National Weather Service Des Moines' Newsletter

THE WEATHER WHISPER

Spring 2012

September Snow in Iowa

by Jim Lee, General Forecaster

Believe it or not, there have been nine years in which snow has been recorded in Iowa in the month of September, most recently in 1995, as detailed in Table 1. The most remarkable of these events is the very early snowfall of September 16, 1881, which was amazing not only for its earliness in the season but also for the extent and amount of snowfall. The track of the surface low pressure center associated with this storm system is illustrated in Figure 1, a reprint of the original "War Department Weather Map" from September of 1881. At the time weather observations and reports were filed by the U.S. Army Signal Service, the progenitor of the modern National Weather Service. In the report of the Chief Signal Officer for that month, the development of the low pressure center is detailed as follows:

"This storm, which pursued a very anomalous track, was first evident in Texas, where on the 14th it moved in a track nearly due east. At the midnight observation, while the storm center was near New Orleans, a barometric depression extended from the Gulf of Mexico to the Lake Superior region. At the same time [an area of high pressure] prevailed with fair weather in New England. These conditions were unfavorable to an eastern progress of the storm, and on the 15th the depression moved in a northerly course to Lake Michigan. On the 16th, with diminishing energy, the storm center moved into Iowa and Minnesota, and on the 17th into Manitoba. The track on the 16th and 17th is very remarkable, and probably for a storm of such energy will have no parallel in the history of the Signal Service."

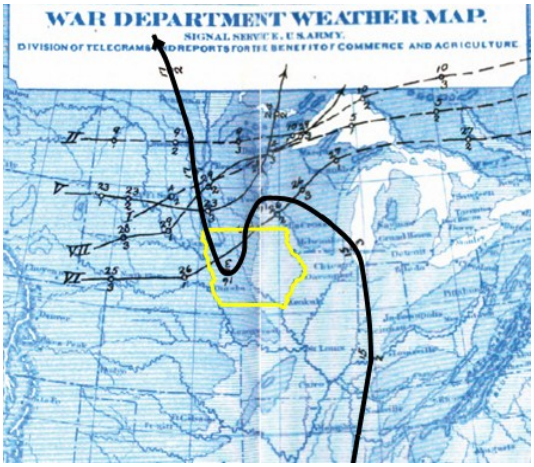

Figure 1: Weather map from September 1881.

On September 14, as the low pressure center moved across the Gulf of Mexico, fair weather prevailed across most of Iowa until a cold front moved through late in the day. At Des Moines the high temperature was 80 degrees but then the official observer wrote that, "Low stratus clouds moved rapidly from north and northwest during the afternoon and evening." On the 15th, as the low pressure center moved northward toward Chicago, it pulled down unseasonably cool air behind the front into Iowa and spread a cold rain across much of the upper Midwest. At Des Moines the temperature fell through the day, with a high of 58 degrees measured early in the morning. The observer noted, "Cloudy and threatening weather prevailed during the day, low stratus clouds moved from the north."

By the morning of September 16, the low pressure center was moving slowly westward into southern Minnesota and northern Iowa, pushing cold air even further southward into the central U.S. Frost was noted as far south as Arkansas and Texas and at Fort Gibson, Oklahoma ice formed on standing water. Across

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Weather-Ready Nation: Saving Lives and Livelihoods

Editors

Ken Podrazik
Aubry Bhattarai

Cover photo courtesy of Kevin Skow

Boone County and ABC5 (WOI-DT) Declared StormReady®

by Jeff Johnson, Warning Coordination Meteorologist

Figure 3: Brad Edwards (right), Chief Meteorologist at ABC5 and Jeff Johnson (left), National Weather Service Warning Coordination Meteorologist at the StormReady® Supporter ceremony.

The National Weather Service is dedicated to the protection of life and property and enhancing economic security and national safety through the prediction and research of weather and climate-related events. The National Weather Service is working to build a Weather-Ready Nation through programs such as the StormReady® program. No community is storm proof, but StormReady® Communities and Supporters can help communities save lives: when seconds count, StormReady® Communities and Supporters are prepared.

On July 18, 2012, officials from the National Weather Service recognized Boone County for completing a rigorous set of criteria necessary to earn the distinction of being StormReady®. Brenda Brock, Meteorologist–in–Charge, Jeff Johnson, Warning Coordination Meteorologist and Karl Jungbluth, Science and Operations Officer presented David Morlan with Boone County's StormReady® certificate and signs at the ceremony. Several members of the Boone County Board of Supervisors, David Morlan, Boone County Emergency Manager and members of the media attended the dedication which was held at the Boone County Courthouse.

"StormReady encourages communities to take a proactive approach to improving local hazardous weather operations and public awareness," said Jeff Johnson, Warning Coordination Meteorologist at the National Weather Service Forecast Office in Des Moines. "StormReady arms communities, and in this case Boone County, with improved communication and safety skills needed to save lives and property before and during the event."

On July 19, 2012, officials from the National Weather Service recognized ABC5 (WOI-DT) for completing a set of criteria necessary to earn the distinction of being a StormReady® Supporter. Brenda Brock, Meteorologist In Charge and Jeff Johnson, Warning Coordination Meteorologist presented Brad Edwards, Chief Meteorologist at ABC5 a StormReady® Supporter certificate.

"StormReady Supporters are businesses which have gone the extra mile to make sure their employees are safe during severe weather," said Jeff Johnson, "television StormReady Supporters have additional requirements than other businesses who are StormReady Supporters, including the ability to transmit warning information and community outreach."

Figure 2: Members of Boone County Emergency Management, Board of Supervisors and National Weather Service officials at the StormReady® ceremony.

Figure 1 (from left to right): Dave Morlan, Boone County Emergency Management, Jeff Johnson and Karl Jungbluth, National Weather Service, observing the mobile Emergency Operations Center (EOC) for Boone County.

Summer Weather Hazards – Heat and Lightning

by Aubry Bhattarai, General Forecaster

While many Iowans enjoy outdoor activities in the summer, summertime brings the most deadly weather phenomena: heat. Heat is the number one weather related killer! In a normal year, about 175 Americans succumb to the demands of summer heat. In fact, in a 40-year period from 1936-1975 nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In a 1995 heat wave, more than 700 deaths in Chicago, IL were attributed to the heat.

Cities pose special hazards when it comes to heat. The stagnant atmosphere traps pollutants in urban areas, which adds to the stresses of hot weather. In addition, concrete, asphalt and other industrial materials common in cities trap heat during the day, and keep the air temperature warmer at night. In addition, cars become killers, with many children and pets dying from hyperthermia (heat stroke) after being left alone in a vehicle in the hot sun. On average (since 1998) 38 children die in the US each year from hyperthermia in vehicles, with 536 total deaths since 1998. Through early August, 23 children have died this year. Even relatively mild temperatures outside can heat a car rapidly inside as the sun beats down. Of these tragic deaths, over half of them were because children were "forgotten" by caregivers, with over half 1 year-old or younger. Remember to always check the back seat before leaving your vehicle! Here are other tips to help you beat the summertime heat:

- Never leave children or pets alone in enclosed vehicles.
- Stay hydrated by drinking plenty of fluids even if you do not feel thirsty. Avoid drinks with caffeine or alcohol.
- Eat small meals and eat more often. Some foods can increase metabolic heat production and increase water loss.
- Wear loose-fitting, lightweight, light-colored clothing. Light-colored clothing reflects sunlight and can help your body maintain normal temperatures.
- Slow down, stay in the coolest place available (not necessarily indoors) and avoid strenuous exercise during the hottest part of the day.
- Strenuous outdoor activities should be reduced, eliminated, or rescheduled to the coolest time of day. Take frequent breaks if you must work outdoors.

