2021 Shareholders Report

Volume 1

National Weather Service
Austin/San Antonio

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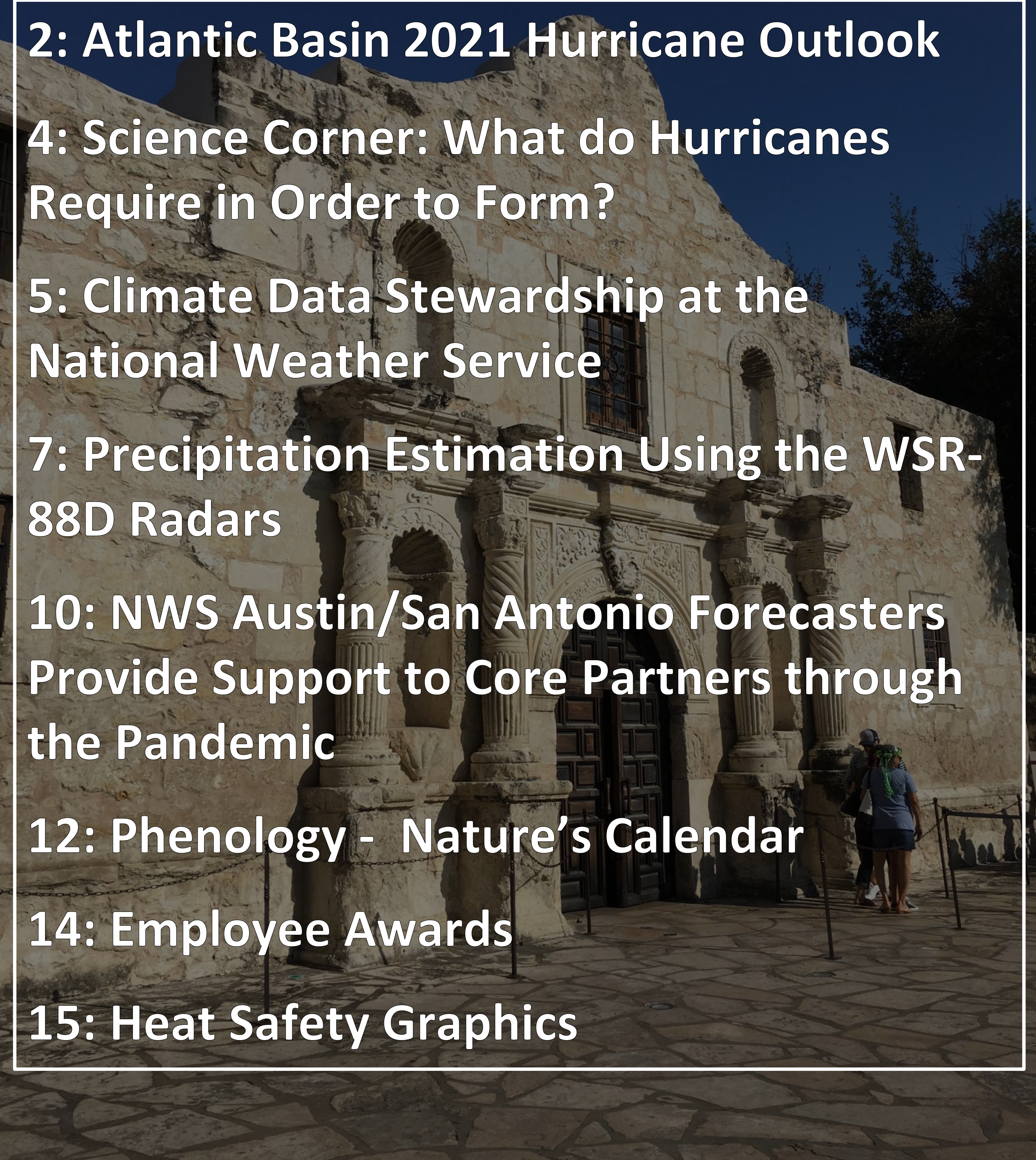
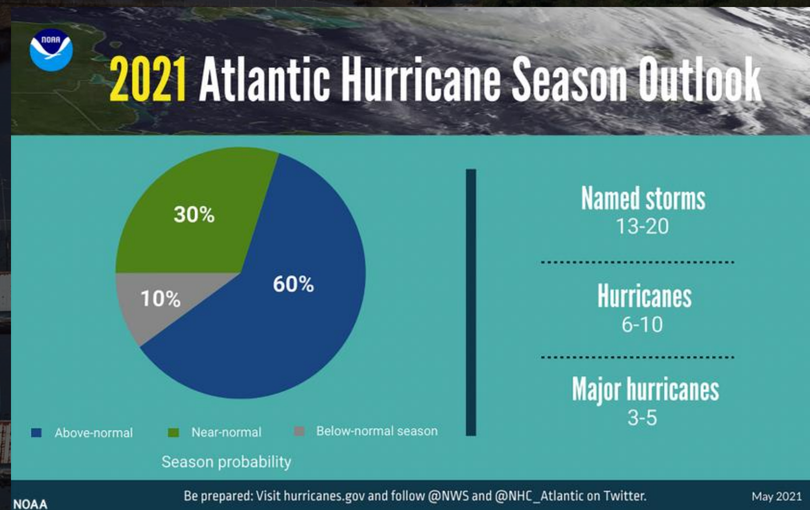


