

July Storm Highlights Danger of Non-Tornadic Thunderstorms

The spring and summer of 2018 was an active one across the Tri-State area with several periods of severe thunderstorms and heavy rainfall. One particular storm that occurred on July 29th highlighted how dangerous severe thunderstorms can be, even if they do not produce a tornado.

Around 615 pm MDT this storm blasted the Seibert and Flagler area with hail the size of baseballs (2.75 inch diameter) and wind speeds estimated as high as 105 mph based on observed damage. The combination of large hail and intense winds devastated crops, automobiles and structures in the area and could have been lethal to anyone caught without shelter. When storms like this occur and significant damage is observed, there is often a question as to whether or not a tornado was responsible. While it is a valid question that will be addressed in greater detail later in the newsletter, I want to highlight the magnitude of this storm in a bit more detail. <u>continued next page</u>

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Message from the MIC, cont.

The image (previous page) is how the storm appeared on Goodland radar 10 minutes before it impacted Flagler and Seibert. If you notice in the image that the red and purple colors take the shape of a backward "C", this is what is known as a 'bow echo' and indicates strong winds oriented in the direction of the bow. Estimating the area of the bow indicates an estimated swath of 12 miles wide with damage suggesting winds of 75 to 105 mph. These wind speeds would fall into the EF-1 category for tornadoes and get close to what would be considered EF-2. One important difference between this storm and a tornado is the size of the area impacted. On average tornadoes are generally less than a half mile wide, significantly smaller than this storm.

While this does not minimize the impact or power that tornadoes have, I hope this example highlights that sometimes even more 'typical' weather can have a large impact. This idea remains important as we progress into the winter season as well. While the large winter storms and blizzards garner a lot of attention and impacts, often we are well prepared for these events before they occur. The smaller events like freezing drizzle or a quick inch of snow often create significant impacts as they may occur suddenly and leave people unprepared.

Increasing this preparedness is one of the key motivations behind the "Weather Ready Nation' (WRN) initiative. As our services continue to evolve, we look forward to better meeting your needs in the future. For more information on the WRN initiative, including ways to get involved, please visit <u>https://www.weather.gov/wrn</u>.

On behalf of the staff, we look forward to serving you and hope for a safe fall and winter!

Jeremy Martin Acting Meteorologist-In-Charge

DID YOU KNOW?

Lightning strikes have been recorded to travel as far as 200 miles from their source. If you are close enough to hear thunder, you are close enough to be struck by lightning. This is why we say 'When thunder roars, go indoors.'

The 20th Annual High Plains NWA/AMS Conference 07-09 August 2018

The <u>High Plains Chapter</u> of the American Meteorological Society and the National Weather Association held its 20th High Plains Conference on Meteorology and Climatology in Hastings, Nebraska, on August 7-9. WFO Hastings hosted the two-day conference, which included a two hour workshop, 3 keynote presentations, a panel discussion, and 25 other presentations. The conference started out the evening of the 7th with Aaron Johnson (SOO from Dodge City) and John Stoppkotte (SOO from North Platte) conducting the Tornado Warning and Improvement Workshop. It consisted of new ways to interrogate the radar for tornado development. Keynoters of the conference consisted of Jeff Piotrowski (Storm Production, Inc), Mark Robertson (Emergency Management Coordinator for the University of Nebraska), and Jared Guyer (Storm Prediction Center). There was also a panel discussion Wednesday afternoon which included Steve Eddy (MIC NWS Hastings), Kirt Smith (Emergency Manager for Hamilton County, NE), Tim Reith (TV Meteorologist for NTV News), Melissa Wheelock (ESU 10 Administrator), and Michael Moritz (WCM NWS Hastings). A short chapter meeting was then conducted at the end of the conference which ended shortly after noon on August 9th.

The High Plains Chapter is supported by the NWS and includes the offices of North Platte, NE, Hastings, NE, Goodland, KS, and Dodge City, KS. Other meteorological entities from the media and private forecasting realms also support the chapter. The chapter-sponsored (almost) annual conference has prided itself on being a place to view high quality meteorological and climatological presentations by those in the fore-casting and research communities alike. The relaxed atmosphere also provides an avenue for first-time presenters to develop into seasoned speakers, while bringing invaluable information on forecasting for the High Plains attendees. The 21st High Plains Conference will be held in Goodland, Kansas in 2019.

