



Southwest Weather Bulletin

Spring-Summer 2011 Edition

National Weather Service El Paso/Santa Teresa

La Nina Brings Severe Drought, Extreme Cold and Record Warmth to the Borderland

An extensive La Nina was present over the eastern Pacific with ocean temperatures cooler than normal from late autumn through the winter and early spring. As a result the circulation pattern over the western United States was dominated by high pressure and westerly winds. Consequently after a severe weather outbreak in October, extremely dry weather developed across the Borderland. From October 21 2010 through April 30 2011, El Paso and other locations experienced only 3 days of measurable precipitation with most of the region getting less than 10 percent of normal rainfall. Thus severe drought conditions existed by the middle of April causing a high to extreme wildfire danger.

The most significant weather event of the winter was a historic outbreak of Arctic air which brought extremely cold temperatures and blizzard conditions to the Borderland in early February, virtually paralyzing the area for several days. But despite this period of unusual cold, overall temperatures were near normal for the November 2010 to February 2011 period.



This severe thunderstorm produced large hail and high winds over Otero County on October 20.
(Joe Rogash NWS/NOAA)

Persistent west to southwest winds combined with upper level disturbances to bring very warm, dry and occasionally windy early spring conditions with both March and April 2011 the warmest and driest on record for El Paso and most other locations.



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Seasonal Weather Highlights



Funnel cloud over Otero County on October 20. (Jeff Passner)

October 4: Thunderstorms produce heavy rains and small hail across the region. Almost an inch of rain falls over portions of Las Cruces while streets flood around Deming.

October 20: Late afternoon and evening severe supercell thunderstorms hammer portions of Otero and El Paso Counties. Baseball-sized hail smashes a vehicle north of Orogrande while one inch-diameter hail falls over El Paso. Winds gust to 66 mph hour at White Sands Missile Range. 1 to 2 inches of rain also fall around portions of Otero County.

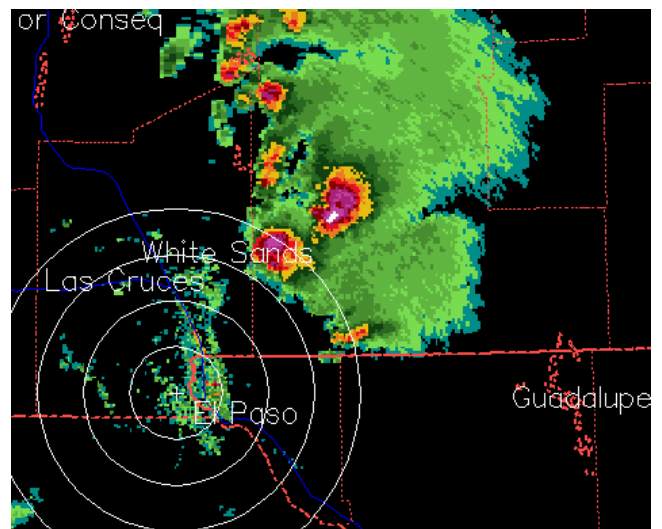
October 25: Windy across the area with gusts around 50 mph.

November 28-29: Windy across the region as wind gusts are measured to 66 mph over east El Paso with gusts from 40 to 50 mph most elsewhere. A strong cold front also lowers temperatures around 20 degrees on the 29th.

December 30: A powerful low pressure system with a strong cold front moves across the southern Rockies bringing stormy weather conditions. Winds gust above 70 mph over portions of east El Paso and Dripping Springs near Las Cruces with 50-60 mph gusts most elsewhere. After the cold front passes during the morning, temperatures fall



This thunderstorm produced heavy rains and small hail over Las Cruces on October 4. (Jeff Passner)



Oct 20 Santa Teresa radar image of late afternoon severe thunderstorms over Otero County NM.



Wind gusts around 50 mph damaged this building in El Paso on October 25. (Victor Calzada /El Paso Times)



Lake Roberts after the Dec 30 snowstorm. (Greg Lundeen NWS/NOAA)



Silver City during the Dec 30 snowstorm. (Terrance Vestal/Silver City Sun News)



Gila Wilderness after the Dec 30 heavy snows. (Greg Lundeen NWS/NOAA)

rapidly to near or below freezing with snow developing. The snow and high winds create blizzard conditions through the afternoon and evening. The snow was especially heavy over Grant County as 7 to 14 inches fall around Silver City while 9 to 12 inches of snow are reported in the Pinos Altos area. Elsewhere 6 inches of snow fall in the Cloudcroft vicinity with 1 to 3 inches around El Paso and Las Cruces.