Another weather hazard Iowans face in the summertime is lightning. Lightning can be a frequent occurrence in Iowa in the summer and may be overlooked as a deadly threat. In fact, lightning is an extremely dangerous and deadly weather phenomenon. On average in the United States there are 54 reported lightning fatalities per year. And only about 10% of people who are struck by lightning are killed, with the other 90% suffering permanent injuries including memory loss, chronic pain and neurological damage. This means there are hundreds of people affected by lightning each year.

Many people think that the risk of being struck by lightning is low. But, did you know that over the course of your lifetime the odds of you being struck by lightning in America are only 1 in 10,000! Through early August, 21 people have been killed by lightning this year across the country.

Lightning is a serious danger. Here are a few tips we hope you'll use to protect yourself, your loved ones and your belongings:

- No place outside is safe when thunderstorms are in the area!
- If you hear thunder, lightning is close enough to strike you.
- When you hear thunder, immediately move to safe shelter.
- Safe shelter is a substantial building or inside an enclosed, metal-topped vehicle.
- Stay in safe shelter at least 30 minutes after you hear the last clap of thunder.
- If someone is struck by lightning, they do not carry an electrical charge and may need immediate medical attention. Monitor the victim and begin CPR or AED, if necessary. Call 911 for help.

For more information on heat, lightning and other Iowa weather hazards please visit: www.weather.gov/dmx/?n=preparedness

NWS Des Moines now on Twitter

by Ken Podrazik, General Forecaster

Early this summer, the NWS Des Moines joined Twitter, and you can now follow us on Twitter. You can get the latest forecasts, climate statistics, and other interesting weather related topics via Twitter and on Facebook. Our Twitter handle is @NWSDesMoines and we will use some common hashtags such as: **#iawx** and **#iowaweather**. Feel free to Tweet storm images on Twitter or post weather photos on Facebook.

Overview of the Creston Tornado

by Kevin Skow, Meteorologist Intern

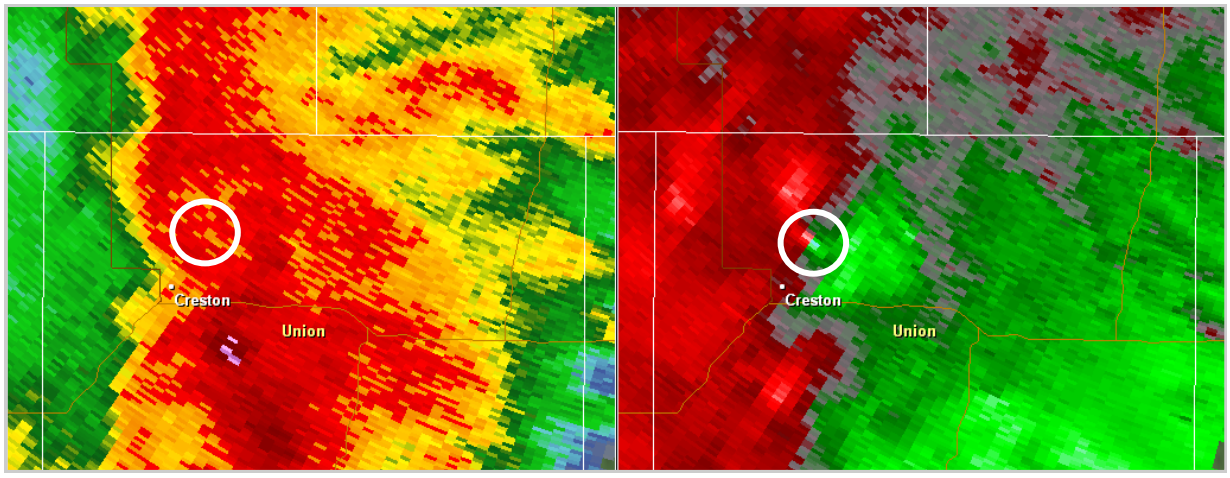
Damage photos from around Creston after the tornado.

On the evening of April 14, 2012, an EF2 tornado tore through the northwest corner of Creston, IA damaging the Greater Regional Medical Center and Southwestern Community College campus along with a number of homes. This tornado was part of a larger severe weather outbreak that encompassed much of the central and southern plains in which dozens of tornadoes touched down across Kansas, Oklahoma, and Nebraska. A total of seven tornadoes struck in Iowa, with the town of Thurman in the southwest corner of the state also taking a hit from another EF2 tornado. Southern Iowa also saw torrential rainfall and damaging winds, with hail up to the size of tennis balls falling near Knoxville. At one point, the Des Moines International Airport automated precipitation gauge measured 1.10 inches of rain in seven minutes, which computes to a rain rate of 9.43 inches per hour!

The Creston tornado touched down at 6:52pm in far eastern Adams County, where it damaged several farm outbuildings before tracking northeastward through open farm fields south of Cromwell. Eight minutes later the tornado raced into far northwest Creston, quickly strengthening from an EF0 to an EF2 tornado. The worst damage occurred just northeast of the Southwestern Community College, where a one story brick building was destroyed. The twister was only in the city of Creston for about three minutes before shifting to the north, and out of the city. From there the tornado continued northeastward, damaging several farmsteads before dissipating ten miles northeast of Creston at 7:15pm. The total track length was over 16 miles long.

The Creston tornado was unique from a meteorological perspective since it developed in an atypical location within the parent storm. Most Iowa tornadoes originate from rotating updrafts associated with supercell thunderstorms or develop along the front edge of squall lines. The Creston case appears to have been a hybrid between these two storm types, where a system with supercell characteristics was embedded within a larger squall line. Even more interesting is that this "supercell," and the eventual Creston tornado, was located near the backside of the squall line. In most cases, rain-cooled air disrupts the inflow of warm, moist air into the thunderstorm updraft and significantly reduces the chances of a tornado. However, based on radar data, strong winds penetrated the squall line and interacted with the cell at the rear of the line and continued to support the storm's updraft. The reasoning for why this happened is not yet fully understood.

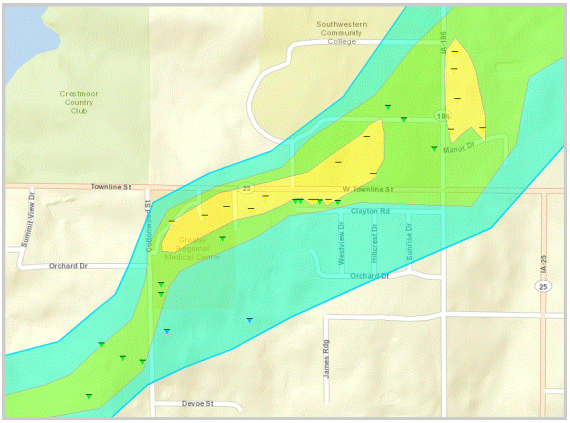
The seven tornadoes on April 14-15 stand out as the largest tornado outbreak for Iowa to date in 2012. Tornadic activity across the state has been quiet this year, with a preliminary count of only 16 tornadoes through July 20. This is far below the average of 40 tornadoes Iowa normally sees by this time of year (the total yearly average is 47). Even though the climatological peak in tornado activity has already passed, Iowa has witnessed large tornado outbreaks as late as mid-November, thus it is possible to see a significant number of tornadoes before the end of the year. The fewest number of tornadoes recorded in Iowa in a calendar year was 22 in 1996 (since reliable recordkeeping began in 1980).



Radar image from the Des Moines radar of the Creston tornado just after passing through the city (7:05pm). The reflectivity image on the left shows that the circulation associated with the Creston tornado (white circle area) was behind the rain in the squall line. On velocity radar imagery (right image), the tornado consisted of a very small but well defined couplet.