Jeremy Martin President Wesley Hovorka Secretary



RADAR POST THE

KGLD WSR-88D Completes Phase I Upgrades

Goodland Weather Forecast Office completes phase one of their WSR 88D doppler radar Service Life Extension Program (SLEP). The Goodland WSR 88D has been in operation since early 1990's. The WSR-88D was originally designed for a 20 year service life, but with SLEP we will extend the expectancy for the system for at least another 20 years. These major upgrades started back in November 2016 and will continue through FY 2022.

We recently completed Phase I in October 2017, which included the Transmitter Backplane Replacement, Modulator Upgrade, Signal Processor Upgrade, and Transmitter Chassis Refurbishment.

The Transmitter Backplane replacement replaced the The Modulator Upgrade consisted of replacing the old wire wrapped design with modern multilayered Printed Wiring Board (PWB) and combines the function of 4 circuit cards to a single multi-layered circuit card. The wiring connection was upgraded to fiber optic (F/O) to improve speed and eliminate attenuation. This was completed November 2016.



modulator unit and modifying the Trigger Amplifier and Charging Switch. The modulator provides the beam power to the system amplifier known as the Klystron. These upgrades removed the top 3 failure items within the modulator making it more reliable and upgraded to fiber optic connections within the unit. This was completed January 2017.





Hardware replaced during Signal Processor Upgrade

The new signal processor and interface panel incorporates the antenna positioning control functions in software, eliminating the Digital Control Unit, which provides that functionality in hardware. The new interface panel also eliminates the current Data Acquisition Unit, which interfaces the computer to system sensors such as backup generator fuel level, temperature sensors, etc. This was completed in Aug 2017.

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Phase I continued

The radar Transmitter Chassis Refurbishment replaced all the internal wiring, because the wiring has started to become brittle due to the heat and aging of the system. The replacement of the wiring eliminates possible issues with open circuits and bad connections. We also replaced breakers, power filters, fuse holders, and blowers. One hundred percent of the transmitter wiring was replaced and fifty percent of the hardware was upgraded or replaced. This was completed in October 2017.



Future upgrades include:

Pedestal – refurbish the pedestal, antenna, and Radome equipment. This task will require a team to remove the pedestal, install the new refurbished pedestal, and have the old pedestal shipped to depot for retrofit upgrade. FY 2018 - 2022

Shelters- consist of 3 shelters Radar Data Acquisition (RDA), Generator, and Transistional Power Maintenance Shelter (TPMS). Repair any damage to concrete walls, replace / repair steel doors and vent hoods, replace old caulk/seals, and paint. FY 2019 -2022

The Goodland WFO Electronics Program is responsible for equipment modifications, alignments, preventative maintenance, software upgrades and any other service work to keep the systems operating. These upgrades are scheduled around the severe weather season as much as possible to ensure the radar is available to provide critical information to the forecasters and to meet the mission of protecting life and

DID YOU KNOW?

On average, lightning strikes somewhere on the surface of the Earth 100 times every second. Each bolt can release up to 1 *million* volts of electricity in just a fraction of a second.

July 29, 2018 Significant Supercell Thunderstorm

On July 29th, a series of storms developed during the afternoon hours in southern Wyoming. The storms initially produced tornadoes and hail to two inches in diameter. As they continued south-southeast, the storms moved into Colorado and strengthened. Reports of hail to the size of baseballs, straight-line winds, and tornadoes continued to come in. The town of Brush, CO in Morgan County was considerably impacted as three EF-2 tornadoes were confirmed by a storm survey courtesy of NWS Boulder, CO.

The storm then continued its damaging trek south into Kit Carson and Cheyenne Counties. However, as alluded to in the "Message from the MIC" section, the storm transitioned from a tornadic supercell to a "bow echo" producing substantial straight-line winds and large hail. Warnings issued focused on the winds and hail anticipated.

