Southeast Texas
Severe Weather Awareness Week
March 1 – 7, 2015

GOVERNOR GREG ABBOT DESIGNATES SEVERE WEATHER AWARENESS WEEK IN TEXAS

Governor Greg Abbott has proclaimed the week of March 1 through 7 2015 as Severe Weather Awareness Week in Texas. In an official proclamation, he reminded Texans of the threat to life that thunderstorms pose, from lightning to floods to tornadoes and stressed the importance of staying aware of weather conditions, and being prepared.

Although severe weather can occur any time of the year, Spring marks the time of year when severe thunderstorms and tornadoes occur most often in Texas. They can bring all the devastating elements - tornadoes, lightning, large hail, damaging winds and flash flooding. This is a time when Texans begin to take increasing advantage of the state's great outdoor opportunities. So, it is particularly important that everyone be aware of the weather when outdoors. Each Texan must know what to do when severe weather threatens him or her at home, at work, at school, at play or even when traveling on the road. Severe Weather Awareness Week is an excellent time to review safety plans for the coming weather threats.

This booklet is designed to serve as a guide to the dangers of severe weather and its impacts on southeast Texas. It is important to remember that severe weather can occur in any month of the year in southeast Texas.

You are encouraged to reproduce this booklet locally for further distribution.

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Mock Tornado Drill/Twitter Messages

As a part of the Southeast Texas Severe Weather Awareness Week, a mock tornado drill will be conducted on Wednesday, March 4, 2015. In addition be sure to follow @NWSHouston on Twitter to receive messages related to severe weather all during the week!


(NWS Houston/Galveston)

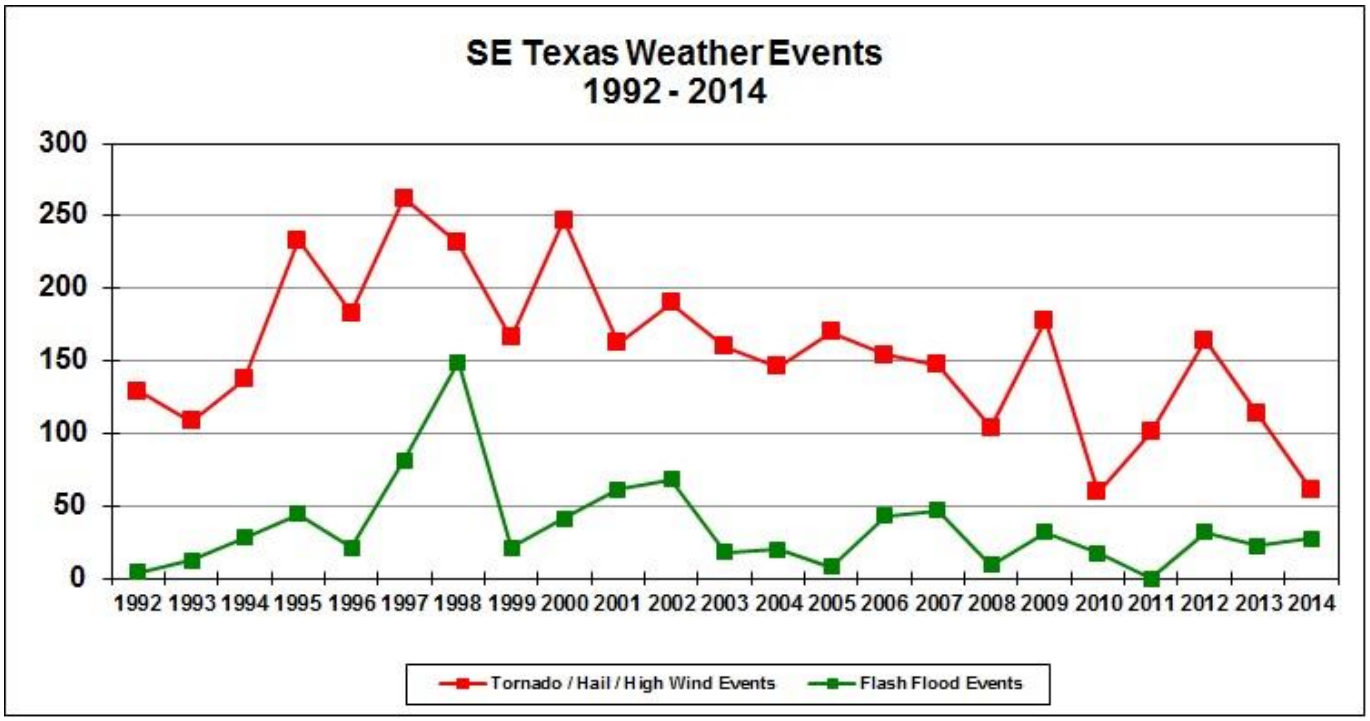
The purpose of the drill is to give citizens of southeast Texas a chance to determine if they can receive a warning, and what to do when a warning is received or a tornado is occurring. Every citizen is urged to participate by considering the protective actions that should be taken during a real tornado warning. Large portions of the population of southeast Texas are in school during weekdays. When the tornado warning for the drill is issued, schools throughout Southeast Texas are encouraged to participate by conducting a tornado drill and putting their severe weather emergency preparedness plan into effect. This will give school administrators and safety officers an opportunity to see how effective their preparedness plan actually is. If your school does not have a severe weather preparedness plan, contact your county's director of emergency management or the Houston/Galveston National Weather Service.

Here are the plans for the drill:

1. At approximately **10:00 am**, a mock Tornado Warning will be issued by the Houston/ Galveston NWS. The mock warning will be in effect for all 23 counties and will only be issued through broadcast on the NOAA All Hazards Weather Radio. We will use the Public Information Statement (PNS) code to issue this mock Tornado Warning. We will **not** activate the Emergency Alert System (EAS). The mock warning will be in effect for 15 minutes.
2. At approximately **10:15 am**, another Public Information Statement will be issued to cancel the mock Tornado Warning. This will signify the end of the drill.

Schools that participate with a tornado drill should activate their emergency procedures when they receive the mock Tornado Warning. Once all of the preparedness actions have been taken and the students have been moved to your prearranged shelter locations, you can consider that the drill is over for your school.

Feedback after the drill is very important. Information about the public's ability to hear the warning is needed in order to evaluate the effectiveness of our tornado warning communication system. Please fill out the evaluation form and relay your comments to your county emergency management or the Houston/Galveston NWS.


SE Texas Weather Events
1992 - 2014
300
250
200
150
100
50
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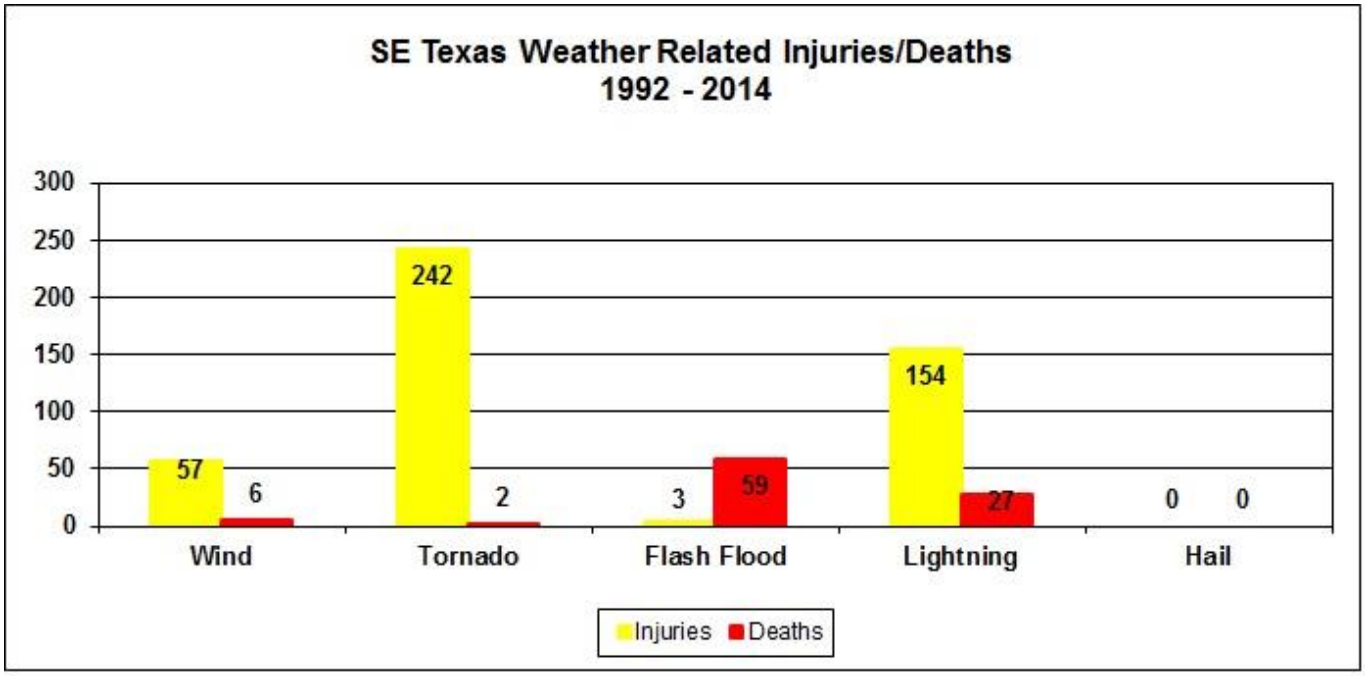
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Tornado / Hail / High Wind Events
Flash Flood Events


SE Texas Weather Related Injuries/Deaths
1992 - 2014
300
250
200
150
100
50
0
57
6
242
2
3
59
154
27
0
0
Wind
Tornado
Flash Flood
Lightning
Hail
Injuries
Deaths

FLOODS AND FLASH FLOODS

What are different types of floods?

Flash Floods

Flash floods are short-fuse weather events, typically lasting on the order of 6 hours or less. Usually, flash floods occur within a few minutes or hours following an excessive rainfall event. They can also be caused by a man-made event, such as a dam or levee failure. Flash floods cause most of the fatalities associated with flooding events. Usually, less warning lead time is provided for flash flooding which requires quick action on the part of the public.