New Storm Survey Software Tested with Creston Tornado

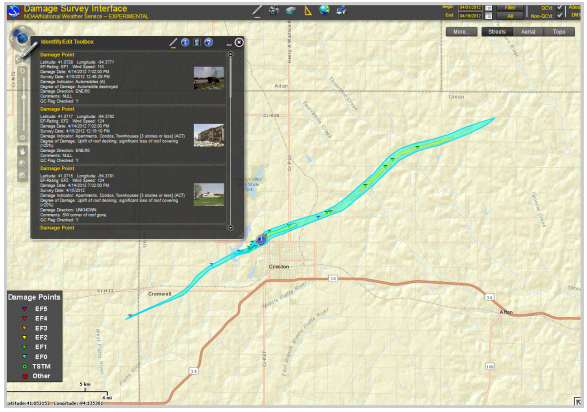
by Kevin Skow, Meteorologist Intern



Close up of the tornado damage path through Creston, showing the detail one can achieve using the damage survey program. Each colored triangle represents a "damage point" that was rated by surveyors. The colors represent different levels of the Enhanced Fujita scale (Blue= EF0, Green= EF1, and Yellow= EF2). The track contours were interpolated between these points.

The Creston tornado presented meteorologists at the NWS in Des Moines with the opportunity to implement new technology to survey tornado damage for the first time. In past years, damage surveyors used paper forms and maps to document damage to structures impacted by a tornado. Once completed, they would travel back to the office where the information was compiled, a track drawn, and a damage scale rating assigned. Now, using a specialized application installed on a smartphone, the surveyors simply need to enter in the type of structure impacted and the extent of the damage to the structure. Using this information, the software automatically determines an estimated EF scale rating and wind speed for that location. These values can be modified, at the discretion of the storm surveyor, to take into account other factors such as structure quality. The phone's GPS is used to calculate the exact position of the damage. A photo and brief description of the damage can also be attached with this information. The surveyors repeat this process for each structure, or "damage point," surveyed.

The phone transmits this information back to the office in real time, where another application plots these damage points on a computerized map. Another person back at the office works with these damage points to construct a plot of the track and create an information statement to be released to the media and general public. In the case of the Creston tornado, the NWS in Des Moines released an information statement and plot of the tornado track by the 6 pm news on April 15. Before the surveyors had even returned to the office!



Screenshot of the Creston tornado track using the online damage survey program.

September Snow

(Continued from page 1)

eastern Nebraska, southern Minnesota, and about the northwestern two thirds of Iowa the colder air allowed rain to mix with or change entirely over to snow at times, mostly in the morning. At Des Moines the high temperature for the day was only 46 degrees and the observer recorded that, "Few flakes of snow was observed." Further north and west the snow was heavier, in some areas melting as it fell but in others managing to accumulate for a short time. At Algona an estimated four inches of snow fell in the morning, breaking some tree branches, but all melted by noon. The snow was observed as "quite heavy" at Creston, while "several inches" were noted between Des Moines and Atlantic and 4-6 inches were estimated on the Rock Island Railroad between Stuart and Avoca.

This stands as one of only two occasions on which fairly widespread, measurable snow has fallen in Iowa in the month of September, the other being on September 25, 1942. In that storm most of the state received snow with amounts ranging up to four inches at Allison, Forest City, Mason City, and Millerton and scattered tree and utility line damage noted across the state. So far 2012 has been far above normal in terms of average temperature so a September snowfall seems unlikely, but it will eventually happen again.

September Recorded Snows in Iowa

Date	Year	Description
16	1881	Widespread measurable snowfall
18	1895	"First snowflakes" noted at Madrid on the 18th
17-18	1912	"Few flakes" observed at Storm Lake and Marshalltown
18-19	1938	Flurries reported at Orleans and Maquoketa on the 18th and 19th
29-30	1939	Traces of light snow and sleet fell across northern Iowa, 0.1" at Sheldon and 0.2" at Sibley
25	1942	Widespread measurable snowfall
30	1961	Light snow fell across northwestern half of Iowa. A few measurable amounts ranging up to 3.0" at Swea City
24	1985	A few flakes at Des Moines
29-30	1985	Widespread wintry mix with 0.5" at Audubon and Storm Lake
22	1995	A few flakes and ice pellets mixed with rain across northern Iowa

Table 1: September snows in Iowa

Climatological Data for April through June 2012

Location	Month	Average Temp	Departure	Highest	Lowest	Rain / Snow	Departure
Des Moines	Apr	56.1°F	+4.4°F	90°F (25th)	31°F (11th)	5.89" / 0.0"	+2.03" / -1.8"
	May	68.5°F	+6.2°F	91°F (26th,27th)	47°F (9th)	3.15" / 0.0"	-1.59" / 0.0"
	Jun	75.7°F	+3.9°F	101°F (27th)	46°F (1st)	2.17" / 0.0"	-2.77" / 0.0"
Mason City	Apr	49.5°F	+2.8°F	82°F (25th)	18°F (11th)	4.01" / M	+0.26" / M
	May	63.1°F	+4.7°F	93°F (27th)	39°F (10th,13th)	2.86" / M	-1.82" / M
	Jun	70.6°F	+2.5°F	97°F (27th)	41°F (1st)	2.74" / M	-2.40" / M
Waterloo	Apr	50.5°F	+1.6°F	78°F (25th)	23°F (11th)	3.75" / 0.0"	+0.05" / -2.0"
	May	65.1°F	+4.6°F	92°F (27th)	40°F (10th,13th)	3.20" / 0.0"	-1.33" / 0.0"
	Jun	71.7°F	+1.7°F	98°F (27th)	42°F (1st)	2.53" / 0.0"	-2.45" / 0.0"
Ottumwa	Apr	53.3°F	+2.4°F	85°F (2nd)	24°F (11th)	4.04" / M	+0.64" / M
	May	66.2°F	+4.8°F	92°F (26th)	43°F (21st)	3.03" / M	-1.68" / M
	Jun	72.3°F	+1.3°F	95°F (27th,28th)	45°F (1st)	3.24" / M	-1.85" / M

Fire Weather—Getting Ready for Fall

by Frank Boksa, General Forecaster

The spring fire weather season was the first season for the new state-wide fire weather plan. The state-wide plan brought new products to several National Weather Service offices serving the state of Iowa and a uniformity of other products. Many compliments were received by the National Weather Service from state and local decision makers on the implementation of this plan. Due to the unusually warm and dry winter and spring there were several times when Red Flag Warnings were needed and verified. There were several instances of hay bail and grass fires as well as fires caused by the burning of winter yard litter.

Special thanks also need to go to our volunteers who reported fuel conditions around central Iowa. The data they provide is crucial to the decision process for the Red Flag Warning.

There are several new additions to the fire weather page of our web-site. For decision support, a fire weather section has been added to the Hourly Weather Forecast Graph page. Anyone interested can now get temperature, dew point, sky condition, wind, and precipitation chances, but there is a great new option where you can view the mix-ing height, transport winds, the Haines index and vent rate. The in-tent is for those with the authority to burn, to have additional decision support service. On our fire weather page there are quick links to our Annual Operating plan which spells out the state-wide fire weather plan, the fire weather planning forecast and watches/warnings that may be in effect. There are also several other useful links available.