January 2011: Extremely dry with most of the lower elevations receiving no measurable precipitation for the month.



Cloudcroft on Dec 31. (CloudcroftWebcam.com)

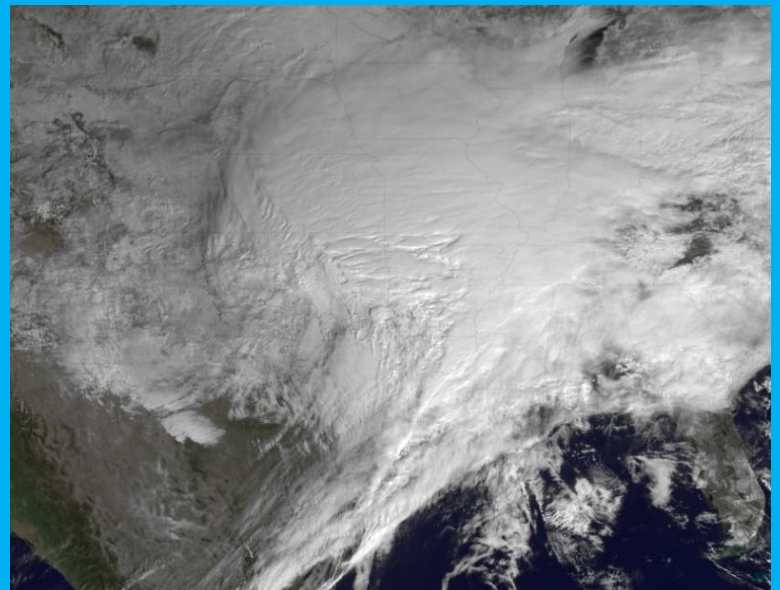
HISTORIC ARCTIC BLAST FREEZES THE BORDERLAND



Feb 2 blizzard conditions caused numerous traffic accidents around the El Paso area. (Rudy Gutierrez/El Paso Times)

Beginning on January 31 and continuing into early February 2011, a historic winter storm slammed most of the United States from the Rocky Mountains to the east coast with an associated blast of Arctic air plunging southward into the southwest. The initial surge of frigid air first penetrated southern New Mexico and far western Texas on Feb 1 with extremely cold air covering the entire area and much of Arizona by Feb 2. Concurrently an upper-level trough moved eastward across the southern Rockies, producing areas of moderate and heavy snow, especially over northern Otero County. Total snow amounts were around 6-12 inches in the Alamogordo and Cloudcroft areas with 9 inches falling near Tyrone in Grant county. Elsewhere 2 to 5 inch snowfalls were common.

By the morning of Feb 2, the combination of frigid temperatures and near blizzard conditions virtually paralyzed El Paso, Las Cruces and



Visible satellite image of the historic February 2011 winter storm.

other towns across the Borderland with offices, schools and businesses shut down. The snow and blowing snow also caused numerous traffic accidents from icy roads and low visibilities.

El Paso set an all-time record low maximum temperature with a high of only 15 degrees. Elsewhere afternoon temperatures generally ranged from 10 to 20 across the deserts while in the mountains Cloudcroft remained extremely chilly with a high of only -1. Temperatures continued to plunge after sunset with readings bitterly cold by sunrise. Over the lowlands Feb 3 morning lows included -13 for Alamogordo, -9 for Silver City, and -5 for both Santa Teresa and Truth or Consequences. Temperatures across El Paso were near 0. Along the mountains temperatures were especially frigid with a low of -30 at the Inn of the Mountain Gods near Mescalero and around -20 in the Cloudcroft vicinity. Again most offices, schools, and businesses were closed on Feb 3 as daytime highs were only around 10 to 20.