Urban Floods

Flash flooding is most severe in urban areas like the Houston metropolitan area. Urbanization increases runoff by 2 to 6 times over what would occur in natural terrain. Flood waters can fill streets, freeway underpasses, and parking lots and can sweep away cars.

River Floods

Heavy rainfall falling over a widespread area (such as a large portion of a watershed) over a prolonged period (up to several days) can cause river flooding. Typically, river flooding begins as a high crest on the upper part of a watershed that takes several days to move downstream. Due to the slow nature of river flooding, ample advanced warning is provided to evacuate people or property in the path of the flooding.

Coastal Floods

Flooding caused by rise in water levels due to high astronomical tides and/or storm surge.

(Harris County Office of Emergency Management)

How does flooding impact southeast Texas?

Flash flooding is a relatively common event over southeast Texas. Tropical systems during the summer and early fall, and strong winter storm systems can cause widespread flooding and flash flooding across the area. Flash flooding can also be produced by strong slow moving thunderstorms especially during the spring and summer months. Flooding and flash flooding can occur anywhere in southeast Texas, but is usually most severe near major watersheds like the Colorado, Brazos, San Jacinto or Trinity Rivers, and near urban centers like the Houston metropolitan area.

What are some major floods that have impacted southeast Texas?

August 2007

Tropical Storm Erin made landfall along the middle Texas coast around the Port Aransas area. A southeast to northwest feeder band developed from Katy to the western end of Galveston Island in the morning and moved slowly eastward to a line from Clear Lake to Humble by late in the afternoon. Training of cells along this line combined with rainfall rates upwards of 4 to 5 inches per hour resulting in major street flooding and minor flooding of several bayous in Harris County. Widespread major street flooding occurred throughout the afternoon across the eastern half of Harris county with SH 288 impassable near the 610 south loop, I-10 east closed at Wayside, and numerous secondary roads closed along I-45 S, SH 225, and I-10 E. Flooding of homes and businesses occurred in the La Porte area where some structures were inundated with more than a foot of water. House flooding also occurred in the Pasadena area. There were also at least a dozen schools that received water damage. There were three fatalities from this flood. Two deaths were from a supermarket roof collapse under the weight of the heavy rainfall. The third death was from a vehicle that drove into a flooded detention pond.

June 2001

Tropical Storm Allison devastated a large portion of southeast Texas with an incredible amount of rain as she meandered around southeast Texas for over five days. Between the 5th and the 10th, much of Houston and the surrounding areas to the north, east and south received between 15 to 35 inches of rain which caused devastating flooding and flash flooding. The largest amount fell over a 6 to 12 hour period on the 8th and 9th resulting in 22 deaths in the Houston area. More than 48,000 homes were damaged (11,000 with major damage and 3,600 completely destroyed). More than 70,000 automobiles were flooded during the storm. In Harris County alone, an estimated 300 billion gallons of water fell. This amount was enough to fill the Astrodome more than 5,600 times! Allison ended up being the costliest tropical storm ever (>$5 billion) for the state of Texas and for the United States.

October 17-21, 1994

This was perhaps the worst flooding to impact such a large portion of southeast Texas on record. Lake Livingston recorded a record height on the 17th and a record flow of 110,000 cfs. Liberty recorded 30 inches of rainfall in less than 48 hours, and much of the city went underwater due to a failed levee system. Spring Creek and Lake Houston set new flood crest records. Several major highways into and out of Houston were flooded including I-45 north of Houston and US 59 northeast of Houston. Four fuel pipelines ruptured on the San Jacinto River, causing a massive fuel spill and widespread fires. An estimated 22,000 homes were flooded across southeast Texas during this event, with $900 million in damage reported. Seventeen fatalities resulted from the floods.

National Weather Service Flood Products:

FLOOD WATCH
Means that conditions in the watch area will be favorable for flooding during the specified period. Usually heavy rainfall is expected following a long period of wet weather.

FLASH FLOOD WARNING
Flash flooding is reported or is imminent in the counties specified in the warning. Take immediate precautions.

URBAN AND SMALL STREAM FLOOD ADVISORY
Flooding of streets, low-lying areas like underpasses and storm drains, and small streams is expected. Caution should be taken while traveling.

FLASH FLOOD STATEMENT
Follow-up information on a Flash Flood Watch or Warning.

RIVER FLOOD OUTLOOK
Indicates potential for flooding along rivers and streams.

COASTAL FLOOD WATCH
Means that conditions are favorable for flooding from high astronomical tides and/or storm surge.

COASTAL FLOOD WARNING
Coastal flooding is reported or imminent. Take immediate precautions.

(NWS)

What do you do in flash flood situations?
The worst place to be in a flash flood is traveling by car. **TWO FEET** of water will carry away most automobiles. Do not cross water flowing over a roadway.

What do you do when a FLOOD WARNING is issued or flooding is imminent?

If advised to evacuate, do so immediately!!

Move to a safe area...not cut off by flood waters.

Avoid areas you know are subject to flooding.

Do NOT attempt to drive over a flooded roadway. Do not drive into barricaded areas; **the barricades are there for a reason**!

Children should never play around storm drains, creeks, streams, or rivers, or in flooded streets.

Things you can do ahead of time to prepare for major floods:

Know the flood risk at your place of home or business and its elevation above flood stage.

Store drinking water in clean bathtubs or containers. This is very important as flood waters will contaminate the drinking water supply in your area.

Stock non-perishable food items requiring little cooking and no refrigeration.

Keep first aid supplies on hand.

Keep NOAA Weather Radio, battery-powered portable radio, emergency cooking equipment, and flashlights in working order.

Install check valves in sewer traps to prevent flood waters from backing into your home.

Flood disaster supply kit:

first aid kit	canned food/can opener	bottled water
rubber boots	NOAA Weather Radio	battery-powered radio
flashlight	batteries	gloves

What do you do after the flood has passed?

(NWS)

Boil drinking water before using. Do not use tap water without boiling it!

Seek necessary medical care at the nearest hospital.

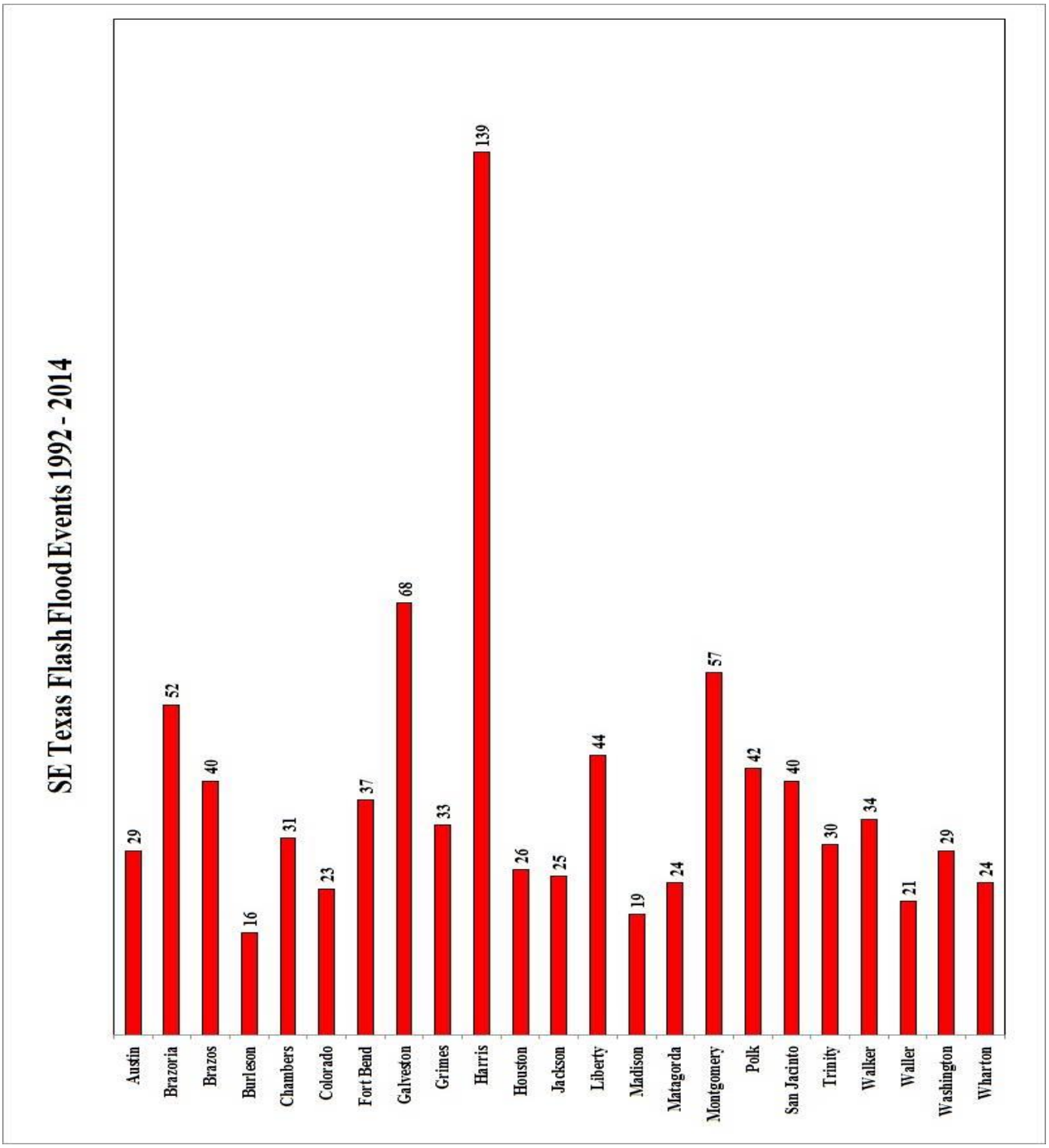
Clothing, food, and shelter are available at the nearest Red Cross.

Do not visit disaster areas. You may hamper rescue and emergency operations.

Electrical equipment should be checked or dried before being returned to service. Make sure to wear rubber gloves and rubber boots when working with electrical equipment.