If the extremely dry conditions continue across central Iowa, then the fall fire weather season will be a dangerous one. The full suite of fire weather products will resume again beginning September 1 and run through November 15. We ask everyone to keep this in mind when planning fall burns. Of special concern will be fires caused by crop stubble during harvest.

http://www.crh.noaa.gov/dmx/firewx.php

Fun Fact:

Top Five Warmest Months for Des Moines

Rank	Month/Year	Mean Temp
1	July 1936	85.8°F
2	**July 2012**	**84.3°F**
3	July 1901	83.9°F
4	August 1983	83.3°F
5	July 1934	82.6°F

Top Five Warmest Months for Waterloo

Rank	Month/Year	Mean Temp
1	July 1936	82.4°F
2	July 1901	81.9°F
3	July 1916	80.6°F
4	August 1947	79.4°F
5	July 1935	79.3°F
5	**July 2012**	**79.3°F**

NWS Des Moines Releases August 2010 Central Iowa Floods Service Assessment

by Jeff Zogg, Senior Hydrologist

Aerial photograph from August 11, 2010 showing flooding affecting Iowa State University and the city of Ames. Jack Trice Stadium, home to the Iowa State University football team is in the foreground. Hilton Coliseum, home to Iowa State University basketball, gymnastics, volleyball and wrestling teams is near the top center. Damage to the Iowa State University campus alone was between $30 and $40 million. (Source: The Des Moines Register)

Earlier this year, the National Weather Service (NWS) in Des Moines, Iowa released its local office service assessment of the historic, multiple-day flash flood and river flood event that occurred in central Iowa in August 2010. The most significant flooding occurred during a three-day period from August 9-11, 2010. For three consecutive nights beginning on August 9, thunderstorms with prolonged heavy rainfall affected central Iowa. Record flooding occurred along several streams, resulting in extensive damage in the Des Moines and Ames metropolitan areas. Some of the flooding exceeded the 0.2% annual chance (i.e., 500-year) event.

Due to the magnitude and impact of this event, NWS Des Moines formed an internal service assessment team to evaluate the effectiveness of National Weather Service (NWS) services provided during this event. The local office service assessment team attempted to emulate the format and structure of the NWS national service assessments, including pre-publication review by NWS Central Region Headquarters. The service assessment team efforts consisted of the following activities:

- Review of the meteorological and hydrologic aspects of the event.
- Interviews of selected NWS Des Moines partners and users. Interviewees included people from the media, emergency management and the private sector.
- Evaluation of NWS operations and activities including short- and long-fused products as well as coordination and verification.
- Evaluation of NWS Des Moines decision support services including feedback from its partners and users regarding its products and services.

The service assessment team identified 17 Facts and 16 Best Practices as well as 14 Findings and subsequent Recommendations. Here the highlights of the lessons learned from this service assessment:

- Particularly Dangerous Situation (PDS) wording was included in some of the river flood warning products. Local media used this wording to highlight the flooding severity.
- It is important to properly highlight high-end flash flood events. One example of doing so is the "Flash Flood Emergency." The NWS must ensure that its local partners and users understand how such events will be highlighted.
- NWS Des Moines places river forecast and data points—including ALERT gages—on its AHPS Web pages. NWS Des Moines partners were easily able to find the information they needed.
- Flood impact statements are valuable to NWS partners and users. They must be updated and corrected as needed.
- Flood inundation mapping was a popular service improvement request.

Although some time has elapsed since the event, the assessment document still contains good "lessons learned" information. NWS Des Moines has already implemented many of the recommendations. As our assessment shows, in order for the NWS to provide effective decision support services during a high-impact hydrologic event, much work needs to be done months—if not years—before the event occurs.

You can access the service assessment at the following link: http://www.crh.noaa.gov/dmx/?n=aug2010floodassessment

We want your feedback! We want to hear about your favorite stories and features, or if there is something you would like to see in an upcoming issue, let us know! Contact the editors at: Kenneth.Podrazik@noaa.gov or Aubry.Bhattarai@noaa.gov

Hurricanes in Iowa Part 3

by Aubry Bhattarai, General Forecaster

With Des Moines lying over 800 miles from the Gulf of Mexico, it seems unlikely that a hurricane would be able to impact Iowa. However, throughout history a few storms have persisted and tracked very near, or across Iowa. This is the third, and final, part in a three part series about hurricanes which have impacted Iowa. Previously, the 1900 Galveston Storm and Hurricane One from the 1921 season have been highlighted.

Hurricane Alicia, 1983
August 15 – August 21

Hurricane Alicia first made U.S. landfall on August 18 about 25 miles southwest of Galveston, TX as a category 3 hurricane. The strongest winds were recorded at Hobby Airport outside of Houston, with gusts to 94 mph. The storm quickly weakened as it pushed inland, with gusts reported at the Houston International Airport (about 25 miles away) of 40 mph. Alicia weakened to a tropical depression near Dallas.

As the first hurricane of the 1983 season, Hurricane Alicia became the first hurricane to have probabilities used in forecasting its landfall. We see these today as the warning cone of hurricane forecasts. The probabilities were first issued when Alicia became a tropical storm. At the time, Hurricane Alicia was the costliest hurricane to hit Texas, with over $2 billion in damage (1983 dollars). It has since been surpassed.

As seen in Figure 1, Hurricane Alicia pushed northward, affecting the central Plains by August 20. While Hurricane Alicia did not pass over Iowa, it ended near Lincoln, NE, Alicia still affected Iowa. The highest rainfall totals, on the eastern side of the storm, tracked over Iowa. Shown in Figure 2 from HPC. Numerous sites across Iowa, especially in the west, reported rainfall totals of over one inch of rain from August 21 and 22.

Due to difficulties in tracking storms prior to modern technology, this may not be a complete list of storms to impact Iowa. However, it is clear that hurricanes in Iowa are very rare. One thing these three storms all shared is the location of U.S. landfall. All three storms made landfall very near Houston, TX or Galveston, TX. However, not all storms which have made landfall near this area have reached Iowa. Hurricane Ike made U.S. landfall near Galveston, TX on September 13, 2008 as a category 2 storm. Hurricane Ike tracked northeast across the U.S., affecting southern Missouri and Illinois, missing Iowa, Figure 3.

Figure 1: Track of Hurricane Alicia in 1983.

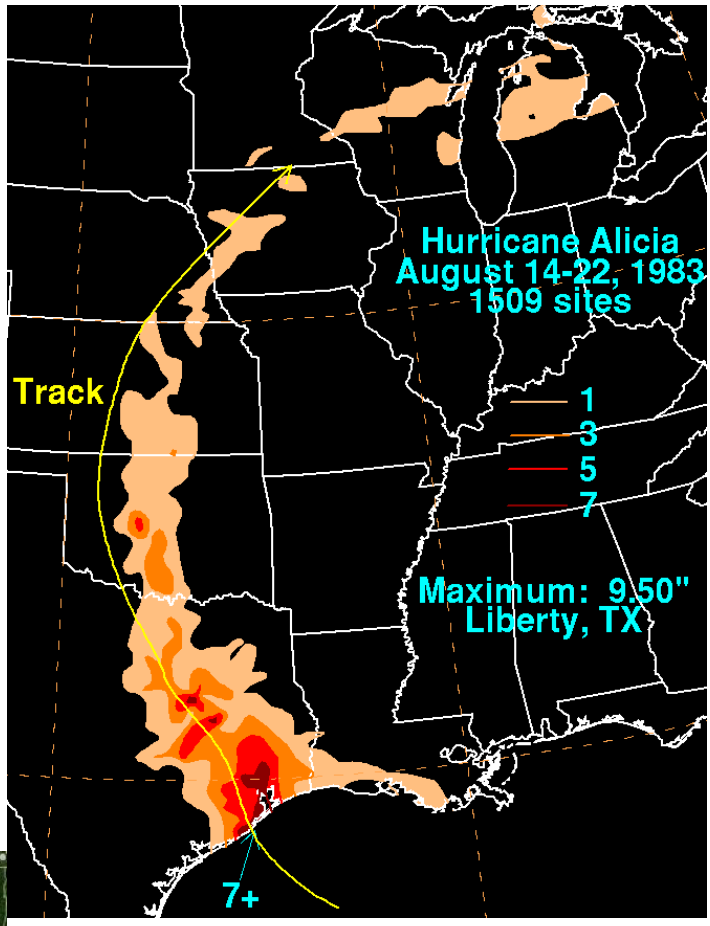


Figure 2 (above): Graphic created by HPC showing rainfall totals associated with Hurricane Alicia. Amounts of over one inch can be seen across Iowa. The highest rainfall total was 9.5 inches in Liberty, TX.