El Paso resident dressed for the extreme cold on Feb 3. (Mark Lambie /El Paso Times)

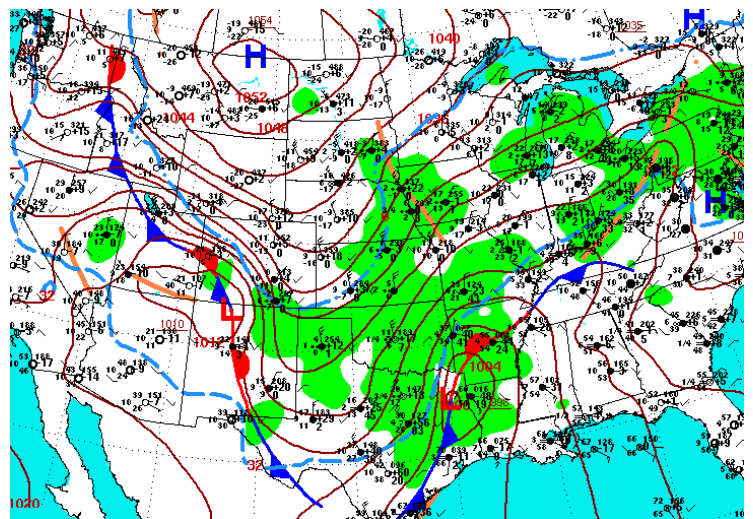


Feb 2 weather related traffic accident near Las Cruces. (Norm Dettlaff/Las Cruces Sun News)

In addition to the unusually severe winter weather conditions, residents across New Mexico and far western Texas had to contend with a loss of utilities. The extreme cold resulted in generator failures, equipment malfunctions, and fuel shortages. Thus electrical outages and rolling blackouts were common, especially around the El Paso and Las Cruces areas where thousands of people experienced a loss of electricity for periods lasting up to an hour. At least 1200 people also lost heat due to insufficient pressure in natural gas lines. With temperatures remaining well below freezing, numerous water pipes burst around El Paso and other locations causing streets to become

flooded and icy. Many residents went without water due to broken pipes and shut-downs at pumping stations.

By the afternoon of February 4 temperatures finally climbed to near or a little above freezing across the lowlands and high temperatures rose into the 50s the following day. For the cold air outbreak period, Alamogordo went 103 consecutive hours at or below freezing with El Paso experiencing freezing temperatures 78 continuous hours. The prolonged exposure to cold air destroyed numerous palm trees and other vegetation.



Weather map for 6 AM Feb 1, 2011 showing the push of frigid Arctic air into New Mexico and far western Texas.

Weather Highlights Continued



Prolonged warm dry weather contributed to this wild fire near Silver City on March 7. (Kalen Severe/Silver City Sun-News)

February 16: Record heat across the area as El Paso reaches a high temperature of 80 with readings around 75 to 80 through most of the lowlands.

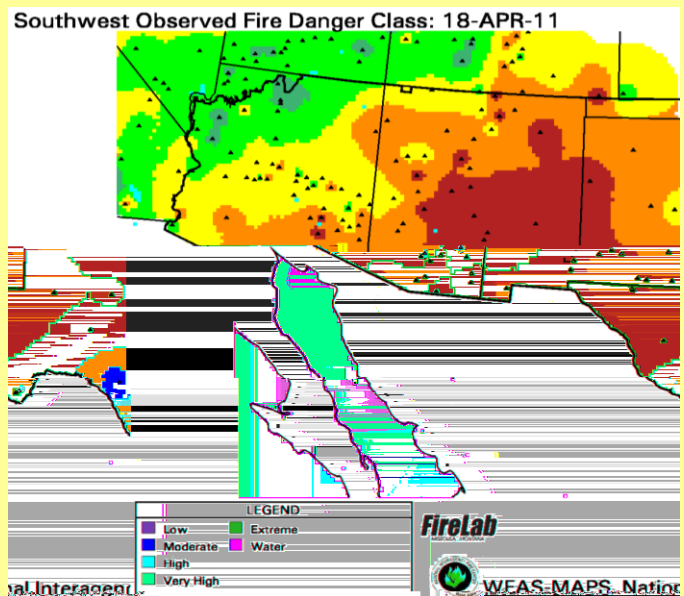
March 2011: An unusually warm and dry March across southern New Mexico and western Texas. For El Paso it was the warmest March on record with the average temperature 63.2 F which is 7.3 degrees above normal. Most of the region also had no measurable precipitation for the month.

March 7: Windy across the area with wind gusts to 70 mph over east El Paso and gusts around 50 mph elsewhere.