The towns of Seibert and Flagler were struck at around 6:15 pm MDT. Widespread wind-driven hail damage was noted, typically on the north facing side of structures. Many forms of vegetation were impacted with trees and bushes stripped of their leaves and corn and wheat fields were shredded. When it comes to the wind damage, most of the debris was blown from the north to the south. Damage in Seibert consisted of several structures toppled and/or missing roofing material, many trees knocked down or branches snapped off, and a mobile home was rolled over. Some of the debris was blown more than one quarter mile away.

Based on the damage evidence, the NWS Goodland storm survey confirmed the damage was the result of straight-line winds.

How can storms produce winds strong enough to cause so much damage? A few factors enhanced the damaging wind potential in this case. First, the storm was a supercell, a highly organized storm that is known for producing extreme severe weather. Second, as the storm moved through Seibert, it

produced a downburst, which is defined as a swath of strong winds produced by the thunderstorm downdraft. Precipitation particles in the storm clouds evaporate, cooling the air. Since cold air sinks, the air rushes to the Earth's surface, causing damage when it hits the ground. Finally, a rear-inflow jet, which is an area of very strong winds several thousand feet up in organized storms such as a "bow echo", was observed. A downburst can force these strong winds to the surface, leading to the possibility for extensive





Damage to a farm structure (Seibert)

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Supercell, cont.

damage. These three factors can be enhanced when the atmosphere is highly unstable or there is dry air available to increase the cooling effect. All ingredients mentioned were present and led to the damage on July 29th. The graphic to the right highlights the downburst process.

Pictures were received of a shelf cloud with this storm; this cloud strongly correlates to incoming straight-line winds. The image below, captured and shared by Dave Ritchey, highlights the shelf cloud as the storm moved through Kit Carson later that evening.





While tornadoes are easily one of the most destructive weather occurrences, straightline winds frequently produce wider swaths of damage where more people are impacted. Damage from wind-driven hail should also not be overlooked as a dangerous weather event. Many of the most costly storms to strike the Tri-State Region produced damaging winds and hail, not tornadoes.

Shelf cloud in Kit Carson County, Colorado. Photo by Dave Ritchey

When severe thunderstorms are in the area and a Severe Thunderstorm Warning is issued, take protective actions as a dangerous combination of wind and hail may be fast approaching. Also, ensure you have multiple ways to monitor and receive weather information. NOAA Weather Radios, local radio broadcasts, Wireless Emergency Alerts (WEAs), television/news broadcasts, the NWS webpages (<u>www.weather.gov</u>), private weather companies and broadcasts, and weather apps will alert you to the danger moving towards your location. Finally, stay tuned to the weather when you know severe thunderstorms are forecast. Keep an eye to the sky, monitoring for rapidly changing weather conditions. Taking these actions could save your life, the lives of your families and friends, and the animals that you care for.

> Ryan Husted Warning Coordination Meteorologist (WCM) NWS Goodland, Kansas

Goodbye

On July 31st, 2018, Dave Floyd retired after 16 years with the National Weather Service. He started as a television meteorologist in Wisconsin then worked as a forecaster on Wall Street before heading to Norman, Oklahoma to teach radar school. He came to Goodland over 10 years ago and was the Warning Coordination Meteorologist before becoming the Meteorologist-In-Charge.

Happy Retirement Dave!



RETIRED!

Imparting wisdom to Jeremy (C) and Ryan (R)

Hello

This year also brought us three new interns. Welcome to WFO Goodland!



Name: Brittany Newman

Hometown: Herndon, Virginia

University: B.S. in Meteorology from the University of Oklahoma (Boomer Sooner!)

Working on my M.S. in Geography from Northern Illinois University

Why do you love meteorology?: Chaos theory. I love the butterfly effect in weather. It is fascinating to see how one atmospheric condition can completely change the weather outcome. My 4th grade classes weather segment and Twister sucked me into meteorology early on.