Figure 3 (left): Track of Hurricane Ike in 2008. Hurricane Ike made U.S. landfall near Galveston, TX but did not track across or near Iowa.

NWS Des Moines Celebrates Earth Day *by Kevin Deitsch, Meteorologist Intern*

NWS Des Moines meteorologists Kevin Deitsch and Mindy Beerends aid a young lady eager to learn more about charge separation and lightning at the Science Center of Iowa's Earth Day Fair.

In late April, the NWS Des Moines took part in the Earth Day festivities at the Science Center of Iowa in Des Moines. Weather within the lower atmosphere is an integral part of Earth's environment and being severe weather season, it is important that people are aware of the dangers of thunderstorms. To help in this effort, NWS Des Moines set up a booth complete with a Van de Graff Generator and a lightning safety game. The children and parents at the event were first introduced to the generator, gaining an understanding of charge separation processes required to produce a lightning strike. Then for the few brave souls that would touch the Van de Graff machine, a demonstration was performed that would make their hair stand straight up. After the generator, the participants were invited to play an interactive game about lightning safety. Multiple places were shown during the game, ranging from mountains, swimming pools, and cars. The children were then asked if each place would be a safe or unsafe location to be during a thunderstorm. It is estimated that over 200 people participated in the activities at the NWS booth throughout the day. Overall, NWS Des Moines was very thankful it could participate in Earth Day activities and raise lightning awareness while promoting a Weather-Ready Nation.

NWS Participates in Community Flood Forums

by Jeff Zogg, Senior Hydrologist

It may be difficult to think about flood preparedness when we are in the midst of a drought. Many of us are now focused on how to deal with the lack of water rather than the over-abundance of it. But even during dry times it is still important to consider what you can do to protect yourself, your loved ones and your property from floods. After all, Iowa droughts sometime end with floods.

The Cedar River inundated much of Cedar Rapids, Iowa on June 13, 2008. (Source: David Greedy/Getty Images)

During this past April and May, the National Weather Service participated in six community flood forums. The forums were made possible due to a two-year grant awarded to the Iowa Insurance Division. The purpose of this project was to engage and educate the public regarding flood preparedness and flood insurance, as well as sources of flood forecast information. The Iowa Insurance Division was the lead agency in this project. Other participating agencies included the U.S. Army Corps of Engineers, the Federal Emergency Management Agency and the Iowa Department of Natural Resources, as well as local emergency managers and community officials.

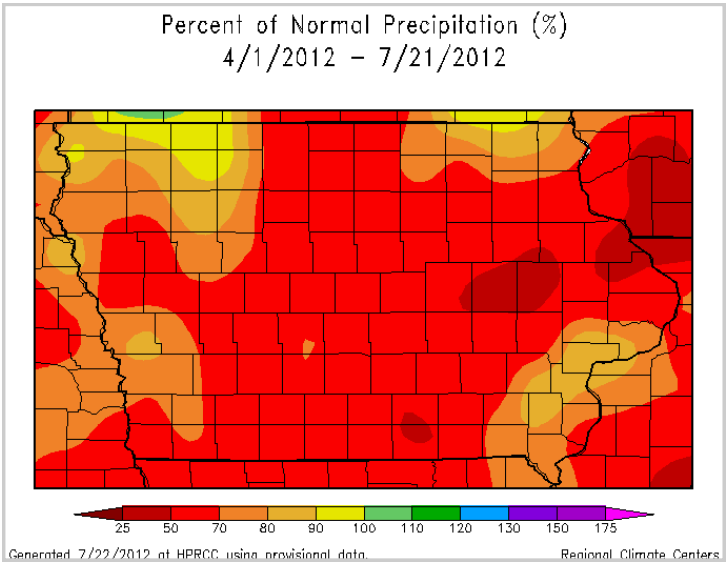
The community flood forums were held in Atlantic, Charles City, Burlington, Cedar Falls, Fort Dodge and Iowa City. At these forums the National Weather Service used statistics to put flood damage and losses into perspective. Did you know that Iowa ranks #2 in the United States for flood-related damage since 1950? (Texas is #1, and much of that damage has been due to tropical systems.) Also, 90% of damage during natural disasters is flood-related. On average each year in the United States, floods cause $5 billion in damage and 90 deaths. In addition to flood statistics, the National Weather Service also showed where to find flood forecast, warning and preparedness information.

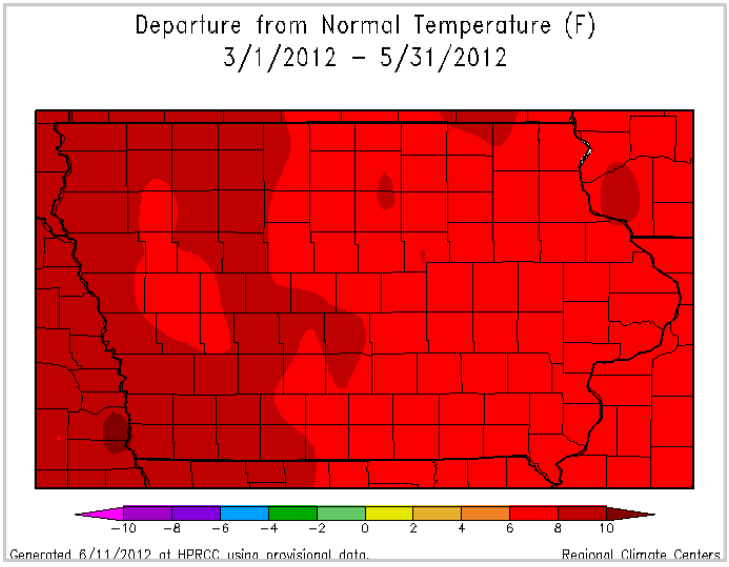
Much of the information shared at these forums is available online. The following Web sites contain valuable flood preparedness and flood insurance information: http://www.donttestthewatersiowa.gov/ , http://www.floodsafety.noaa.gov/ and http://www.floodsmart.gov/ . You can find flood forecast information on the NWS Web site at http://www.weather.gov/desmoines . Feel free to contact us if you have any questions regarding flood preparedness, flood insurance or flood forecasts.

Spring and Early Summer Weather Review *by Craig Cogil, Senior Meteorologist*

Precipitation:

Precipitation was near normal early in the period with both March and April near normal in overall rainfall in the state. However, rainfall became more sporadic and spotty during May with this pattern continuing into June. The rainfall deficit during the growing season (see image to right) is generally below 70% of normal for much of Iowa with some locations in east central Iowa below 50% of normal. This, in combination with much above normal temperatures has led to the rapid development of drought conditions over much of Iowa. These conditions have not been seen in Iowa since at least 1988 when widespread drought covered much of the Corn Belt. The recent lack of precipitation has also led to many communities restricting water usage along with record prices for grain commodities.





Temperature:

Temperatures were very mild across the state during the entire period from March to June. In fact, it was the warmest March on record across Iowa with a departure of 15.2 degrees above normal for the month. Numerous record highs were broken across Iowa with temperatures reaching 90 degrees in portions of western Iowa. The warmth continued into April and May with temperatures remaining well above normal for the entire state. This made the Spring of 2012 the warmest spring on record among 140 years of data. Early summer saw the mild readings persist with June coming in nearly two degrees above normal. Iowa continues on pace to see its warmest year ever as temperatures have remained much above normal for the first six months of the year.

