trouble with the heat.
* Heat exhaustion: Heat exhaustion typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a form of mild shock. If not treated, the victim may suffer heat stroke.
* Heat stroke: Heat stroke is life-threatening. The victim's temperature control system, which produces sweating to cool the body, stops working. The body temperature can rise so high that brain damage and death may result if the body is not cooled quickly.
* Sunstroke: Another term for heat stroke.

If a Heat Wave Is Predicted or Happening...

* Slow down. Avoid strenuous activity. If you must do strenuous activity, do it during the coolest part of the day, which is usually in the morning between 4:00 a.m. and 7:00 a.m.
* Stay indoors as much as possible. If air conditioning is not available, stay on the lowest floor, out of the sunshine. Try to go to a public building with air conditioning each day for several hours. Remember, electric fans do not cool the air, but they do help sweat evaporate, which cools your body.
* Wear lightweight, light-colored clothing. Light colors will reflect away some of the sun's energy.
* Drink plenty of water regularly and often. Your body needs water to keep cool.
* Drink plenty of fluids even if you do not feel thirsty.
* Water is the safest liquid to drink during heat emergencies. Avoid drinks with alcohol or caffeine in them. They can make you feel good briefly, but make the heat's effects on your body worse. This is especially true about beer, which dehydrates the body.
* Eat small meals and eat more often. Avoid foods that are high in protein, which increase metabolic heat.
* Avoid using salt tablets unless directed to do so by a physician.

Signals of Heat Emergencies...

* Heat exhaustion: Cool, moist, pale, or flushed skin; heavy sweating; headache; nausea or vomiting; dizziness; and exhaustion. Body temperature will be near normal.
* Heat stroke: Hot, red skin; changes in consciousness; rapid, weak pulse; and rapid, shallow breathing. Body temperature can be very high-- as high as 105 degrees F. If the person was sweating from heavy work or exercise, skin may be wet; otherwise, it will feel dry.

Treatment of Heat Emergencies...

* Heat cramps: Get the person to a cooler place and have him or her rest in a comfortable position. Lightly stretch the affected muscle and replenish fluids. Give a half glass of cool water every 15 minutes. Do not give liquids with alcohol or caffeine in them, as they can make conditions worse.
* Heat exhaustion: Get the person out of the heat and into a cooler place. Remove or loosen tight clothing and apply cool, wet cloths, such as towels or sheets. If the person is conscious, give cool water to drink. Make sure the person drinks slowly. Give a half glass of cool water every 15 minutes. Do not give liquids that contain alcohol or caffeine. Let the victim rest in a comfortable position, and watch carefully for changes in his or her condition.
* Heat stroke: Heat stroke is a life-threatening situation. Help is needed fast. Call 9-1-1 or your local emergency number. Move the person to a cooler place. Quickly cool the body. Immerse victim in a cool bath, or wrap wet sheets around the body and fan it. Watch for signals of breathing problems. Keep the person lying down and continue to cool the body any way you can. If the victim refuses water or is vomiting or there are changes in the level of consciousness, do not give anything to eat or drink.

Heat Index °F (°C)

Relative Humidity (%)

Temperature	40	45	50	55	60	65	70	75	80	85	90	95	100
110 (47)	136 (58)												
108 (43)	130 (54)	137 (58)											
106 (41)	124 (51)	130 (54)	137 (58)										
104 (40)	119 (48)	124 (51)	131 (55)	137 (58)									
102 (39)	114 (46)	119 (48)	124 (51)	130 (54)	137 (58)								
100 (38)	109 (43)	114 (46)	118 (48)	124 (51)	129 (54)	136 (58)							
98 (37)	105 (41)	109 (43)	113 (45)	117 (47)	123 (51)	128 (53)	134 (57)						
96 (36)	101 (38)	104 (40)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	132 (56)					
94 (34)	97 (36)	100 (38)	103 (39)	106 (41)	110 (43)	114 (46)	119 (48)	124 (51)	129 (54)	135 (57)			
92 (33)	94 (34)	96 (36)	99 (37)	101 (38)	105 (41)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	131 (55)		
90 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	103 (39)	106 (41)	109 (43)	113 (45)	117 (47)	122 (50)	127 (53)	132 (56)
88 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	98 (37)	100 (38)	103 (39)	106 (41)	110 (43)	113 (45)	117 (47)	121 (49)
86 (30)	85 (29)	87 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	102 (39)	105 (41)	108 (42)	112 (44)
84 (29)	83 (28)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	92 (33)	94 (34)	96 (36)	98 (37)	100 (38)	103 (39)
82 (28)	81 (27)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	91 (33)	93 (34)	95 (35)
80 (27)	80 (27)	80 (27)	81 (27)	81 (27)	82 (28)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	86 (30)	87 (31)

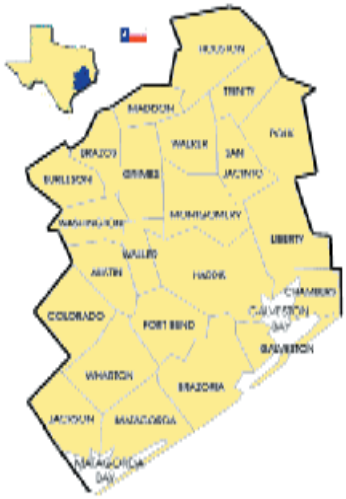
Category	Heat Index	Possible heat disorders for people in high risk groups
Extreme Danger	130°F or higher (54°C or higher)	Heat stroke or sunstroke likely.
Danger	105 - 129°F (41 - 54°C)	Sunstroke, muscle cramps, and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity.
Extreme Caution	90 - 105°F (32 - 41°C)	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Caution	80 - 90°F (27 - 32°C)	Fatigue possible with prolonged exposure and/or physical activity.

Precautions To Take Against Excessive Heat

Increase your intake of non-alcoholic, non-carbonated, caffeine free beverages such as water and juice.
Wear clothing that is light in color and loose fitting.
Avoid the outdoors during extreme heat. Stay out of the sun.
Stay in an air-conditioned environment if possible. Shopping malls offer relief if your home is not air-conditioned.
Check on the elderly. They are especially susceptible to heat related illness.
Eliminate strenuous activity such as running, biking and lawn care work when it heats up.

Heat Related Illnesses And Their Symptoms

SUNBURN - Redness and pain in the skin. In severe cases there is also swelling, blisters, fever, and headaches.
HEAT CRAMPS - Heavy sweating and painful spasms usually in the leg or abdomen muscles.
HEAT EXHAUSTION - The person becomes weak and is sweating heavily. The skin is cold, pale and clammy. Fainting and vomiting accompanies heat exhaustion.
HEATSTROKE/SUNSTROKE - High body temperature (106 degrees or higher) along with hot dry skin and a rapid and strong pulse. Unconsciousness is possible.



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