Another Active Tropical Season Forecast for the Atlantic Basin

By: Jason Runyen, Lead Meteorologist

To say the 2020 Atlantic Basin hurricane season was active is an understatement. Thirty named storms occurred in 2020, breaking the previous record of 28 storms set in 2005. Official records date back to 1851. Out of these 30 named storms, 11 struck the U.S. The previous record for landfalls in the U.S. during a single season was nine set in 1916. Nearly the entire coastline of the U.S. from Texas to Maine was at one time under some type of watch or warning from a tropical system. The 2020 season was also only the second time on record of having 5 or more tropical cyclones at the same time!



Major Hurricane Laura approaching the southwest coast of Louisiana Aug 26, 2020

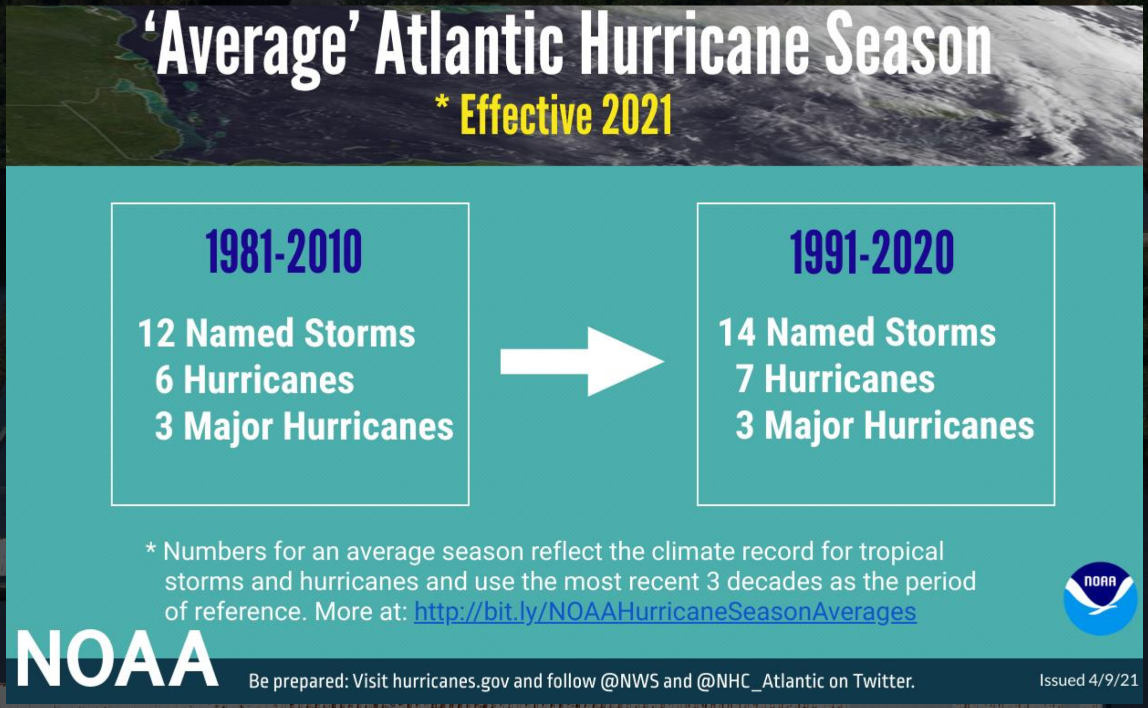
Favorable conditions will once again be in place for an active hurricane season in the Atlantic basin this year. El Nino Southern Oscillation (ENSO) conditions are currently in the neutral phase, with the possibility of the return of La Nina later in the hurricane season. “ENSO-neutral and La Nina support the conditions associated with the ongoing high-activity era,” said Matthew Rosencrans, lead seasonal hurricane forecaster at NOAA’s Climate Prediction Center. The forecast ENSO conditions also correlate to an increased risk for Texas. During ENSO-neutral or La Nina conditions Texas is twice as likely to experience a tropical storm or hurricane strike than during El Nino conditions.