Iowa Statewide Averages and Rankings for Temperature and Precipitation *by Craig Cogil, Senior Meteorologist*

Month	Temperature	Departure from Normal	Rainfall	Departure from Normal	Temperature Ranking	Precipitation Ranking
March 2012	51.1°F	+15.2°F	1.95"	-0.20"	1st Warmest	57th Wettest
April 2012	52.1°F	+3.2°F	3.99"	+0.48"	26th Warmest	31st Wettest
May 2012	65.1°F	+5.0°F	3.51"	-1.05"	14th Warmest	57th Driest
June 2012	71.6°F	+1.9°F	2.99"	-2.03"	28th Warmest	21st Driest
Spring 2012	56.1°F	+7.8°F	9.45"	-0.77"	1st Warmest	57th Wettest

Spring months include March through May. Rankings are based upon 140 years of records. All values are preliminary.

Outlook for the Rest of Summer through the Fall of 2012

by Miles Schumacher, Senior Meteorologist

Spring and summer thus far have been one of the warmest in Iowa weather history. Temperatures have been consistently above normal for 10 months. The last month that was below normal was September, and that was only 1.5 degrees below normal. A combination of factors helped to keep temperatures above normal. The summer thus far has turned out to be warmer than expected. One of the likely reasons is the way the transition into El Niño has developed. The warmest pool of water remained along the northwest coast of South America and has not spread west as quickly as was expected. With the warm water in this location, the probability of an upper level ridge of high pressure forming over the central U.S. is enhanced.

The La Niña pattern collapsed for the most part during the early spring, with a strengthening El Niño forming during the summer months. A significant El Niño signal was present by early July. It is not uncommon for the lag between changes in the Pacific and the atmospheric response to be two to three months.

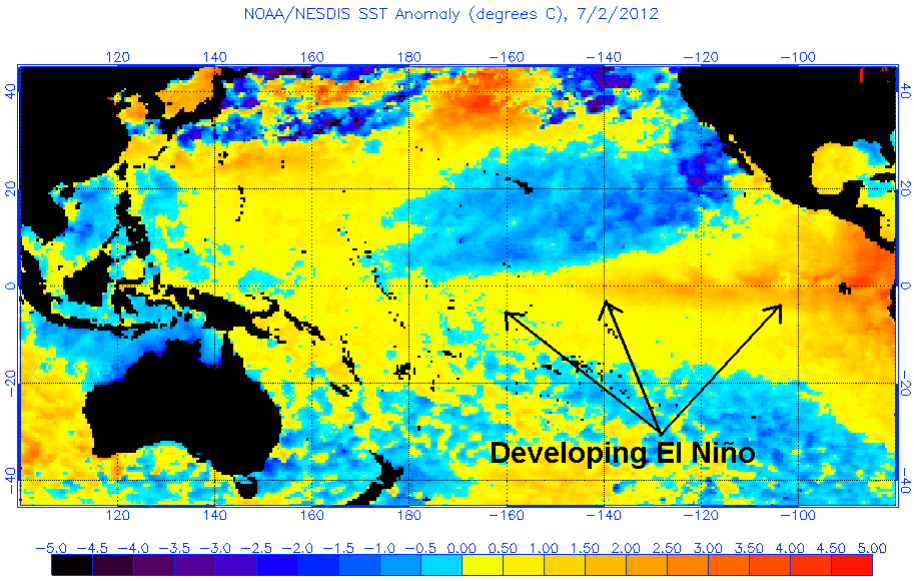


Figure 1: Sea Surface temperature departure from normal, equatorial Pacific.

The change is likely to continue through the rest of the summer into the fall months. By the late fall, conditions are expected to be in a weak to moderate El Niño state. The current temperature departures for the equatorial Pacific are shown in Figure 1. Note the plume of warmer than normal water temperatures extending from northwest South America, west along the equatorial Pacific. The cool pool of water to the north is the remaining cool water from the recent La Niña conditions as well as negative Pacific Decadal Oscillation (PDO).

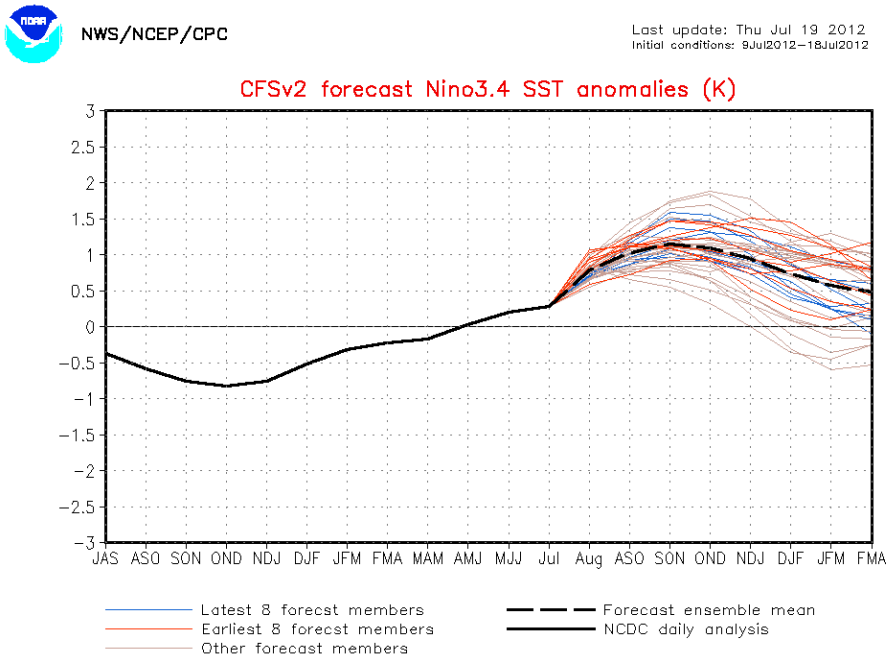


Figure 2: Sea Surface temperature departure for the past year and projection into the Winter of 2012. Departure in degrees K is shown on the ordinate, with time on the abscissa.

The atmosphere typically follows a three to seven year cycle between El Niño and La Niña. Depending on the phase of the PDO, El Niño/La Niña is favored during warm/cold phase of the PDO. The Pacific is currently in the cold phase of PDO. La Niña conditions are favored by a two to one margin during the cold phase. El Niño events that occur during the cold phase tend to be weak. Model forecasts suggest we will move toward a moderate El Niño late this fall or early in the upcoming Boreal winter. Figure 2 shows the observed central Pacific Sea Surface Temperature departure (solid black line) and a series of forecasts (blue for recent, red for previous and other model members in mauve). The forecast mean is depicted going forward as a dashed black line. It is based on the initial conditions from 19 July 2012. As can be seen from Figure 2, there is a significant spread in the forecasts moving into the winter months. Most of the model runs do maintain at least weak El Niño conditions through the winter. It should be noted that this forecast is based on one model only. This model is consistent with, and therefore representative of, other modeling.

Although in meteorology no two years are the same strictly speaking, one can look at weather patterns of the recent past to give some indications of near term weather trends in the future. This forecast is based in large part on the best fit from sever-

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Outlook

(Continued from page 11)

al of the years that were similar to the spring season through the middle summer months thus far. Considerations were also made for the state of the Pacific, expected El Niño and other factors that influence our weather pattern.

During most summers, August is typically fairly well correlated with July. The atmosphere will likely become increasingly influenced by El Niño. It is expected that the warm pool northwest of South America will spread west and thus not have as strong of an influence on the ridge over the U.S. The warm signal from El Niño is expected to remain into August, however a weakening does not appear likely. Temperatures, though above normal across the state, are not expected to be as extreme as those we saw this July. Rainfall is expected to remain below normal as well. Once again, the negative departure of rainfall is not expected to be as extreme as in July. Drought conditions are not expected to improve. Rainfall would have to be substantially above normal to improve the dry conditions. See Figure 3.