Report broken utility lines to the proper authorities

For more information on the NWS' "Turn Around, Don't Drown" program:
http://www.nws.noaa.gov/os/water/tadd/


SE Texas Flash Flood Events 1992 - 2014
Austin 29
Brazoria 52
Brazos 40
Burleson 16
Chambers 31
Colorado 23
Fort Bend 37
Galveston 68
Grimes 33
Harris 139
Houston 26
Jackson 25
Liberty 44
Madison 19
Matagorda 24
Montgomery 57
Polk 42
San Jacinto 40
Trinity 30
Walker 34
Waller 21
Washington 29
Wharton 24

SEVERE THUNDERSTORMS

What classifies a "severe" thunderstorm?

A thunderstorm is classified as "severe" by the National Weather Service when it produces wind gusts in excess of 58 mph or hail of 1 inch in diameter or larger. An occurrence of a tornado will also classify a thunderstorm as severe.

How do severe thunderstorms impact southeast Texas?


(Gene Rhoden)

While severe thunderstorms are most common in the spring and summer, they can occur just about any time of the year in southeast Texas. On average, southeast Texas experiences 50 to 60 days a year with thunderstorms. Severe thunderstorms occur on about a third of those days. Severe storms can occur just about any time of day in southeast Texas, but are most common in the afternoon and evening hours.

Severe weather threats:

Downbursts

A downburst is a small area of rapidly descending air beneath a thunderstorm. Downburst winds are often referred to as "straight-line" winds. Severe downbursts produce wind gusts from 60 mph to more than 100 mph. The damage is often similar to damage from a weak tornado. Downburst damage is far more common in southeast Texas than tornado damage.

Large Hail

Hail is formed as strong rising currents of air within a storm (updrafts) carry water droplets to a height where freezing occurs. The ice particles travel upward and downward through the storm several times, growing in size. Once they become too heavy to be supported by the storm's updraft, they fall to the ground as hail. Hail of 1 inch in diameter or larger classifies "large" or damaging hail. Hail sizes are usually given as references to everyday objects to make it easier to estimate hail size.

Tornadoes

Tornadoes are another threat from severe thunderstorms. See the Tornado section for more information.

Cloud-to-Ground Lightning

Thunderstorms can produce extremely dangerous lightning. See the Lightning section for more information.

Flash Flooding

Heavy rains from severe thunderstorms can produce flash flooding. See the Floods/Flash Floods section for more information.

Examples of Hail Size	
pea sized	0.25 inch
dime sized	0.75 inch
nickel sized	0.88 inch
quarter sized (classifies storm as severe)	1.00 inch
golfball sized	1.75 inch
baseball sized	2.75 inch

(NSSL)

What can you do to be prepared for severe weather?

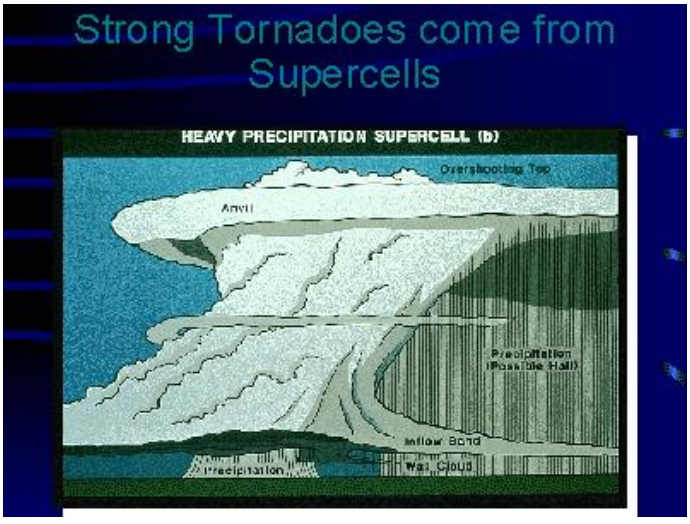
Know the county that you live in and the names of nearby major cities.
SEVERE THUNDERSTORM WARNINGS are issued on a county by county basis with the names of major cities highlighted in the warnings.

Have a NOAA Weather Radio in your home and/or place of business.
Some receivers are specially built to alarm any time a severe weather Watch or Warning is issued by the National Weather Service.

Make sure you are aware of the best spot in your home to take shelter from severe weather.

The most appropriate place is usually an interior room on the lowest floor of your home and away from windows. If you know severe weather is approaching or a SEVERE THUNDERSTORM WARNING is issued, seek shelter immediately!!

Being in a sturdy building on the lowest floor and away from windows is the only safe place in a severe thunderstorm!! Automobiles, boats, or out in the open are not safe places in severe thunderstorms.



(NOAA)

What were some severe weather events that have impacted southeast Texas?

March 27, 2009
Baseball sized hail was reported near Cut and Shoot (in Montgomery County).

October 22, 2008
Showers and thunderstorms developed along and ahead of a strong cold front and produced golf ball size hail (up to 1.75 inches) in Houston (Harris County) near the intersection of Beltway 8 North and the Hardy Toll Road.

May 4, 2006
A severe thunderstorm developed in the afternoon and produced large hail (up to 3.00 inches - the size of tea cups) in the Champions Forest Subdivision near Houston Hooks Airport.

May 8, 2005
Severe thunderstorms with strong damaging winds and large hail moved across the southern half of southeast Texas with damage observed from the El Campo and Wharton area (trees and power lines down, roof damage and a hanger with an airplane inside destroyed) eastward to the coast. Further to the east (Brazoria County), strong winds downed trees and blew roofs off mobile homes in Rosharon, Danbury and Liverpool. In Alvin, a metal shed and billboards were also downed by the wind. Near the coast in Galveston County, large hail (up to golf ball size) fell in Texas City, and strong winds downed large trees and damaged property from League City to Dickinson to Galveston Island. On the Island, there was building damage along the Port of Galveston, vehicles were blown off the road and trees were downed. One home was shifted about ten feet into another home next door dislodging it from its piers (both homes were Galveston 1900 Storm survivors).

December 23, 2002
The combination of abundant low level moisture, a strong upper level storm system and a warm front helped to produce nearly fifty severe weather events across Southeast Texas, including tornadoes in Colorado, Burleson, Washington, Brazos, Grimes, Madison, Montgomery, and San Jacinto counties. Large hail (up to 1.75 inches) was observed mainly north and west of the Houston area. Locations from Houston to the beaches felt the brunt of this event in the evening when a squall line rapidly moved eastward across Harris County and toward the coast and produced 60 to 80 mph winds.

November 23-24, 2000
Three tornadoes struck the Houston area on Thanksgiving night. An F1 tornado struck Katy injuring one person, flipping over two office trailers and damaging several homes. Pasadena was also struck by an F1 tornado which damaged a church and two schools, several homes in a neighborhood, and tore the walls off of a strip shopping center. Another F0 tornado struck Conroe, downing trees and tearing the steeple off a church.

National Weather Service Severe Thunderstorm Products:

HAZARDOUS WEATHER OUTLOOK

Issued by the local National Weather Service office daily at 7 am. Usually covers a large portion of southeast Texas. Outlines the reasons for the potential for severe weather, the area that could be affected, and the time that severe weather is anticipated.

SEVERE THUNDERSTORM WATCH

Issued by the Storm Prediction Center in Norman, OK. Usually covers a large area (such as all or a portion of southeast Texas) and lasts for 6 to 8 hours. A SEVERE THUNDERSTORM WATCH means that conditions are favorable for severe thunderstorms that may produce large hail, damaging wind, dangerous lightning, or possibly tornadoes.