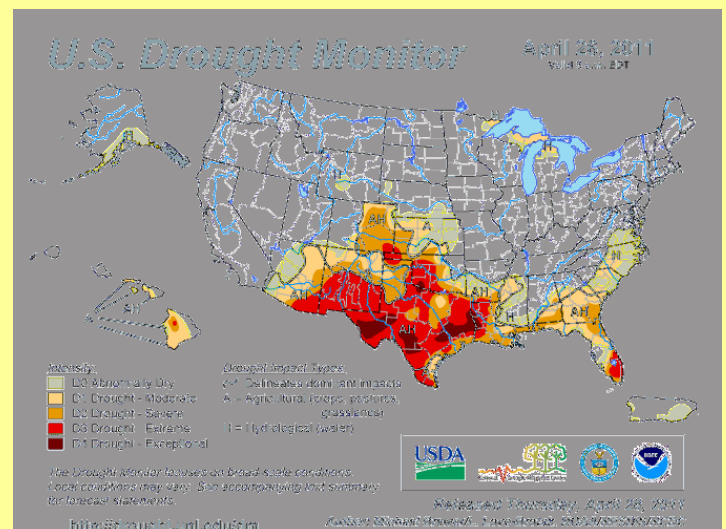
April 2011: Warmest and driest April on record for El Paso and other locations with no precipitation falling across the region.

April 2: Hot day with record heat. El Paso, sets a record by reaching 91 degrees with record high temperatures also occurring at Las Cruces (92), Deming (91), Truth or Consequences (90), Alamogordo (90), Silver City (82) and Cloudcroft (71).

April 3: Windy with blowing dust over the region. Winds gust to 79 mph at St. Augustine Pass in Dona Ana County with gusts around 50 to 60 mph elsewhere.



By mid April 2011 the fire danger was extreme across much of the area.



Extreme drought conditions develop in the spring.



Unusually dry conditions, above normal temperatures and occasionally strong winds contributed to a large wild fire which burned over 10,000 acres around Ruidoso NM in early April. (Harold Oakes Ruidoso News)

April 9: A deep low pressure system causes very strong winds across the Borderland with widespread blowing dust. On the higher elevations winds gust to 88 mph at Salinas Peak with gusts to 75 mph at San Augustine Pass. Over the lowlands winds gust around 60 to 70 mph over portions of northeast El Paso, and around Las Cruces, Silver City, Deming, White Sands Missile Range and Rodeo NM with gusts at least 50 mph most elsewhere. Blowing dust reduces visibilities to a quarter mile around Deming forcing the closure U.S. Highways 180, 11, and 26.

April 26: Very windy with gusts to 75 mph at McGregor Range in southern Otero County and gusts to 71 mph at El Paso Airport. Elsewhere wind gusts from 50 to 60 mph are common. Blowing dust is widespread with Highways 11 and 180 closed near Deming due to low visibilities.



On April 26 high winds produced blowing dust and low visibilities over Santa Teresa NM and surrounding location. (John Fausett NWS/NOAA)

April 29-30: Windy with gusts around 50 mph each afternoon along with a few areas of blowing dust.

Floods and Flash Floods

Although the southwestern United States is known for having a sunny dry climate, during the late spring and summer thunderstorms with heavy rains can develop across southern New Mexico and far western Texas. This is due to circulation changes taking place across the region. Usually in late June or early July the prevailing dry westerly flow retreats northward while a broad area of low pressure develops at the surface over western Arizona, southern California and northwestern Mexico. This feature, often referred to as a “**desert heat low**”, pulls moisture from the Gulf of Mexico and/or Gulf of California into the area. The inflow of moisture can combine with very warm surface temperatures to generate showers and thunderstorms.

By definition a flash flood is produced by heavy rains falling within a 6 hour period. So while floods can occur any time of the year, a study of flash floods across southern New Mexico and far western Texas reveals they are most frequent from the latter part of June through the middle of September. Most flash floods also occur during the late afternoon and evening hours, typically from 3 PM to midnight. However flash floods can still happen at any time of the day; for example the historic floods that inundated El Paso on August 1, 2006 mostly resulted from heavy rains falling between 5 AM and noon.