Other contributing factors for an active season include predicted warmer-than-average sea surface temperatures in the tropical Atlantic Ocean and Caribbean Sea, weaker tropical Atlantic trade winds, and an enhanced west African monsoon.

The NOAA forecast for 2021 indicates a likely range of 13 to 20 named storms (winds of 39 mph or higher), of which 6 to 10 could become hurricanes (winds of 74 mph or higher), including 3 to 5 major hurricanes (category 3, 4 or 5; with winds of 111 mph or higher). This forecast reflects a 90% chance of either near-normal to above-normal tropical cyclone activity.

So what is normal? Last month, NOAA updated the statistics used to determine when hurricane seasons are above-, near-, or below-average relative to the latest 30-year climate record. Every ten years the averages are updated to the most recent 30-year climate record, which for 2021 is now based on the 1991-2020 averages. From 2011-2020 the averages were based on the 1981-2010 climate record.

For more information on the 2020 Atlantic Hurricane Season from two NHC scientists, see their recent blog post here.



The 1991-2020 climate record indicates an average hurricane season producing 14 named storms, of which 7 become hurricanes, including 3 major hurricanes. This is an increase in both named storms and hurricanes compared to the 1981-2010 period of record. The increase in the averages may be attributed to the overall improvement in observing platforms, including NOAA's fleet of next-generation environmental satellites and continued hurricane reconnaissance. It may also be due to the warming ocean and atmosphere which are influenced by climate change. The update also reflects a very busy period over the last 30 years, which includes many years of a positive Atlantic Multi-decadal Oscillation, which can increase Atlantic hurricane activity.

Like previous tropical seasons, 2021 started early. This year marks the 7th straight year that the Atlantic Basin has experienced a named tropical cyclone prior to the start of the official season, which is June 1. Tropical Storm Ana formed and dissipated over the open Atlantic May 22-23.

While the official hurricane season runs June 1st through November 30th in the Atlantic basin, it's important to note that on average two-thirds of all hurricanes in the Atlantic Basin form after August 28th, and half form after September 9th. Over 90% of all major hurricanes (Category 3-5 on the Saffir-Simpson Hurricane Wind Scale) have occurred from August through October.

Below is the list of names that will be used during the 2021 tropical season. Only twice before, in 2005 and 2020, has the list of names been exhausted forcing forecasters to use the Greek Alphabet. New for this season, and future seasons, the Greek alphabet will no longer be used if the main list of names is completely used. During the 2020 season, use of the Greek Alphabet led to confusion due to unfamiliarity and similar-sounding names. Instead, a supplemental list of names, approved by the World Meteorological Organization, will be used anytime the standard seasonal list is exhausted.

Science Corner: What do Hurricanes Require in Order to Form?

By: Nick Hampshire, Lead Meteorologist

Hurricane season for the Atlantic Basin spans from June 1st through November 30th and tropical systems that track through the western Gulf of Mexico can bring impacts to South-Central Texas. Have you ever wondered what needs to happen for a hurricane to form?

Tropical systems are initially classified as a wave or tropical disturbance that can then strengthen into a tropical depression. After further strengthening, once maximum winds reach 34 knots (39 mph) the system is classified as a tropical storm and finally at 64 knots (74 mph), a hurricane. The first thing needed for a tropical system to develop is the system has to be a certain distance away from the equator. As the earth spins, a rotating force (Coriolis Force) is created in the atmosphere with the force being strongest at the poles and non-existent at the equator. This spin is what allows low-pressure systems in the northern hemisphere to rotate counterclockwise. Typically, tropical systems in the Northern Hemisphere will not develop south of 5 °N latitude.

The second thing needed is warm ocean temperatures and this is the reason hurricane season is in the summer. Research has shown that the general minimum temperature needed is 80 degrees °F. The associated low pressure system lifts the warm air and moisture into the atmosphere and is the fuel needed to keep the tropical system thriving.

Third, temperature needs to be decreasing with increasing height throughout the atmosphere. As the tropical system continues, it generates heat as air is lifted from the warm ocean layer that is exhausted into the atmosphere from the center of the rotating system. In order for this warm air to rise, the surrounding air must be cooler. Therefore, the change of temperature with height must be negative at all times.

Tropical systems also require low vertical wind shear in the atmosphere, meaning very little change in wind speed and direction with height. Hurricanes are vertically stacked weather systems and any high winds in the upper atmosphere would tilt the upper level circulation of the system away from the surface low pressure system causing the continued deep warm-air circulation to cease.

Last, there needs to be deep moisture in the atmosphere extending from the surface into the upper levels of the atmosphere. For example, if there is any dry air in the mid-levels of the atmosphere, the warm-moist air rising from the lower atmosphere would begin to evaporate. Evaporation leads to cooling and therefore the warm and moist air needed would cool and dry as the rising parcels encounter the drier air, disrupting the warm-core structure of the system.