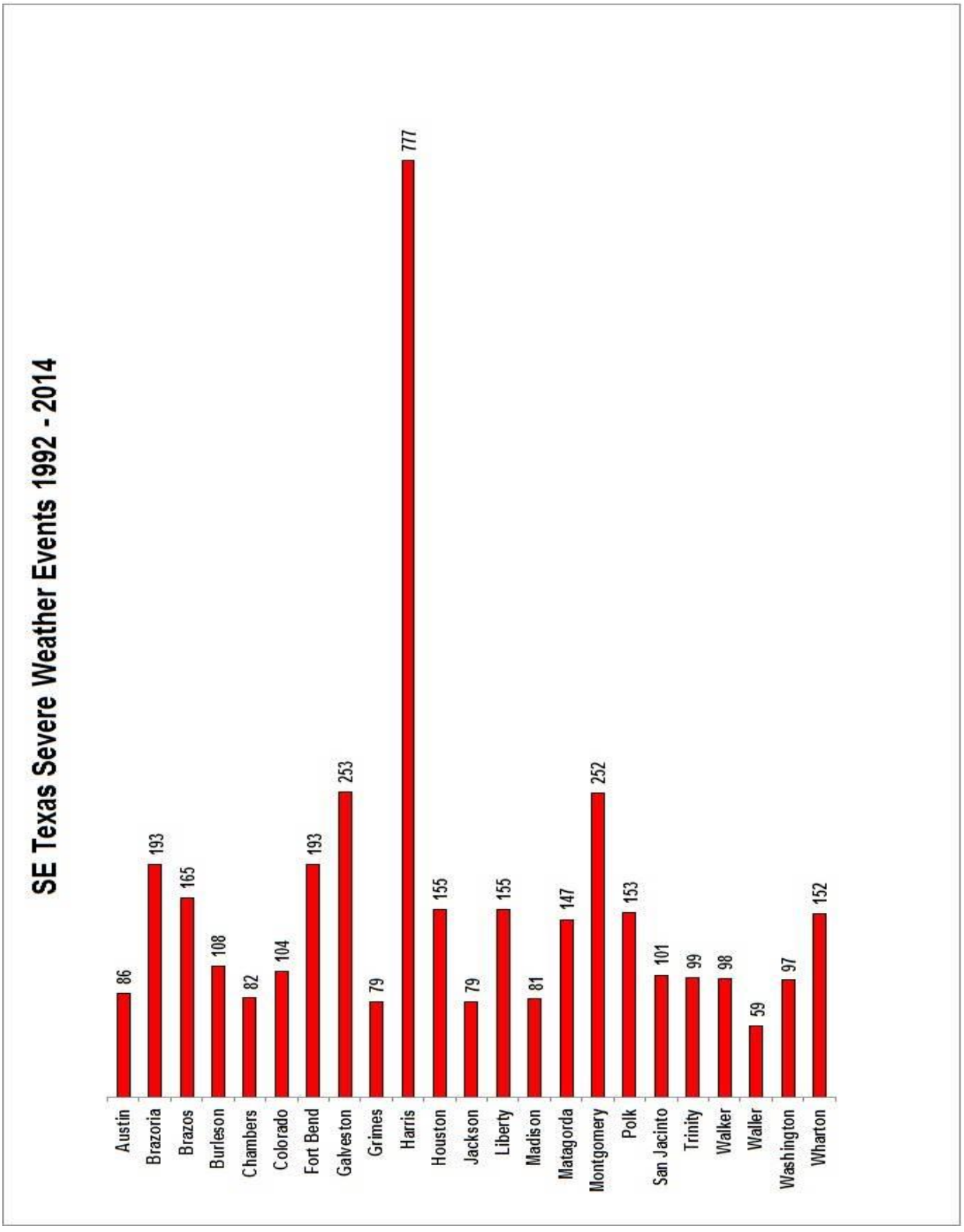
SEVERE THUNDERSTORM WARNING

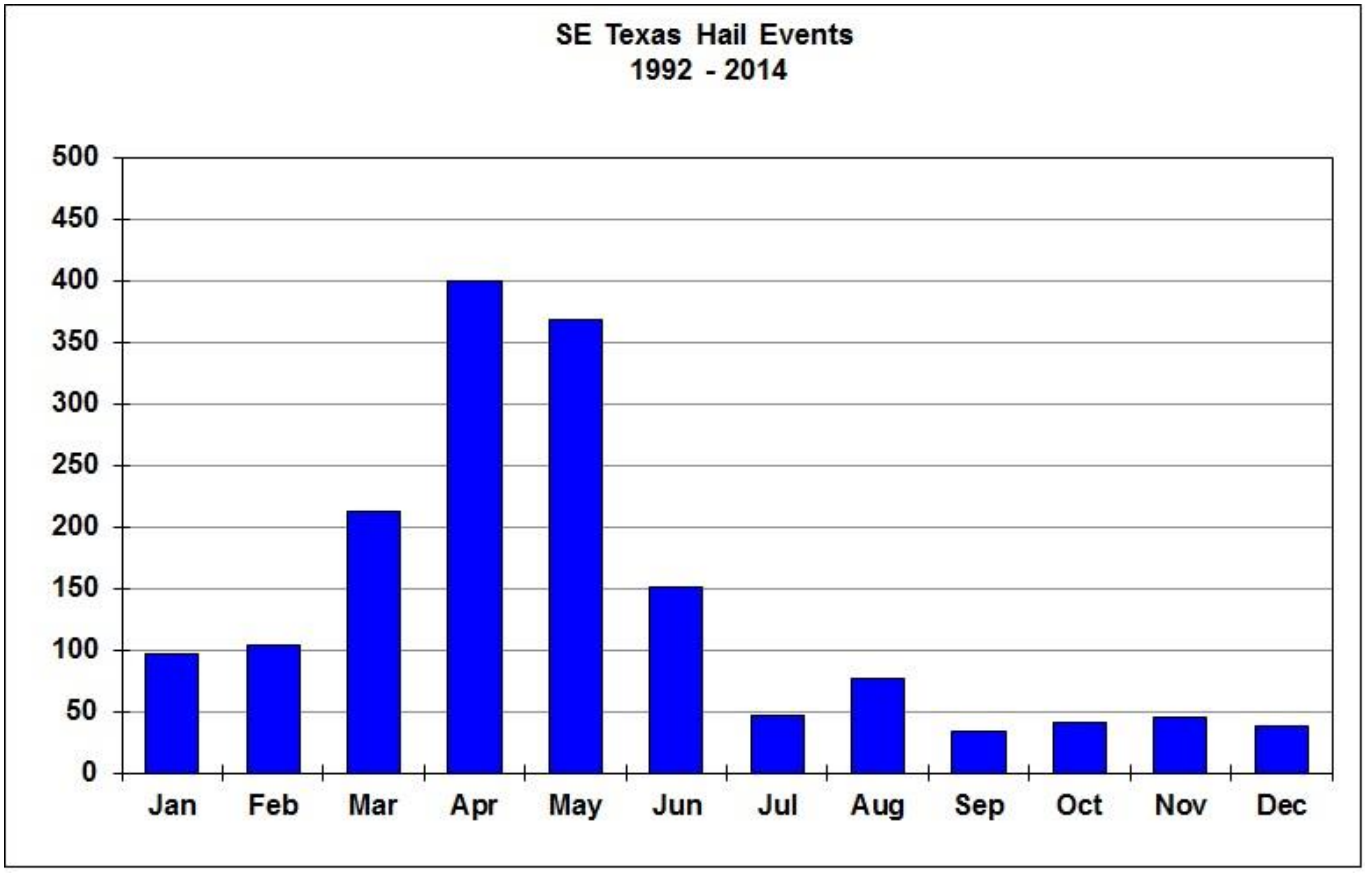
Issued by the local National Weather Service office. Usually covers a small area (one or a few counties) and has a short duration of 30 minutes to an hour. A SEVERE THUNDERSTORM WARNING means that a severe thunderstorm has been detected by radar, or reports of severe weather have been received by the National Weather Service in the area covered by the warning. The warnings are broadcast over NOAA Weather Radio and are usually scrolled on local television stations. The warnings are also relayed to local emergency management and public safety officials who can activate emergency procedures to help protect the public. If a warning is issued for your area, take action immediately!!

SEVERE WEATHER STATEMENT

Follow-up information on a WARNING.

(NSSL)


SE Texas Severe Weather Events 1992 - 2014
Austin 86
Brazoria 193
Brazos 165
Burleson 108
Chambers 82
Colorado 104
Fort Bend 193
Galveston 253
Grimes 79
Harris 777
Houston 155
Jackson 79
Liberty 155
Madison 81
Matagorda 147
Montgomery 252
Polk 153
San Jacinto 101
Trinity 99
Walker 98
Waller 59
Washington 97
Wharton 152


SE Texas Hail Events
1992 - 2014
500
450
400
350
300
250
200
150
100
50
0
Jan
Feb
Mar
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May
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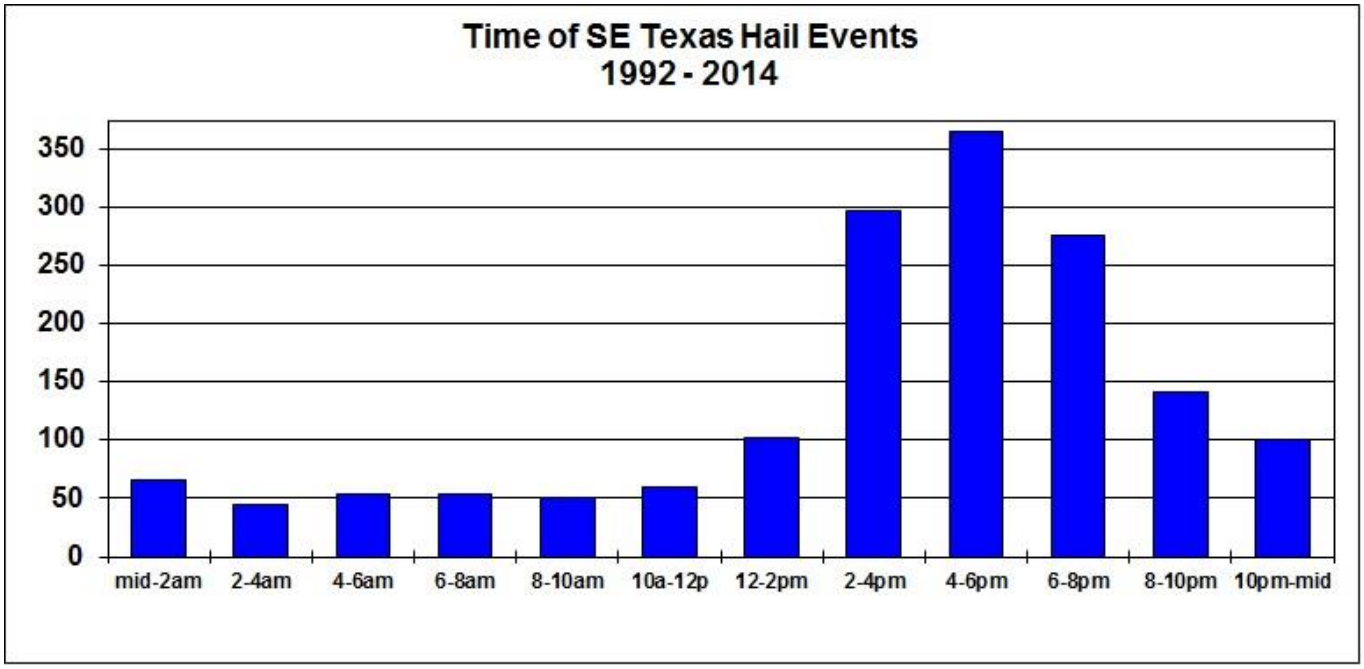
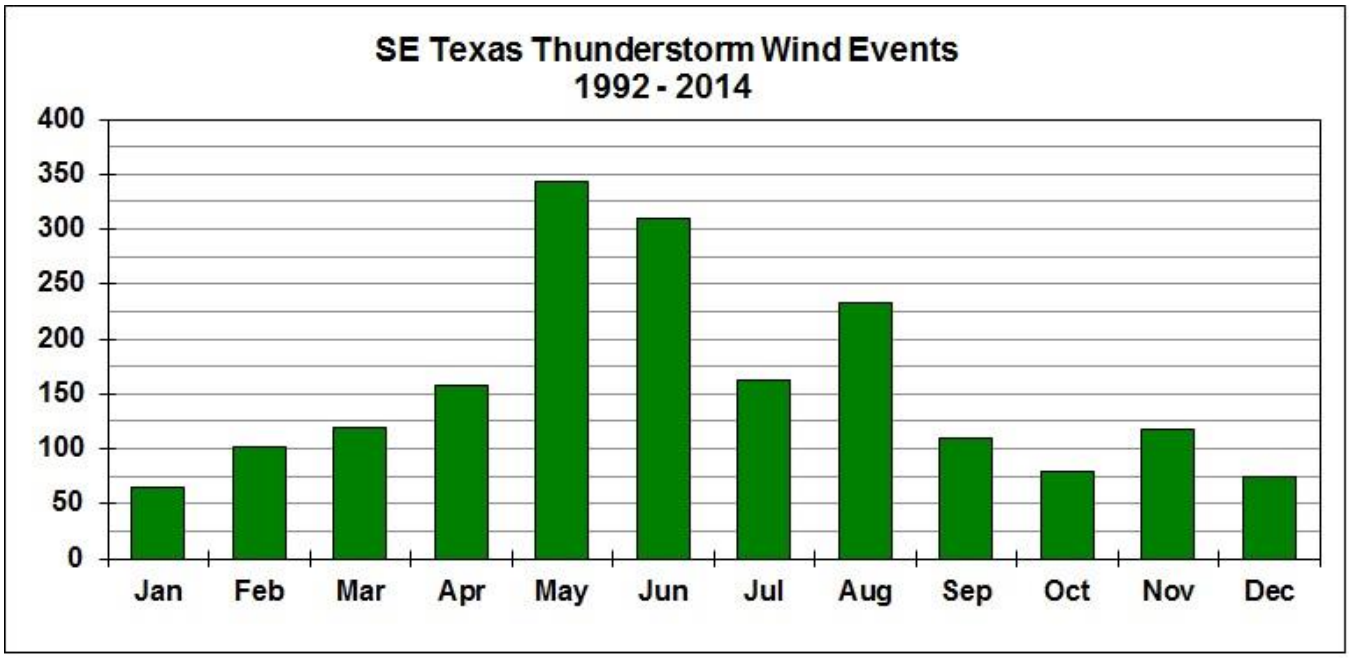
Jul
Aug
Sep
Oct
Nov
Dec