The atmosphere is expected to begin to respond more to the developing El Niño as we move into the fall months. It is likely that the warm and dry pattern will continue through at least the first part of the fall. There are some indications that the fall will start out warmer than normal with a trend toward colder weather in the latter half of the fall. It appears most likely that temperatures in November will be normal or below normal. Precipitation is most likely to remain drier than normal as well, though again rainfall will most likely be closer to normal than it has been. With the transition of the pattern taking place, there is some indication that the lowering of the jet stream that normally takes place during August will be delayed. This may enhance rainfall during the month of September and may help the dry conditions somewhat. During the rest of the fall there is not a strong indication toward wet or dry conditions. There is a slight leaning toward drier conditions in October, but the signal is not strong. See Figure 4 for details. It will be important to monitor the development of El Niño over the next few months. There are some indications that the pool of warmer than normal water will shift west gradually during the fall months. This is one reason for the possibility of November turning cooler than normal. Furthermore, looking ahead, most of the longer range projections indicate that El Niño will weaken during the early winter months. A weak El Niño would have less of an effect on the weather across the central U.S. over the upcoming winter, which may temper the typical warm and dry pattern more typical of moderate to strong El Niños.

These outlooks are based more heavily on statistics than many of the methods used by the Climate Prediction Center. The complete set of official forecasts from the Climate Prediction Center can be found on our website.

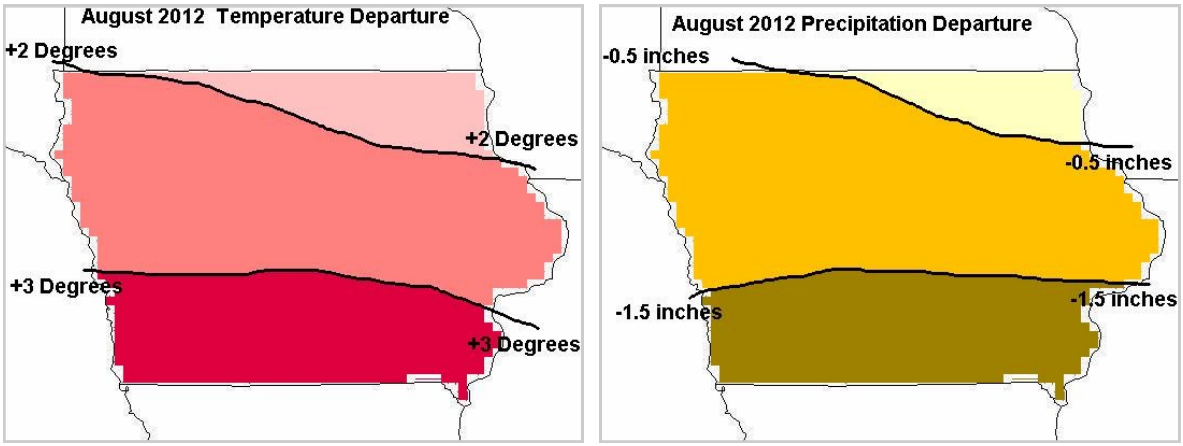

Figure 3: Mean Temperature (left) and Precipitation (right) departure for August.

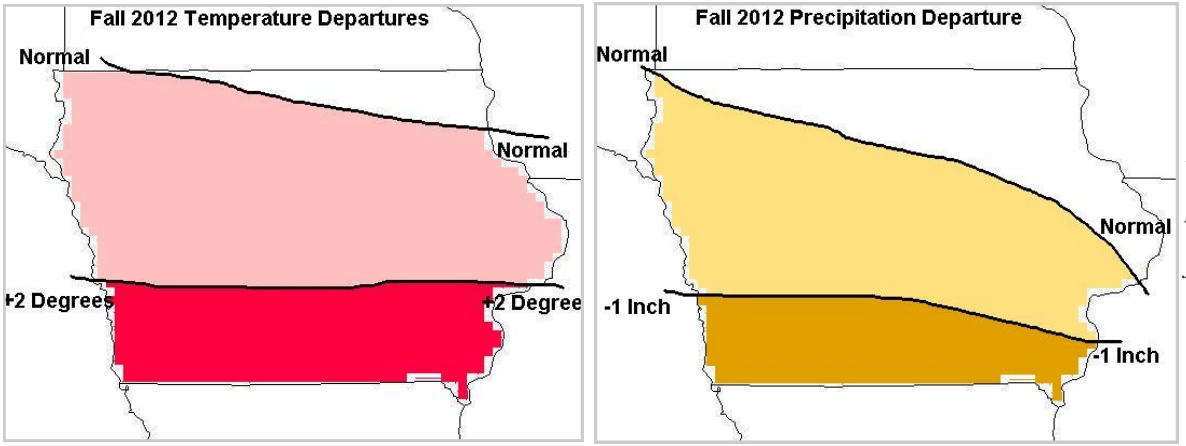

Figure 4: Mean Temperature (left), precipitation (right) departure forecast for the Fall of 2012.

Dual Pol Radar Application – The Tornadic Debris Signature

by Roger Vachalek, Senior Meteorologist

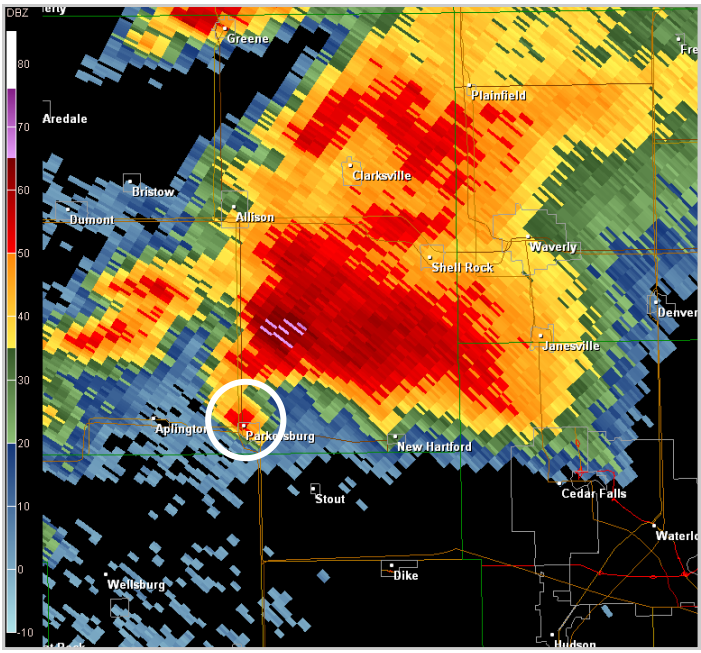

Figure 1: Reflectivity debris ball signature (circled) at Parkersburg, Iowa May 25, 2008.

With the arrival of the Dual Polarization (Dual Pol) upgrade to the Des Moines Weather Office radar in September, forecasters at the Des Moines office will be able to seek and detect additional signatures in thunderstorms such as tornadic debris and large hail, and also detect winter weather phenomenon such as areas where rain changes over to snow.

One of the more interesting aspects of the summer-season use of Dual Pol Radar will be the detection of tornadic debris signatures (TDS). Traditional Doppler Radar imagery can detect debris caused when a tornado has touched down, but the size and strength of the tornado is generally large and already prominent in the radar signature. An example of this was seen in the EF5 May 25, 2008 Aplington-Parkersburg tornado, Figure 1. The bright red area located at the edge of the hook echo is called a debris ball signature. This was a result of the amount of debris caught up in the path of the tornado and signified significant damage taking place at that moment. Similar to that, Dual Polar radar can see debris from tornados that cause damage, but at a smaller scale. Though the Des Moines office will not have Dual Pol Radar installed until mid to late September of this year, some examples of tornadic debris signatures have already been seen by other National Weather Service offices in the southern U.S.