Climate Data Stewardship at the National Weather Service

By: Keith White, Meteorologist

One of many responsibilities of the National Weather Service (NWS) is stewardship over weather data that is used in long term records of our climate. The accuracy of these data are of the utmost importance as they are essential to decisions made in sectors such as agriculture, insurance, energy, transportation, water resources, and health. As Climate Services Focal Point at NWS Austin/San Antonio, I frequently use these data to answer questions from the public as well as our partners in the media, government, and other stakeholders, many of whom need to be able to make informed decisions beyond the 7-day accuracy window of weather forecasts.

Data is collected via a range of different sources, from automated systems to volunteer cooperative observers entering data manually each day. After several rounds of quality control (QC) it ends up at its final repository at the National Centers for Environmental Information (NCEI) which “hosts and provides public access to one of the most significant archives for environmental data on Earth.”

The primary systems used for remote weather observations, the Automated Surface Observing System (ASOS; figure 1), are typically located at airports. There, in addition to providing valuable data to meteorologists in support of forecast and warning operations, they help ensure flights are able to take off and land in safe weather conditions. The instruments provide data for the following weather elements:

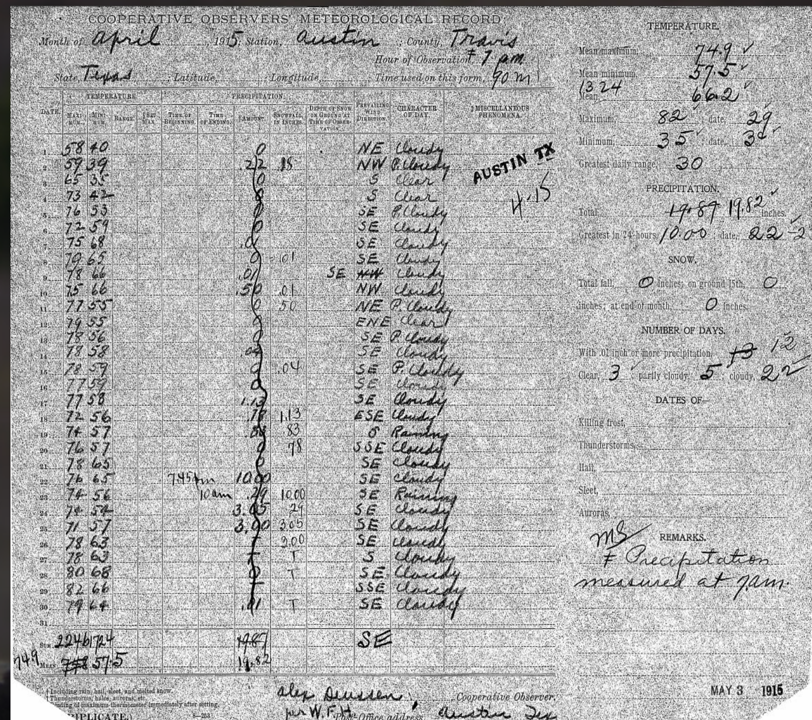
1) Sky condition, including cloud height and amount (clear, scattered, broken, overcast) up to 12,000 feet
2) Visibility (to at least 10 statute miles)
3) Basic present weather information: type and intensity for rain, snow, and freezing rain
4) Obstructions to vision: fog, haze
5) Pressure: sea-level pressure, altimeter setting
6) Ambient temperature, dew point temperature at 2 meters
7) Wind: direction, speed and character (gusts, squalls) at 10 meters
8) Precipitation accumulation

An Automated Surface Observing System (ASOS)

For decades leading up to the installation of hundreds of additional automated systems like the ASOS and it’s little brother the Automated Weather Observing System (AWOS) in the 1990s, paid observers took manual observations of all of the same weather elements a minimum of each hour 24/7/365 at a few hundred locations nationwide. In addition, the Cooperative Observer Program (COOP), which also dates to the 19th century and continues to this day, provides daily observations of maximum and minimum temperature and precipitation at a few thousand locations. These observations date back as far as the mid-1800s in some places, although here in south-central Texas records typically begin in the 1880s to early 1900s. As noted in one of several NWS Directives documents (the backbone of NWS operations) pertaining to climate services, the COOP mission is “to provide observational data...necessary to define the climate of the United States and to help measure extreme weather events, climate variability, and long-term climate change.” Some of these sites also serve as a backup should an ASOS go down, which happened for 4 days in Del Rio this past February.

National Weather Service offices are primarily staffed by meteorologists, but we also rely on our support staff to keep things running smoothly. Our Electronics Technicians, for example, are in charge of both routine maintenance and repair of NWS ASOS systems (in addition to NOAA Weather Radio transmitters, Automated Radiosonde Observing Systems, weather radar, and more), and help keep them running 24/7/365 to collect this valuable data and ensure its accuracy.