Time of SE Texas Hail Events
1992 - 2014
350
300
250
200
150
100
50
0
mid-2am
2-4am
4-6am
6-8am
8-10am
10a-12p
12-2pm
2-4pm
4-6pm
6-8pm
8-10pm
10pm-mid


SE Texas Thunderstorm Wind Events
1992 - 2014
400
350
300
250
200
150
100
50
0
Jan
Feb
Mar
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May
Jun
Jul
Aug
Sep
Oct
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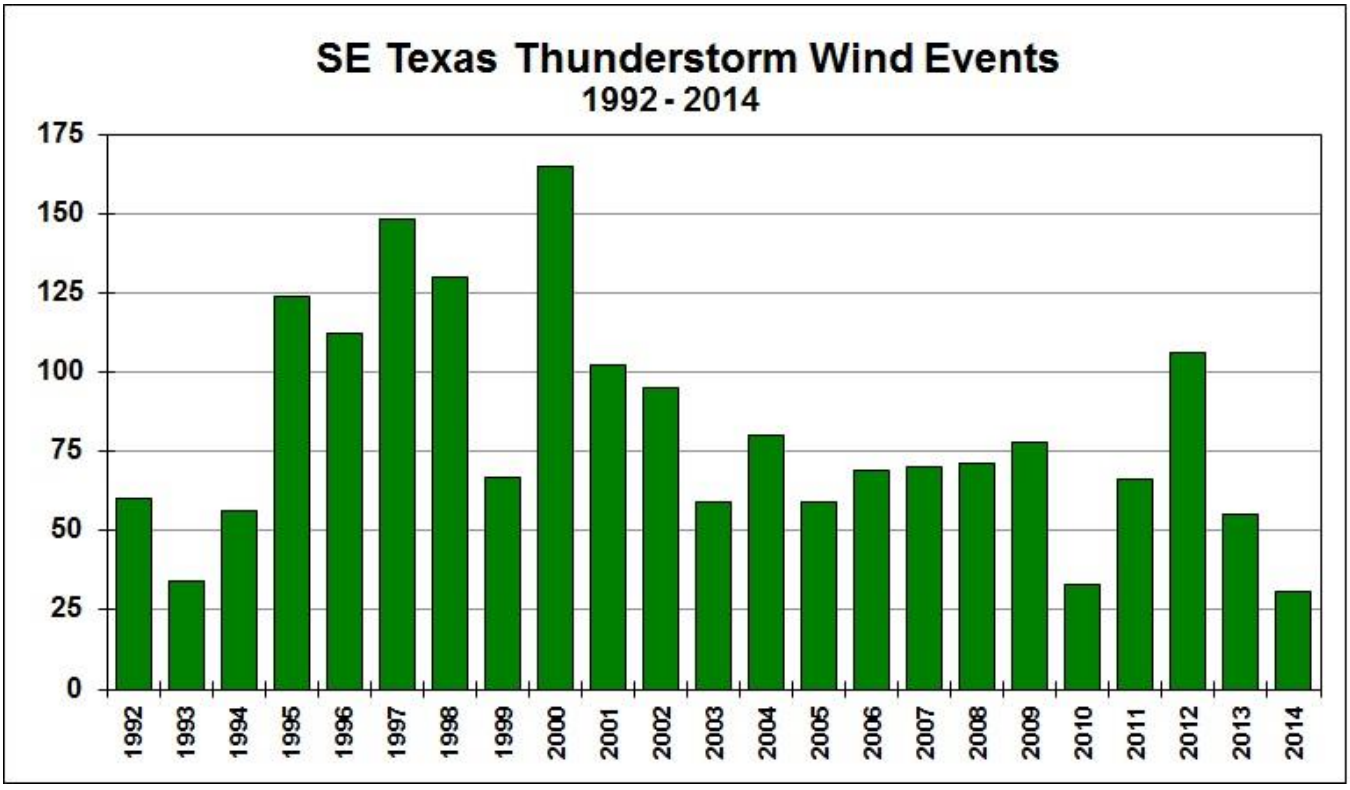
Dec


SE Texas Thunderstorm Wind Events
1992 - 2014
175
150
125
100
75
50
25
0
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
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2006
2007
2008
2009
2010
2011
2012
2013
2014

TORNADOES


(NSSL)

What causes tornadoes?
Tornadoes most commonly form from large-scale storm systems that traverse the U.S. from west to east. Typically, severe thunderstorms will develop in the warm, moist airmass ahead of the storm system, and can produce tornadoes. Tornadoes can result from isolated thunderstorms or as part of a large squall line that forms along a cold front. Severe thunderstorms and tornadoes need an unstable (warm, humid) airmass, cold air at mid-levels of the atmosphere, and strong wind shear (turning and strengthening of winds with height in the atmosphere) to develop. In a thunderstorm, the tornado begins as a circulation several thousand feet above the ground, and slowly descends to the ground.

Organized tropical systems like tropical storms and hurricanes can also produce tornadoes, but usually smaller and shorter-lived than those spawned by mid-latitude systems.

How do tornadoes impact southeast Texas?
Texas averages 137 tornadoes each year, the highest number of any state in the U.S. Tornadoes are most common during the spring and summer months nationwide, but due to our proximity to the Gulf of Mexico as a moisture source, tornadoes can occur in southeast Texas any time of year. In fact, some of our worst tornado outbreaks on record in southeast Texas have actually occurred in the late fall and winter months. Strong to violent tornadoes (those F2 or larger) are fairly uncommon, but they can occur. Tornadoes are usually isolated incidences, but occasionally can occur in “outbreaks” of several in one day.

What is a waterspout?
Waterspouts are weak tornadoes that form over water. Along the upper Texas coast they are most common during the morning hours of the summer months, and do not require a thunderstorm to be present to form. Usually, waterspouts are short-lived, do little if any damage, and have winds well less than 100 mph. On rare occasions, they can move inland as tornadoes and cause damage.


(Dr. Joseph Golden, NOAA)

How are tornadoes rated?

Weak tornadoes are generally those classified as EF0 or EF1 and comprise 69% of all tornadoes nationally and 93% of all tornadoes locally. In southeast Texas, these tornadoes typically last only a few minutes and produce winds less than 100 mph. Usually, they will cause only spotty minor damage, such as downing trees or power lines. Tornadoes in the F0 or F1 category contribute to less than 5% of tornado deaths annually.

Strong tornadoes are those classified as EF2 or EF3, with winds of 110 to 205 mph. They comprise 29% of all tornadoes nationally and account for nearly 30% of all tornado deaths across the entire U.S.. They may last 20 minutes or longer. Tornadoes of this magnitude are uncommon in southeast Texas, accounting for only 7% of all the tornadoes that have affected the area.

Violent tornadoes, those classified as EF4 or EF5, account for only 2% of all tornadoes nationwide. These tornadoes account for 70% of all tornado deaths nationally, and their lifetime can exceed 1 hour. Violent tornadoes have occurred in southeast Texas, but they are extremely rare. These tornadoes only account for less than 1% of all the tornadoes that have ever struck southeast Texas. Tornado rating has nothing to do with the size of the tornado. Each tornado is rated after it touches down, based on the damage that it has done.

Enhanced Fujita Scale for Tornado Damage		
NUMBER	WIND SPEED (3 SEC GUST)	DAMAGE
EF-0	65 to 85 mph	Light
EF-1	86 to 110 mph	Moderate
EF-2	111 to 135 mph	Considerable
EF-3	136 to 165 mph	Severe
EF-4	166 to 200 mph	Devastating
EF-5	Over 200 mph	Incredible

What should a school do to prepare for a tornado?

1. Develop a severe weather action plan and conduct frequent drills. Children should kneel on the floor, putting their head on the ground and covering their neck with their hands. The neck and lower head are the most vulnerable parts of the body to flying debris.
2. Each school should be inspected and shelter areas designated by a registered engineer or architect. Schools without basements should use interior rooms and hallways on the lowest floor and away from windows.
3. Have a compressed airhorn or megaphone to activate the alarm in case of power failure.
4. Make special provisions for disabled students or those in trailers.
5. Have someone on hand to turn off the gas or electricity if the school is damaged.


(NWS Houston/Galveston)

6. Prepare to keep children at school beyond regular hours if threatening weather is expected. Children are safer in school than traveling on the roadways during severe weather. Students should NOT be sent home early if severe weather is approaching.
7. Large, high rooms are dangerous when a tornado is approaching. Gymnasiums, cafeterias, and auditoriums offer no protection in a tornado. Other large facilities can take similar measures for tornado preparedness.

What can you do ahead of time to prepare your home or business for a tornado threat?


(NWS Houston/Galveston)

1. Develop a plan for your family or coworkers at your place of residence or business.

2. Do frequent tornado drills.

3. Know the county where you live. All National Weather Service warnings are issued by county.

4. Purchase a NOAA Weather Radio with a warning alarm and battery back-up. It will automatically be activated when a warning is issued.