Name: Joseph Patton Hometown: Baton Rouge, Louisiana

University: University of Oklahoma and Florida State University

Why do you love meteorology? I've never not loved meteorology, ever since I was a little kid. What fascinates me most is that every day you can learn something different about our incredibly complex atmosphere and how it behaves. From making my own hurricane tracking chart to working at the NWS Goodland office today, weather inspires me to be creative, to think of new ideas, and most importantly to help protect others.



Name: Amanda Wekesser Hometown: Lincoln, Nebraska University: University of Nebraska-Lincoln

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Why do you love meteorology?: I love meteorology because it gives me the opportunity to share my passion for the weather with others. I enjoy being able to teach people about the weather and to help people plan their day based on the forecast. The weather is always changing and that makes it an exciting career to be in.

BMH: The New Face of NOAA Weather Radio

Have you ever wondered how tornado warnings or other severe weather emergencies are communicated by the National Weather Service? This is done with NOAA Weather Radio (NWR), also known as, "The Voice of NOAA's National Weather Service." NWR is one of the most crucial services we provide to the Tri-State area.

As part of the National Weather Service's Weather Ready Nation initiative, the NWR system received a major overhaul in 2017, its biggest since 1998. This was very exciting news for our organization, as the new software disseminated warnings and additional weather information in a more fluid and organized way.

The new system used to implement this process is called BMH (Broadcasting Message Handler). Before we jump into BMH, let us discuss what exactly is NWR? NOAA Weather Radio All Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service office. NWR broadcasts official Weather Service warnings, watches, forecasts and other hazard information 365 days a year, 24 hours a day, 7 days a week to the public.

NWR's history: In April of 1965, the devastating Palm Sunday Tornado Outbreak occurred. In the Midwest U.S. states of Indiana, Ohio, Michigan, Wisconsin, Illinois and Iowa, there were 47 tornadoes resulting in a large loss of life. After the storms survey, one of the key recommendations was the establishment of a nationwide radio network that could be used to broadcast weather warnings to the public. Beginning in 1966, the Environmental Science Services Administration (ESSA) started a nationwide program known as "ESSA VHF Weather Radio Network." In the early 1970s, this network changed, and has since been known as NO-AA Weather Radio.

Throughout its history, NWR has saved countless lives and undergone many iterations. The last major update was in 1998 with the implementation Console Replacement System (CRS). BMH, was a major upgrade due to the system not only being more user friendly, but was easily integrated into AWIPS. AWIPS, or Advanced Weather Interactive Processing System, is the system use at WFO Goodland to receive and manipulate Meteorological data. This system is essentially the backbone of how we forecast the weather. Having BMH integrated within AWIPS aids us in our mission to protect life and property.

So what changed from CRS to BMH? To the everyday listener, the only thing you may notice is a clearer voice. This was due to the new NeoSpeech text-to-voice software. As of December 2017, the National Weather Service replaced all Weather Forecast Offices with BMH. So next time you hear a weather radio warning be mindful of the new voice of NOAA Weather Radio All Hazards.

Elizabeth Vickery General Forecaster WFO Goodland

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Winter Spotter Training Classes are Back!

For the second year now, the National Weather Service (NWS), in Goodland, KS will be conducting Winter Weather Talks across the Tri-State Region from October 22nd through November 20th.

These talks are free and are open to people of all ages. Talks will be held in each county on a weekday evening between 6:30 and 8:45 pm local time. Please check the list below for dates in your county.

Come and enjoy this unique opportunity to learn how to measure and report snow fall/depth. We will create a fun and hands on atmosphere by using props to simulate snow fall so you can practice measuring.

We will also go over winter weather safety during the talks.

If you have any questions, or want more information, contact me via e-mail at brian.warren@noaa.gov or by phone 785-899-2360.

We hope to see you there!