Occasionally, bad data is still transmitted, either by ASOS/AWOS or by human-entered COOP data. Some systems have automated QC checks implemented that flag observations if they fail a certain number of standard deviations from climatology, and they can be corroborated by meteorologists here or corrected if needed. I also perform a thorough, manual QC process each month for our four long-term climate data site ASOS stations of Del Rio, San Antonio, Austin Bergstrom and Austin Camp Mabry before the data are sent to NCEI. Per NWS Directives: "...all data are preliminary until they have been subject to all levels of NCEI quality control. Once they have passed this quality control, the data are considered "final data."' NCEI's data products are then sent back to us for one last round of checks before they are finalized and become part of the official historical weather record.



COOPERATIVE OBSERVERS' METEOROLOGICAL RECORD.

Month of April, 1915. Station, Austin; County, Travis; State, Texas; Latitude, ; Longitude, ; Hour of Observation, # 7 am; Time used on this form, 90 m

Date	Temperature: Maximum	Temperature: Minimum	Precipitation: Time of beginning	Time of ending	Amount	Snowfall in inches	Prevailing wind direction	Character of day
1	58	40			0		NE	Cloudy
2	57	39			.22	.18	NW	P. Cloudy
3	65	35			0		S	Clear
4	73	42			0		S	Clear
5	76	53			0		SE	P. Cloudy
6	72	59			0		SE	Cloudy
7	75	68			.01		SE	Cloudy
8	79	65			0	.01	SE	Cloudy
9	78	66			.01		SE	Cloudy
10	75	66			.50	.01	NW	Cloudy
11	77	55			0	.50	NE	P. Cloudy
12	79	55			0		ENE	Clear
13	78	56			0		SE	P. Cloudy
14	78	58			.04		SE	Cloudy
15	78	57			0	.04	SE	P. Cloudy
16	77	59			0		SE	Cloudy
17	77	58			1.13		SE	Cloudy
18	72	56			.78	1.13	ESE	Cloudy
19	74	57			.83	.83	S	Raining
20	76	57			0	.78	SSE	Cloudy
21	78	65			0		SE	Cloudy
22	76	65	7:45 pm		10.00		SE	Cloudy
23	74	56		10 am	.29	10.00	SE	Raining
24	74	54			3.05	.29	SE	Cloudy
25	71	57			3.00	3.05	SE	Cloudy
26	78	63			T	3.00	SE	Cloudy
27	78	63			T	T	S	Cloudy
28	80	68			0	T	SE	Cloudy
29	82	66			T		SSE	Cloudy
30	79	64			.01	T	SE	Cloudy
31								
Sum	2246	1724			19.87		SE	
Mean	74.9	57.5			19.82			

AUSTIN TX 4.15

TEMPERATURE. Mean maximum 74.9; Mean minimum 57.5; Mean (1324) 66.2; Maximum 82, date 29; Minimum 35, date 3; Greatest daily range 30.

PRECIPITATION. Total 19.87 19.82 inches; Greatest in 24 hours 10.00, date 22-23.

SNOW. Total fall 0; inches on ground 15th 0; inches at end of month 0 inches.

NUMBER OF DAYS. With .01 inch or more precipitation 13 12; Clear 3; partly cloudy 5; cloudy 22.

DATES OF. Killing frost; Thunderstorms; Hail; Sleet; Auroras.

REMARKS. # Precipitation measured at 7am.

MAY 3 1915

† Including rain, hail, sleet, and melted snow. ‡ Thunderstorms, haloes, auroras, etc. § Reading of maximum thermometer immediately after setting.

(DUPLICATE.)

Alex Deussen, per W.F.H., Cooperative Observer. Post-Office address, Austin Tex

Monthly Observation Form for Austin, TX April 1915

But what about when we discover possible data errors in the historical archive? Well, there's a process for that too! As one example, I recently discovered that our database showed a 3.8" snow event for April 2, 1915 at Austin. Clearly that seems improbable, but I had to verify. First, I took a peek at temperature and precipitation data for that date: 0.18" of precipitation and a low of 39, neither of which mesh with nearly 4" of accumulating snow. If the snow data was entered incorrectly, could the other data for that date have been as well? Thankfully, there's a tool at NCEI for meteorologists and researchers to view the original paper forms dating back as far as records were taken. Over a 12 year period from 2000-2011, the Climate Database Modernization Program produced nearly 56 million images from all types of physical media. You can see in Figure 2 that the temperature and precipitation data were correct, and that there was no mention of snow that month. I took this evidence to NCEI via a ticketing tool called Datzilla. They hold power over the final decisions when it comes to historical data corrections, and were happy to correct the data in all of our archive databases.