Figure 2 from Alabama shows what a tornadic debris signature looks like with Dual Pol radar. Note that in the four panel image, radar reflectivity is located in the upper left panel with storm relative motion velocity in the upper right panel. The lower left panel is a Dual Pol radar product called "correlation co-efficient." This indicates the amount of difference in size between the various particles the radar sees at the time the radar is sampling. When Dual Pol sees rain drops, the correlation coefficient is near 100 percent because the size of most of the raindrops is similar. As more and more particles become random in size, many large and many small together, the correlation coefficient drops well below 100 percent. In Figure 2 a white circle highlights the location of the tornado as the tornado was seen by the radar. In the upper left panel, the reflectivity shows no sign of a well-defined hook echo, common to a strong tornado in some situations; it does show a very strong rotation indicated in the upper right panel of storm relative motion where the bright blue-green and red velocities meet. This is called a velocity couplet and indicates strong rotational motion.

In the lower left panel, the correlation coefficient has dropped significantly near the tornado to around 80 percent. This is the area where tornadic debris is being detected by the Dual Pol radar both near the surface and aloft. Since the debris takes some time to form after the tornado is already on the ground and causing damage, this new product will not give any extra lead time for tornado warnings and it will not be used to issue a warning under most circumstances. However, the Dual Pol radar can confirm that a strong rotational velocity signature has indeed produced a tornado and that the tornado is producing, or has already produced, damage. This extra piece of information is very valuable as confirmation for a storm that already has a tornado warning issued for it. The tornadic debris signature is also valuable at night when spotting tornados becomes very difficult compared to daytime events. Even during the day, a thunderstorm with a rain-wrapped or obscured tornado might go undetected by spotters because the rain completely hides the tornado from view. Dual Pol radar should be able to see the damage of the tornado despite the tornado not being visible to spotters. Again, this is a tool that can confirm

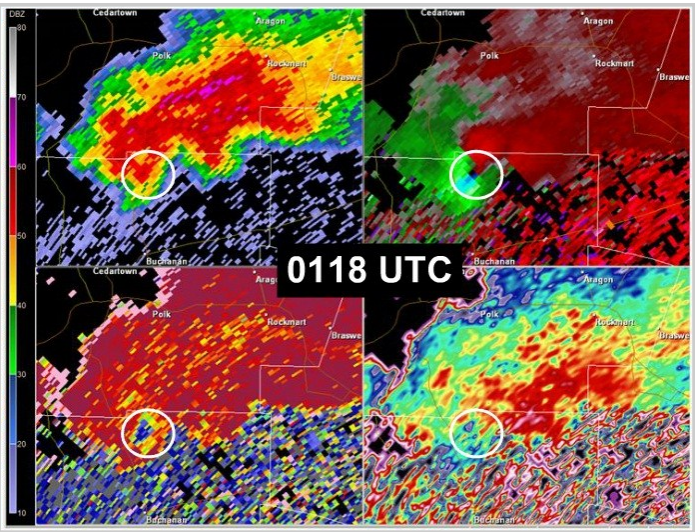

Figure 2: Four panel display of reflectivity (upper left); storm relative motion (upper right); correlation coefficient (lower left); and differential reflectivity (lower right).

(Continued on page 14)

New Mobile Weather Warnings *by Jeff Johnson, Warning Coordination Meteorologist*

June, 2012, marked the beginning of a new feature provided by the National Weather Service. Users will have the capability to have select high impact National Weather Service warnings sent to their cell phones. Additional alerts from other government agencies, such as FEMA, may also be sent to your phone. Here is how it works: If you are at home, or traveling in an area where a warning has been issued, your phone will receive alerts broadcast by nearby cell towers. If your phone is enabled to receive alerts, your phone will receive an alert the resembles a text message; the message will be no longer than 90 characters. The alert will have a special tone and vibration, repeated twice, so that you will be able to tell it apart from a regular message. If you receive an alert, you should follow any action advised by the emergency message and seek additional details.

The service is free of charge and messages will not count towards texting limits on your wireless plan. It comes enabled on newer cell phones depending on the carrier. For more information about wireless alerts, visit: http://www.crh.noaa.gov/news/display_cmsstory.php?storyid=83063&source=0

To the right is a list of National Weather Service warnings which will be sent via Warning Emergency Alerts to cell phones. The warning type and sample message are shown.

Warning Type	CMAS Message
Tsunami Warning	Tsunami Warning in this area. Avoid coastal areas. Check local media. –NWS
Tornado Warning	Tornado Warning in this area til hh:mm tzT. Take shelter now. – NWS
Extreme Wind Warning	Extreme Wind Warning this area til hh:mm tzT ddd. Take shelter. – NWS
Flash Flood Warning	Flash Flood Warning this area til hh:mm tzT. Avoid flooded areas. Check local media. -NWS
Hurricane Warning	Hurricane Warning this area til hh:mm tzT ddd. Check local media and authorities. -NWS
Typhoon Warning	Typhoon Warning this area til hh:mm tzT ddd. Check local media and authorities. -NWS
Blizzard Warning	Blizzard Warning this area til hh:mm tzT ddd. Prepare. Avoid Travel. Check media. -NWS
Ice Storm Warning	Ice Storm Warning this area til hh:mm tzT ddd. Prepare. Avoid Travel. Check media. -NWS
Lake Effect Snow Warning	Lake Effect Snow Warning this area til hh:mm tzT ddd. Avoid travel. Check media. –NWS
Dust Storm Warning	Dust Storm Warning in this area til hh:mm tzT ddd. Avoid travel. Check local media. -NWS

Dual Pol Radar

(Continued from page 13)

that a tornado is occurring and in most cases is not a tool that will be used to issue a tornado warning for an area. Issuing a tornado warning will most likely be done with routine Doppler Radar products such as recognizing thunderstorm structure on radar and exacting the location of a velocity couplet as in Figure 2 in the upper right hand panel.

In summary, a Dual Pol tornadic debris signature can be helpful in the following ways:

⇒ It can confirm the touchdown of a tornado due to the debris the radar is seeing.

⇒ It can be used to enhance the wording of tornado warning statements that follow the initial warning.

⇒ It can be very useful at night or during rain-wrapped tornado events when the tornado is not initially seen to be on the ground by storm spotters due to poor spotting conditions.

⇒ It might help detect weaker tornados that traditional Doppler Radar products have a difficult time locating.

Despite these benefits, a Dual Pol tornadic debris signature will not do the following:

◊ It will not increase the lead time of tornado warnings since the tornadic debris signature follows the touchdown of a tornado.

◊ There is currently no method to compare the size of the Dual Pol tornadic debris signature to the size, strength, or expected duration of the tornado that has been detected.

◊ There is no way to determine how large or to what extent a structure has been hit or damaged by the tornado that has been detected. Storm spotters and reports from the public and law enforcement are still essential and the only methods to see the immediate impact of any tornado.

As the staff of the Des Moines National Weather Service sees more and more of these signatures in the next few years, we will undoubtedly gain additional insight and benefit for our users. For now, look forward to this exciting change over the next year. We will have some additional short articles covering other summer and winter uses for Dual Pol Doppler Radar in future editions of our newsletter.

Weather Word Search

Click here for the answer key

AUTUMN	DROUGHT	FREEZE	HARVEST	LEAVES	SUNNY	STORM
CLOUDY	DUST	FROST	HAZE	PUMPKIN	SUNRISE	WINDY
DEW	FIRE WEATHER	GALE	HUMIDITY	RAIN	SUNSET	
DRIZZLE	FOG	GLOOMY	HURRICANE	SUMMER	TROPICAL