What else can you do to prepare for a tornado?

· Remain alert for signs of an approaching tornado.
· Be aware of rapidly darkening skies.
· Listen for approaching strong winds or the sound of a freight train.
· Look for rotation in clouds or a “wall cloud,” a distinct lowering from the back of a thunderstorm. In southeast Texas, hazy skies and tall trees make sighting tornadoes difficult. Also, tornadoes are often obscured by rain or can occur at night.

National Weather Service Tornado Products:

· **TORNADO WATCH**
Issued by the Storm Prediction Center in Norman, Oklahoma. Usually covers a fairly large area (such as all or a portion of southeast Texas) and runs from 6 to 8 hours. A TORNADO WATCH is usually issued a few hours in advance of severe weather, and means conditions are favorable for severe thunderstorm development.

· **TORNADO WARNING**
Issued by your local National Weather Service office. Typically runs for a short time span, usually 30 minutes to 1 hour and covers a relatively small area of one to a few counties. Means a tornado has been sighted or a strong circulation has been detected by radar. If a TORNADO WARNING is issued for your area, seek shelter immediately!!

Remember, tornadoes can occur even if a TORNADO WATCH or a TORNADO WARNING are not in effect!!

(NWS Houston/Galveston)

What do you do when a tornado is approaching or a TORNADO WARNING is issued?
1) In a home or business, go to the safest place, usually on the lowest floor of the building in a central room away from windows. Get under a sturdy piece of furniture.
2) Stay away from windows.
3) Get out of automobiles immediately! They will become flying debris in a tornado. Do not try to outrun a tornado in your car.
4) If caught outside, lie flat in a nearby ditch or depression.
5) Abandon mobile homes. Even if tied down, they will offer no protection in a tornado.

What are some memorable tornadoes and tornado outbreaks that have impacted southeast Texas?

February 18, 2013
An EF-1 tornado with wind speeds in a 95 to 105 mph range produced extensive damage to the roof, garage and front door area of a brick home in Shepherd (San Jacinto County). An adjacent barn was also destroyed. The damage path extended a little over one half mile with downed trees observed along the path on either side of the brick home.

August 30, 2009
An EF-1 tornado with wind speeds in a 80 to 90 mph range produced a damage path around 1/3 of a mile long and 100 feet wide on Galveston Island. The tornado originated as a waterspout then moved onshore near the intersection of 29th Street and Seawall Blvd. The tornado caused a couple injuries and damaged several structures along its path.

May 3, 2009
An EF-1 tornado produced a 2 mile long and 50 yard wide damage path, destroyed an outdoor shed, shifted a double wide trailer and flipped a pickup truck. A small metal boat was carried 300 yards across an open field. Numerous trees were either uprooted or snapped off close to the ground. Damage was estimated at around $60,000.

December 29, 2006
An F1 tornado moved south to north across the central College Station area (Brazos County) and produced a damage path that was five miles long and at times 200 yards wide. The majority of the damage was concentrated along the Harvey Mitchell Parkway with several businesses and an apartment complex receiving significant damage.

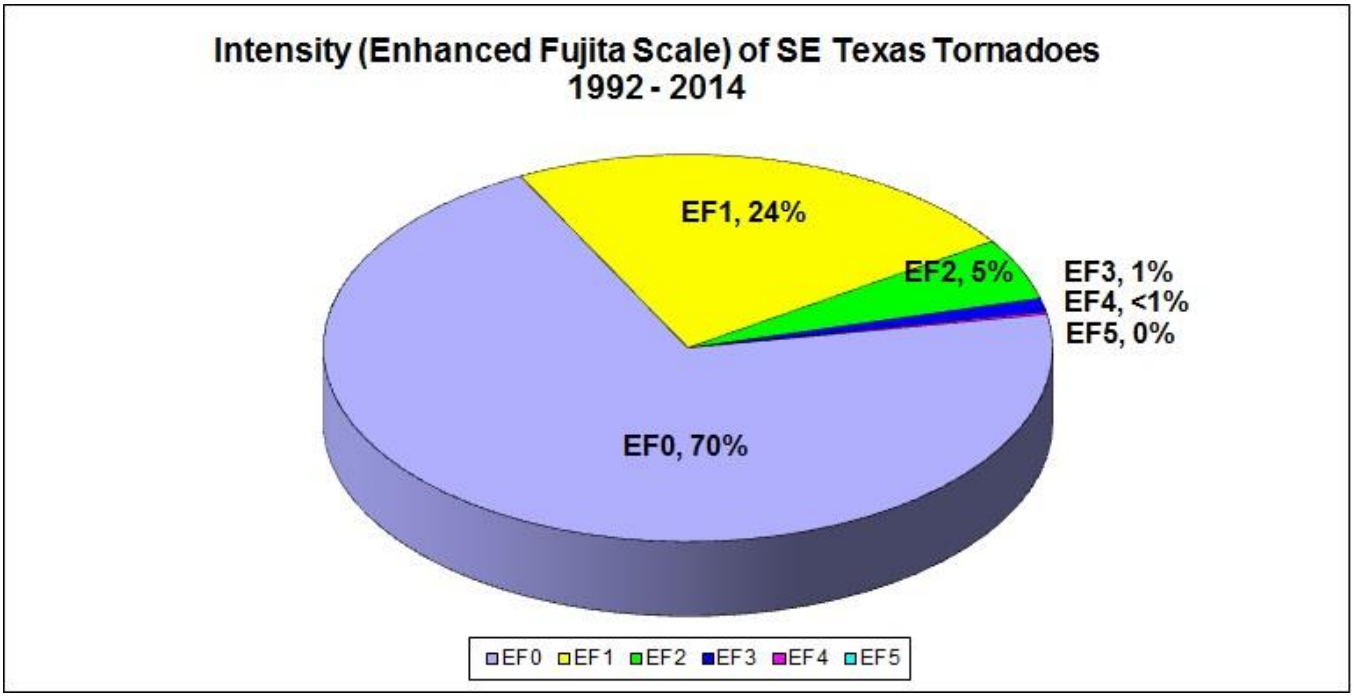
October 4, 2004
An F0 tornado struck the Friendswood (Galveston County) area in the afternoon. An 18 wheeler was overturned at the intersection of FM 2351 and FM 518. Trees were snapped and numerous fences were damaged. Widespread power outages occurred in and around city. A 16 foot boat was flipped over in a residential yard.

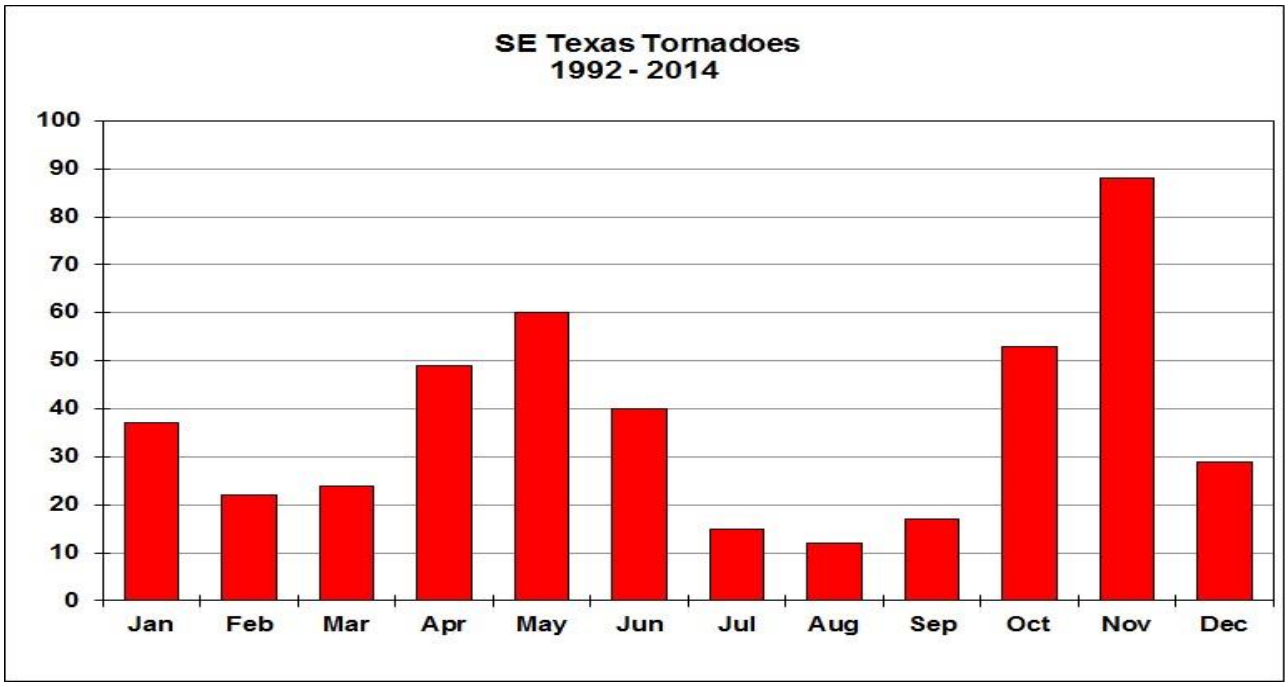
March 30, 2002
An F3 tornado struck the La Porte area on this evening. The tornado began its path three miles south of La Porte and then moved northeast and partially demolished a mini mart and caused major roof damage to an apartment complex. The path of this tornado was 3/4 of a mile long.