Taking this investigation a step further, I used these original paper forms to fill in several decades worth of missing snowfall data from the Austin Bergstrom International Airport site. Long-time NWS partner Troy Kimmel assisted in this effort to ensure our historical archive databases are as complete as possible.

This all just scratches the surface of all the hard work that goes into climate data stewardship. In fact, I've really only touched on parts of a few of the "Ten Principles of Climate Monitoring" that are outlined in our directives, much of which would bore many of you readers!

You can access some of the historical records for our four primary sites on a recently revamped webpage here.

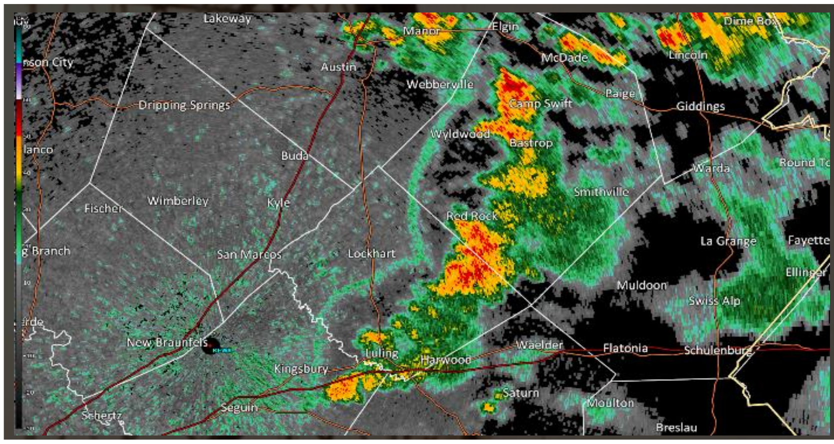
Precipitation Estimation Using the WSR-88D Radars

By: Aaron Treadway, Lead Meteorologist

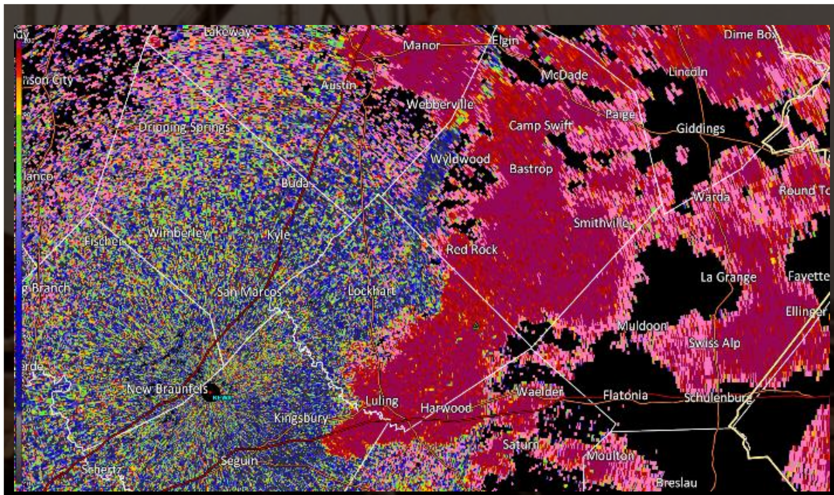
There are a variety of methods that meteorologists use to measure precipitation. The truest and most accurate way is through direct rain gauge observations at official National Weather Service (NWS) observing sites (ASOS and AWOS at airports), NWS cooperative observers, USGS, and private rain gauge networks (such as LCRA, GBRA, and some local counties), and the public CoCoRaHS network. While some of these rain gauge networks report in real time or every 15 minutes, others only report once a day. This means that NWS meteorologists need a faster way to measure precipitation so they can issue life-saving Flood Advisories and Flash Flood Warnings. The WSR-88D radar meets this requirement. Weather radar updates every two to four minutes and allows forecasters to see where heavy rain is falling and estimate how much has fallen in the last hour or through an entire event. There are several base and dual-pol products that help the radar detect what is falling from the clouds and how heavy the precipitation is, along with several derived products that produce an estimate of how much rain has fallen. These various products are discussed below.

The first group of products are called base or dual-pol products. They are directly processed from the data received from the radar beam. Dual-Polarization was introduced about ten years ago and allows for the vertical and horizontal cross section of what the radar 'sees' to be measured. This helps the radar tell the difference between rain, hail, snow, biological targets, and debris. To learn more about how radar works visit the [NWS Educational JetStream].