In most instances floods develop when and where there are abundant and above normal amounts of water vapor in both the lower and middle levels of the atmosphere. Surface dewpoints are typically in the 50's or even 60's during flash flood occurrences indicating a very humid air mass. Another factor conducive for heavy rains is weak wind speeds aloft; when cloud layer winds speeds are relatively light, thunderstorms will often move slowly allowing them to dump large amounts of rain over a given location.



Heavy rains caused flooding and evacuations across much of the El Paso area during the summer of 2006. (Victor Calzada/El Paso Times)



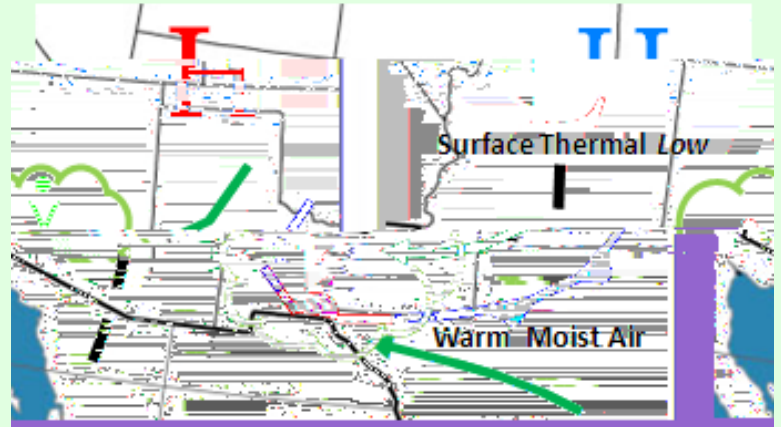
Water rescue in Canutillo during the 2006 floods.

Certain atmospheric circulation patterns are also more favorable for heavy rainfall. One particular pattern includes a cold front moving slowly into the region from the north or northeast before becoming stationary along the western mountains and Mexican border. East or southeast winds just behind or along the front will typically transport moist air into the Borderland so that lifting along the front or over the mountains will act to generate thunderstorms with heavy rains. On August 19, 1978 over 10 inches of rain fell at White Sands Missile Range near the mountains and along a slow moving cold front.

Another pattern associated with southern New Mexico and far western Texas flash floods includes a slow moving trough of low pressure drifting eastward across the southwestern United States. This pattern induces a deep southerly flow with copious amounts of tropical moisture streaming into the Borderland. Thunderstorms often develop and move repeatedly over a localized area when weak disturbances aloft move northward out of Mexico into the region. Much of the flooding occurring in 2006 was the result of low pressure aloft being located over the area.

Finally the remnants of hurricanes and tropical storms from either the eastern Pacific or the Gulf of Mexico can produce heavy rainfall. In September 2006, moisture from Hurricane John brought up to 7 inches of rain to the El Paso vicinity. In July 2008, Hurricane Dolly's circulation center moved northward over the area causing flooding rains and water damage from El Paso to Ruidoso NM.

The Santa Teresa- El Paso National Weather Service Forecast Office closely monitors atmospheric conditions to determine the flood threat across far western Texas and southwestern and south central New Mexico. When the environment is determined to be favorable for heavy rains and possible flooding within the next 12 to 36 hours or more, a **Flood Watch** is issued. When heavy rains are falling and flooding is imminent or occurring, the Weather Service will put out a **Flood Warning**. Thus it is especially important for persons to get the latest weather forecast from NOAA Weather Radio or local media, especially if they are in areas susceptible to flooding.



A favorable weather pattern for flash floods over the Borderland includes warm moist unstable air from the east flowing along a slow moving or stationary surface front.



Floods often occur over southern New Mexico, western Texas and eastern Arizona when an approaching low pressure system to the west pulls moist unstable air from the Gulf of Mexico and Gulf of California into the region.



Summer 2006 flooding at San Vicente NM.

Tornadoes...They **CAN** and **DO** Happen Over the Borderland



In May 2007 this tornado moved across White Sands Missile Range for almost an hour. (Miriam Rodriguez)



This tornado moved across Luna County near Deming in October 2006. (Nick Margentina)



September 2006 tornado just west of Las Cruces. (Brandon Quinones)

Compared to the central and southeastern United States, tornadoes are relatively infrequent across southwestern and south central New Mexico and far western Texas. Only a few tornadoes are reported in the region each year and most Borderland tornadoes are short-lived, small and weak, typically lasting less than 5 minutes and having diameters under a 100 yards and wind speeds below 100 mph. Nevertheless over the past decade photographic evidence, radar data, and spotter reports suggest that tornado occurrences may be increasing across the area.