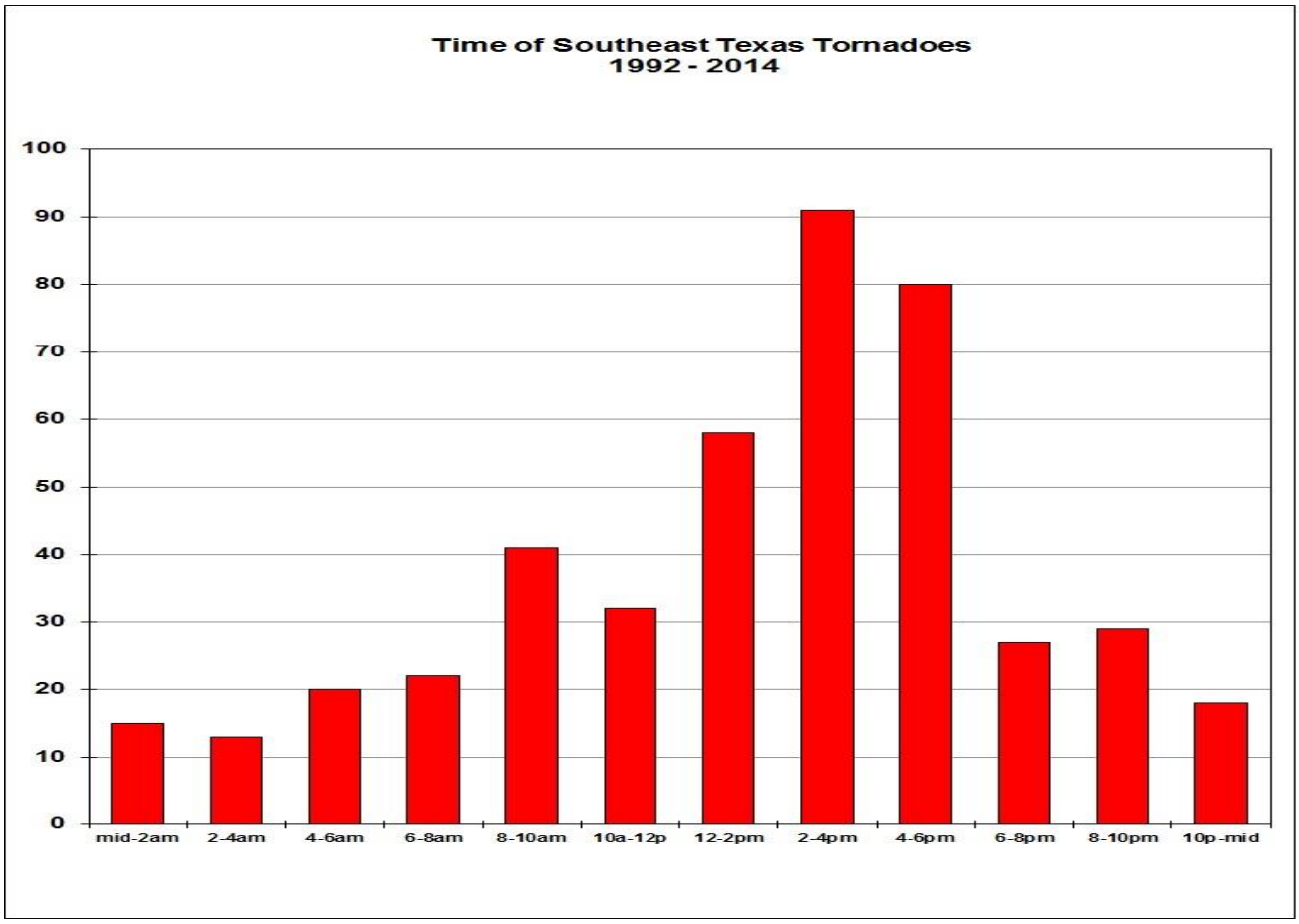
January 1, 1999
Here's proof that tornadoes can occur any time of year in southeast Texas. On New Year's Day 1999, nine tornadoes touched down over southeast Texas in association with a strong storm system that moved across the region. Two of the tornadoes were rated as F2. One of the tornadoes tracked 5 miles to the southeast of Trinity, damaging homes in several subdivisions. The other F2 impacted an area in Liberty County 10 miles east of Devers. Eight injuries were reported during this outbreak.

October 23, 1997
An unseasonably strong storm system spawned 11 tornadoes around southeast Texas. Two F2 tornadoes were reported. One tornado tracked 12 miles from Lake Houston to western Liberty County. Another tornado tracked 25 miles through Montgomery and Liberty counties, resulting in major damage to several homes. An F1 tornado struck Sugar Land damaging 109 homes.

The November 1992 Outbreak
Perhaps the worst tornado outbreak on record in southeast Texas occurred on November 21, 1992. Over a dozen tornadoes resulted from a powerful storm system moving across the area. Most of the tornadoes occurred during a two hour period during the early afternoon that day. Widespread damage occurred in the Houston area, with hundreds of homes and businesses affected. A total of 34 injuries and over $12 million in damage resulted from this outbreak. Amazingly, there were no fatalities. An F4 tornado struck Channelview, traveling on the ground 20 miles into Liberty County. This tornado resulted in 15 injuries, 200 homes destroyed, and 1000 homes damaged. An F3 tornado tracked from northeastern Harris County into Liberty County for a total of 28 miles. Two F2 tornadoes occurred in Harris County. One tornado tracked right through the middle of Houston, traveling from Hermann Park northward to near Intercontinental Airport damaging 600 buildings and injuring 6 people. Another tornado struck the Kelliwood subdivision in Katy causing significant home damage and injuring six. It then went on to hit the West Side Airport where it damaged a dozen aircraft.




SE Texas Tornadoes
1992 - 2014
100
90
80
70
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Time of Southeast Texas Tornadoes
1992 - 2014
100
90
80
70
60
50
40
30
20
10
0
mid-2am
2-4am
4-6am
6-8am
8-10am
10a-12p
12-2pm
2-4pm
4-6pm
6-8pm
8-10pm
10p-mid

LIGHTNING


(NSSL)

Lightning occurs with ALL thunderstorms. An average 93 deaths and 300 injuries occur around the U.S. annually. An estimated 100,000 thunderstorms occur nationwide each year. The southeast Texas area averages 50 to 60 days with thunderstorms per year. Lightning results from the buildup and discharge of electrical energy between positive and negative charged areas. Most lightning deaths or injuries occur when people are on a golf course, near water, or standing under trees for shelter. The late afternoon or early evening hours during the summer are the most common times for lightning casualties nationwide, but they can occur just about any time of year near the Gulf coast. The Gulf coast region has the highest incidences of lightning strikes annually throughout the U.S. Lightning can strike several miles away from a thunderstorm. If you know a thunderstorm is nearby or approaching, you should take shelter in a building and stay away from trees, metal objects and water. An automobile can be a relatively safe place when lightning occurs. Avoid using telephones and electrical appliances during a thunderstorm.

If you are caught outside during a thunderstorm...

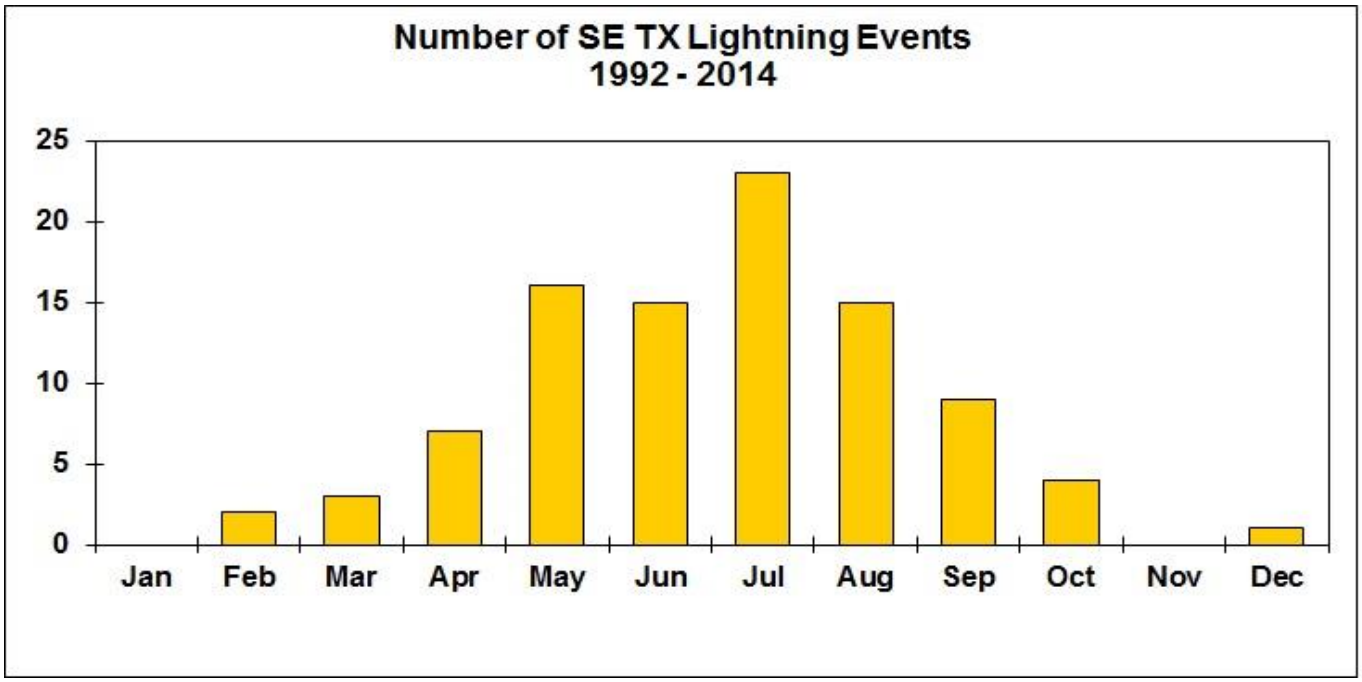
· If you feel your hair stand on end it means lightning is about the strike. Squat low to the ground on the balls of your feet. Place your hands on your knees with your head between them. Make yourself the smallest target and minimize contact with the ground.