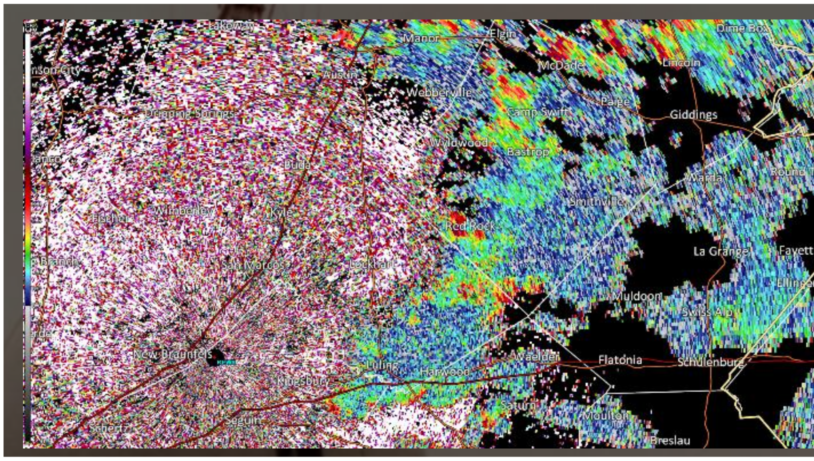
Base Reflectivity (Z)
This is the familiar product shown on TV frequently. The base reflectivity measures how much energy is sent back to the radar from the precipitation. Brighter colors, indicating higher reflectivity, mean either larger targets (like big rain drops or hail) or higher concentrations of raindrops (heavier rainfall). As a legacy radar product, base reflectivity provides a good initial estimate of precipitation intensity.



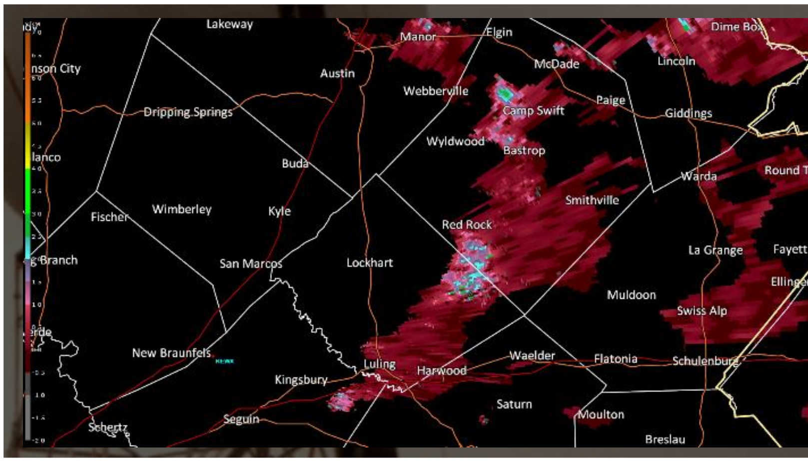
Correlation Coefficient (CC)
The next most common product used in examining precipitation is correlation coefficient. This dual-pol product measures how the horizontal and vertical pulses are behaving as the radar scans. More uniform scans produce high CC (the reds) and mean rain or snow while more complex scatters produce low CC (the blues) and often mean biological targets or debris being lofted into the atmosphere. CC can also help differentiate between hail and rainfall.



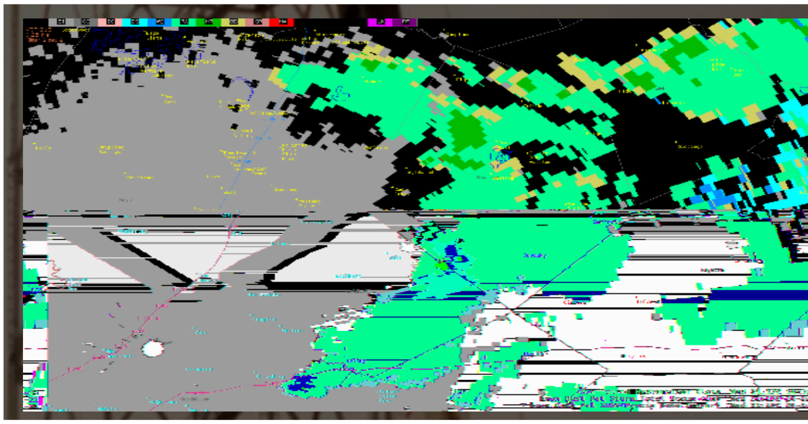
Differential Reflectivity (ZDR)
Another dual-pol variable is differential reflectivity which represents the difference between the vertical and horizontal profiles of the targets the radar is seeing. Because rain drops tend to be flatter and fatter ZDR is positive for raindrops, but it is near zero for hail (because hail tumbles it appears spherical to the radar). The larger the rain drops (which tend to produce heavier rain), the larger the ZDR.