All classes start at 6:30pm LOCAL time

County	City	Date	Location	
Decatur	Oberlin	10/22/18	Golden Age Center—105 W Maple Street	
Logan	Oakley	10/23/18	Logan County Courthouse—710 W 2nd Street	
Sherman	Goodland	10/24/18	Wolak (Fire/EMS Station) Building—1006 Center Street	
Thomas	Colby	10/25/18	Community Bldg downstairs—285 E 5th Street	
Gove	Grainfield	10/26/18	Gove County 4-H Building- 757 W 3rd	
Kit Carson	Burlington	10/29/18	Burlington Ambulance Building- 1576 Lowell Avenue	
Sheridan	Hoxie	10/30/18	Bowen Scott House- 1041 Sheridan Avenue	
Wichita	Leoti	11/1/18	Leoti Fire House- 301 N 4th Street	
Wallace	Sharon Springs	11/2/18	Wallace County Fairgrounds—CAB Bldg	
Cheyenne (KS)	St. Francis	11/5/18	Cheyenne Co Emergency Services Building- 125 W US-36	
Hitchcock	Trenton	11/6/18	EMS Building—359 Main Street (south of the bank)	
Yuma	Yuma	11/7/18	Yuma Ambulance Bldg—in the classroom-302 E 2nd Ave	
Cheyenne (CO)	Cheyenne Wells	11/8/18	Ambulance Building—155 W 1st Street South	
Greeley	Tribune	11/9/18	Tribune Fire Dept- At Ingalls Ave and W Greeley Ave.	
Rawlins	Atwood	11/13/18	Midwest Energy Meeting Room—303 Main Street	
Red Willow	McCook	11/14/18	Heritage Senior Center- 1312 W 5th Street	
Dundy	Benkelman	11/20/18	EMS Building—1305 A Street	



Meet A Met



2003

2018

This issue's interview is with another lead forecaster, Brandon Vincent. Even though Brandon only joined us last year, he is no stranger to the High Plains. He has been a storm chaser since 2003 and started coming out here in 2007. He has also chased storms across the mid-Atlantic and the southeastern US.

Q: Where are you from originally?

A: The Shenandoah Valley in Virginia

Q: Where did you go to college?

A: North Carolina State University

Q: How long have you worked at the NWS, and which offices have you worked at?

A: 15 years. I've worked at 3 NWS offices:

- Morehead City, NC (2003-2006)
- Raleigh, NC (2006-2017)
- Goodland, KS (2017-)

Q: What is the scariest weather situation you've ever been in?

A: The April 16, 2011 tornado outbreak in North Carolina

Q: What are your hobbies and interests in your spare time?

A: Varied and ever-changing. Now that I live next-door to the Rockies, I spend a fair amount of time exploring and rockhounding in KS, CO, UT, WY, and MT. I found a shark tooth in an outcrop of shale near Wakeeney KS -- 2,300 ft above sea level. The tooth belonged to a shark that lived in the western interior seaway, a vast inland sea that covered central North America during the late Cretaceous (85-90 million years ago).



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Shark tooth with impression. Photos by Brandon Vincent

Q: Do you have any "heroes" or people that inspire you?

A: Richard Feynman and Robert F. Kennedy

Q: Favorite book or author?

A: Carl Sagan - The Demon Haunted World

Q: What is your favorite place you've ever been to and why?

A: Costa Rica. This small Central American country contains 5% of the world's biodiversity; that's an incredibly rich variety of plants, animals, and habitats.

Q: If you could visit anywhere in the world, where would it be?

A: Uluru, Australia



Uluru, also known as Ayers Rock, is a sandstone formation in Northern Territory







City**	Rain to Date (in.)	Average Rain to Date (in.)	Departure From Ave. (in.)
Goodland	16.76	16.73	+0.03
Burlington	14.07	14.98	-0.91
McCook	20.03	18.68	+1.35
Hill City	30.19	19.19	+11.00

Useful Links

Storm Prediction Center

- <u>www.spc.noaa.gov</u>

Weather Prediction Center

- www.wpc.ncep.noaa.gov

Climate Prediction Center

- <u>www.cpc.ncep.noaa.gov</u>

• · Climate Data

- <u>www.ncei.noaa.gov</u>

• · CoCoRaHS

- www.cocorahs.com
- · Weather Models

- www.ncep.noaa.gov

• · Space Weather

- <u>www.swpc.noaa.gov</u>



Contact Us

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Website: <u>http://www.weather.gov/gld</u>

Facebook: <u>http://www.facebook.com/</u> <u>nwsgoodland</u>

Twitter: https://twitter.com/NWSGoodland