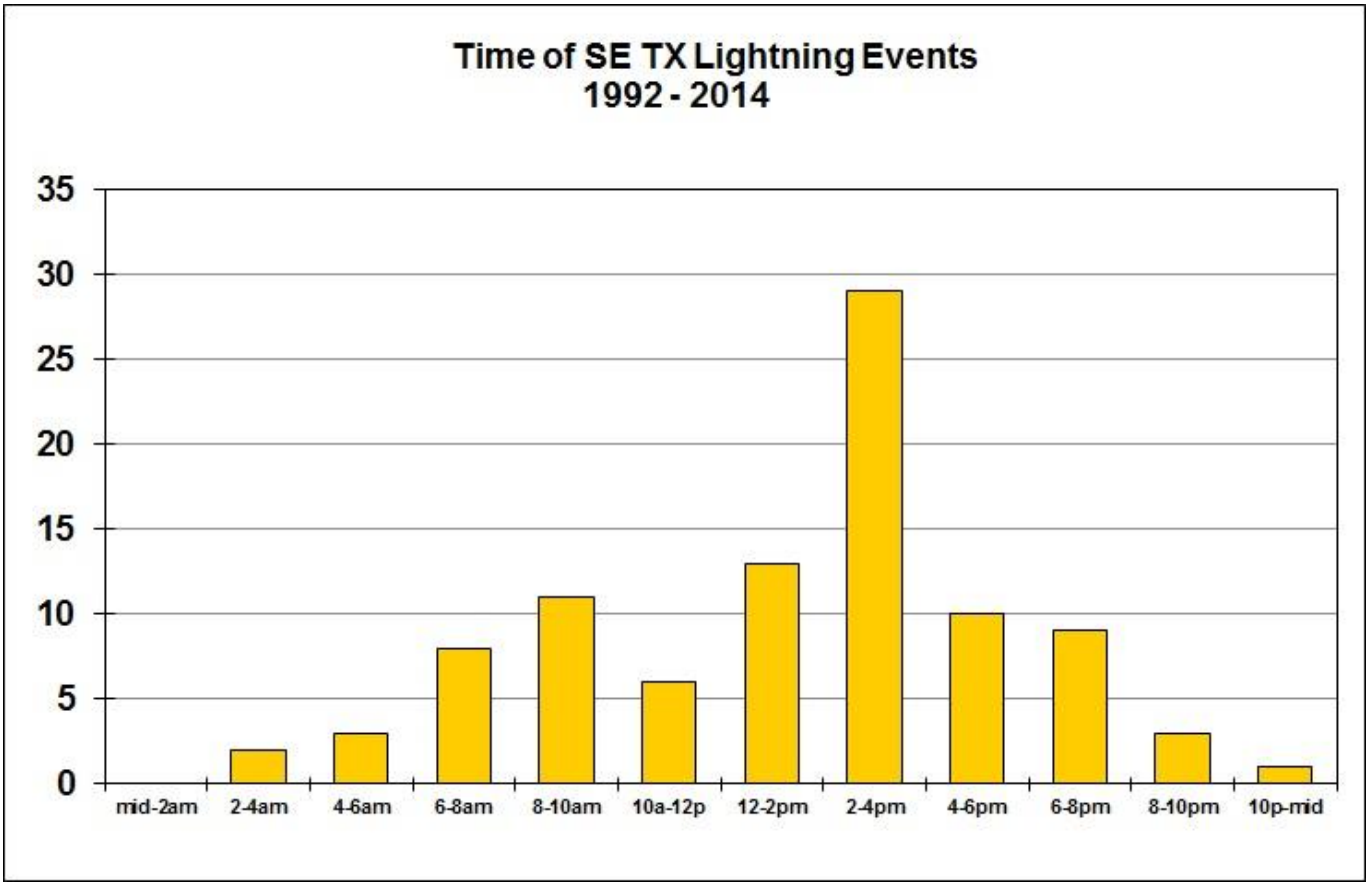
· Stay away from trees and other tall objects. If you are in the woods, find the shortest trees to seek shelter underneath.

· Use the “30-30 Rule” while outside. The first 30 is the number of seconds between a flash of lightning and the time you hear thunder. This means the lightning is approximately 6 miles away (30 seconds divided by 5 seconds a mile). The second 30 refers to the number of minutes after the last flash of lightning or a clap of thunder to establish an all-clear.

(NOAA)

More Lightning Safety Awareness:
http://www.lightningsafety.noaa.gov


Number of SE TX Lightning Events
1992 - 2014
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

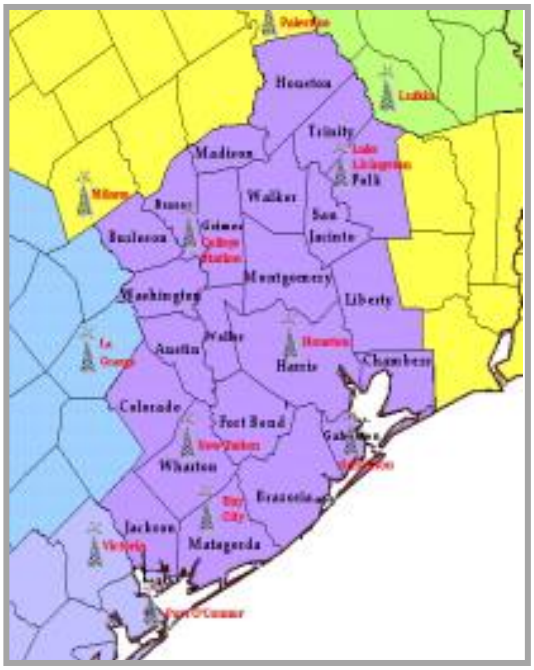

Time of SE TX Lightning Events
1992 - 2014
35
30
25
20
15
10
5
0
mid-2am
2-4am
4-6am
6-8am
8-10am
10a-12p
12-2pm
2-4pm
4-6pm
6-8pm
8-10pm
10p-mid

NOAA WEATHER RADIO

General Information


(NOAA)

NOAA Weather Radio (NWR) is a nationwide network of radio stations broadcasting continuous weather information direct from a nearby National Weather Service office. NWR broadcasts National Weather Service warnings, watches, forecasts and other hazard information 24 hours a day. Working with the Federal Communications Commission's new Emergency Alert System, NWR is an "all hazards" radio network, making it the single source for the most comprehensive weather and emergency information available to the public. NWR now broadcasts warning and post-event information for all types of hazards - both natural (such as earthquakes and volcano activity) and technological (such as chemical releases or oil spills). Known as the "Voice of the National Weather Service," NWR is provided as a public service by the Department of Commerce's National Oceanic & Atmospheric Administration. The NWR network has more than 480 transmitters, covering the 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories. NWR requires a special radio receiver or scanner capable of picking up the signal. Broadcasts are found in the public service band between 162.400 and 162.550 megahertz (MHz).



(NWS Southern Region HQ)

What types of NOAA Weather Radio receivers are available?

NOAA Weather Radio receivers come in many sizes and with a variety of functions. Many radios can receive an alarm tone, triggered when the NWS issues severe weather announcements or emergency information. Most NOAA Weather Radio receives are either battery-operated portables or AC-powered desktop models with battery backup, so they can be used in many different situations. Some CB radios, scanners, short wave and AM/FM radios are also capable of receiving NWR transmissions.

FIPS Codes

The National Weather Service uses several different codes to identify counties during varying weather events. One such code, FIPS Codes, helps identify specific states and counties during severe weather events. When combined with a specific event such as a severe thunderstorm or tornado warning, the FIPS Code will identify which state and county the warning affects. For example, when we here at the National Weather Service issue a tornado warning for Montgomery County, the FIPS Codes would follow as: 048339. The 048 part of the code signals to the public that this product refers to a county in the State of Texas, with the 339 part of the code specifically identifying Montgomery County. If you put it in a handy reference manual and you know the state identifier and the list of county identifiers, you can pinpoint any county in the United States without reading the text. This code helps computer programmers with television, radio, private companies, and the National Weather Service automatically monitor severe weather warnings and statements to better serve the public.

NWS Houston/Galveston NOAA Weather Radio Area FIPS Codes

COUNTY	FIPS CODE	COUNTY	FIPS CODE
Austin	048015	Madison	048313
Brazos	048041	Milam	048331
Brazoria	048039	Montgomery	048339
Burleson	048051	Polk	048373
Chambers	048071	Robertson	048395
Fort Bend	048157	San Jacinto	048407
Galveston	048167	Trinity	048455
Grimes	048185	Walker	048471
Harris	048201	Waller	048473
Leon	048289	Washington	048477
Liberty	048291	Wharton	048481
Matagorda	048321		

SKYWARN

What is SKYWARN?

SKYWARN is a concept developed in the early 1970s that was intended to promote a cooperative effort between the National Weather Service and communities. The emphasis of the effort is often focused on the storm spotter, an individual who takes a position near their community and reports wind gusts, hail size, rainfall, and cloud formations that could signal a developing tornado. Another part of SKYWARN is the receipt and effective distribution of National Weather Service information. SKYWARN is a program sponsored by your National Weather Service Office in conjunction with your local Emergency Management Organization. It is a group of trained volunteers that watch the skies during severe weather and relay reports back to you local Emergency Management Official and/or the National Weather Service (NWS). These volunteers provide valuable information to help the NWS save lives and reduce property damage in your community by improving warnings.

(SWN)

How do I join SKYWARN?

Each NWS office around the country is the primary point of contact for each local SKYWARN program. If you or your community is interested in sponsoring a SKYWARN Program, contact your local NWS office to schedule a training session. The Houston/Galveston National Weather Service conducts most SKYWARN classes during the months of January, February and March before the spring severe weather season peaks in April and May. These training sessions last around 3 hours and can be scheduled during the day, in the evening or even on Saturday to fit your schedule. For further information on particular programs, please contact Gene Hafele at 281.337.5074 or listen to NOAA Weather Radio in your area for information on these programs as they come closer.

For more SKYWARN information:

NWS SKYWARN	http://www.weather.gov/skywarn
National SKYWARN	http://skywarn.org
NWS Houston/Galveston SKYWARN	http://www.srh.noaa.gov/hgx/?n=skywarn
East Texas SKYWARN	http://stormwarn.net/

Important Contact Information

National Weather Service Houston/Galveston
1353 FM 646 Suite 202
Dickinson, TX 77539
281.337.5074
weather.gov/houston

Phone Numbers/E-mail Addresses:

Meteorologist-In-Charge, Jeffry Evans	x224	jeffry.evans@noaa.gov
Warning Coordination Meteorologist, Dan Reilly	x223	dan.reilly@noaa.gov
Service Hydrologist, Dave Schwertz	x228	dave.schwertz@noaa.gov
Information Requests/Forecasts	x229	sr-hgx.nws@noaa.gov

Internet Addresses:

State of Texas Division of Emergency Management	http://www.txdps.state.tx.us/dem
Federal Emergency Management Agency (FEMA)	http://www.fema.gov
Storm Prediction Center	http://www.spc.noaa.gov
National Climatic Data Center	http://www.ncdc.noaa.gov/oa/ncdc.html
EMWIN Houston	http://houston.emwin.org/