Stronger and more damaging tornadoes typically develop within a moderately to highly unstable air mass which includes warm moist air at low levels and cool dry conditions aloft. Another important ingredient for strong tornadoes is an environment where wind speeds increase and wind directions change with height. This allows the thunderstorm updrafts to interact with the environmental winds and induce the rotation necessary for tornadoes. Most thunderstorms producing stronger tornadoes occur ahead of a trough of low pressure aloft with tornado generation often ensuing when thunderstorms move along thermal boundaries such as stationary fronts or outflows.

In September 2006, a powerful supercell thunderstorm moving eastward along Interstate 10 produced a tornado just west of Las Cruces. In October 2006, radar wind and reflectivity data plus photographic evidence indicated a potentially destructive tornado developed in Luna County near Deming. In May 2007 a tornado up to 500 yards wide was on the ground for almost an hour as it tracked across White Sands Missile Range. In each case there were no injuries or significant damage because the tornado stayed in open desert away from populated areas. But these storms illustrate that the tornado danger is genuine across the Borderland.

The National Weather Service will issue a **TORNADO WATCH** for an area and time where strong and violent tornadoes are possible. A **TORNADO WARNING** is issued if it is determined a tornado is occurring or will likely develop within about 20 minutes in a specified area. Persons travelling should also remember that during the spring, the risk of destructive tornadoes greatly increases east of the Rockies in such areas as central and eastern Texas, Oklahoma, Kansas and even far eastern sections of New Mexico.

Borderland Hail Storms

During recent years evidence suggests large hail storms are becoming more common across the Borderland. Since 2004 there have been at least 32 thunderstorms which produced hail the size of golf balls or greater over south central and southwestern New Mexico and far western Texas. On September 16 2010, the mostly costly hailstorm ever to strike El Paso occurred when a supercell thunderstorm dropped tennis ball-sized hail on portions of the city, damaging buildings and motor vehicles. Damage for the storm was estimated at 150 million dollars. On September 13, 2006 golf ball-sized hail driven by strong winds damaged roofs and automobiles around Las Cruces. On May 28, 2008 golf ball to baseball-sized hail driven by high winds damaged over 500 homes in the Tularosa NM area.

Large hail is frequently produced within strong thunderstorm updrafts which occur where the air mass is rather unstable with warm temperatures and abundant moisture at low levels and cool dry conditions aloft. When the air mass is buoyant and subject to lift, updrafts with speeds in excess of 50 mph can rise to levels above 50,000 feet where the air is well below freezing. This results in the creation of supercooled water droplets and ice particles which subsequently interact and collide with one another to ultimately create larger hailstones. Low freezing levels are also important. If the freezing level is too high then even larger hail which forms aloft will melt before striking the ground. Rotating thunderstorms or supercells, which usually form in strong vertical wind shear, are especially conducive for the formation of large hail.

Large hail can fall any time across the borderland but is most common during the months of May, September and October. When weather radar or weather spotters provide information that hail at least one inch in diameter is falling, the National Weather Service will issue a Severe Thunderstorm Warning for the affected area.



Tennis ball-sized hail caused widespread damage across El Paso in September 2009. (El Paso Times)



Large hail shattered windows at Tularosa in May 2008. (Karen Reyes)



This supercell thunderstorm dropped damaging egg-sized hail over Chaparral NM in April 2004. (Greg Lundeen NWS/NOAA)



By mid February, the lack of precipitation caused portions of the Rio Grande in El Paso to become completely dry. (Joe Rogash NWS/NOAA)

Spotters...Please call the National Weather Service If You Observe:

Tornado or Funnel Cloud...Report Time, Location and Movement

Hail...1/2 Inch or Larger

Damaging Winds...Damage To Buildings, Motor Vehicles, Trees, Power Lines And Other Structures

Flash Flooding...Flooding Of Streets and Buildings , Or If Rivers, Streams And Arroyos Flood Or Overflow

Heavy Rains...1/2 Inch of Rain In Less Than 30 Minutes Or At Least 1 Inch Of Rain In Less Than 2 Hours

Blowing Dust...Whenever Blowing Dust Reduces The Visibility To Less Than 2 Miles