Specific Differential Phase (KDP)
KDP is similar to ZDR in that it looks at the orientation and shape of the target the radar is detecting. Horizontally oriented targets (like rainfall) produce a positive KDP. A benefit of KDP is that it is also sensitive to the concentration of targets. The more targets being scanned, the higher the KDP. That means that higher values of KDP (the brighter colors) represent higher concentrations or heavier rainfall.



Hydrometeor Classification (HC)
This product runs dual-pol variables through an algorithm and produces a best guess of the type of target the radar is seeing. As an example, in the image to the right the red is small hail, dark green is heavy rainfall, and light green is lighter rainfall. Snow, ice crystals, clutter, and biological targets are other potential classifications produced by this algorithm.

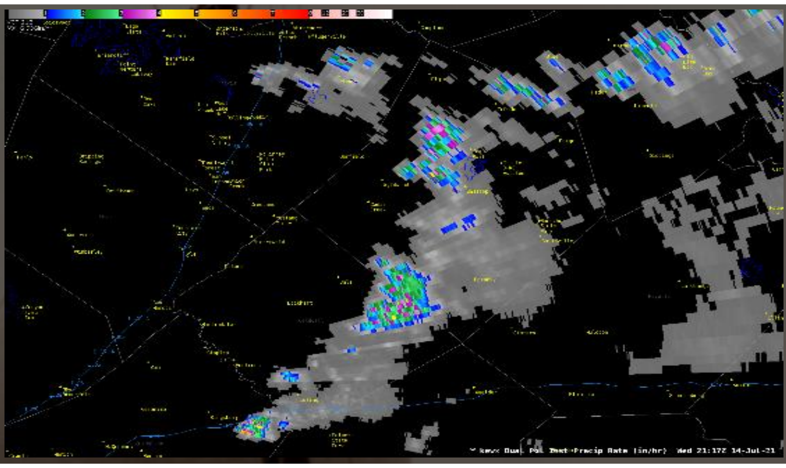


Meteorologists can use these five base and dual-pol products to detect pockets of heavy rainfall and differentiate them from other meteorological targets like hail, using the radar to identify the location of the heaviest rainfall and track its anticipated direction. However, the radar also takes the data from these products and processes them into derived products that not only estimate rainfall rates, but rainfall totals as well.

The second group of products are the derived products and they are calculated in two different ways. The first way, called the Precipitation Processing Subsystem, uses only the reflectivity, a legacy product, to determine the precipitation estimation. This may tend to overestimate some precipitation as it is more likely to translate higher reflectivity contaminated with hail into heavier precipitation. The Quantitative Precipitation Estimation Algorithm is much more complex, using three equations rather than one, along with the additional dual-pol variables to produce a more accurate picture of precipitation amounts. Meteorologists often use both the legacy and the dual-pol estimates in tandem to compare their outputs and observe the range of possible precipitation amounts. When rain gauge data is available, the estimates are also compared to that data to determine whether the legacy and dual-pol estimation are over, under, or accurately estimating the amount of precipitation.

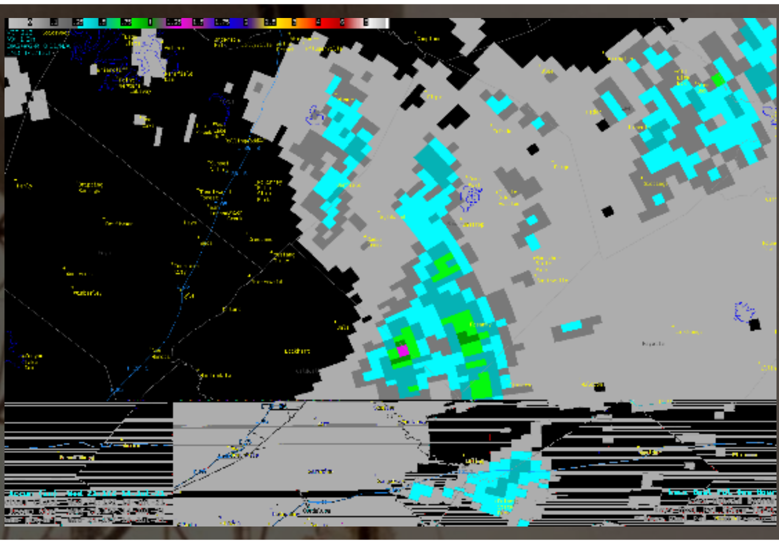
Digital/Instantaneous Precipitation Rate

The instantaneous precipitation rate product is often used in South Central Texas where heavy rainfall, even for a short time, can cause flash flooding. The product gives the meteorologist an idea where the heaviest rainfall is at the moment and is updated with each volume scan. The resolution of 250 meters also provides a detailed look at the different rainfall rates in the storms observed by the radar. Logically, heavier rainfall rates produce higher rainfall totals.



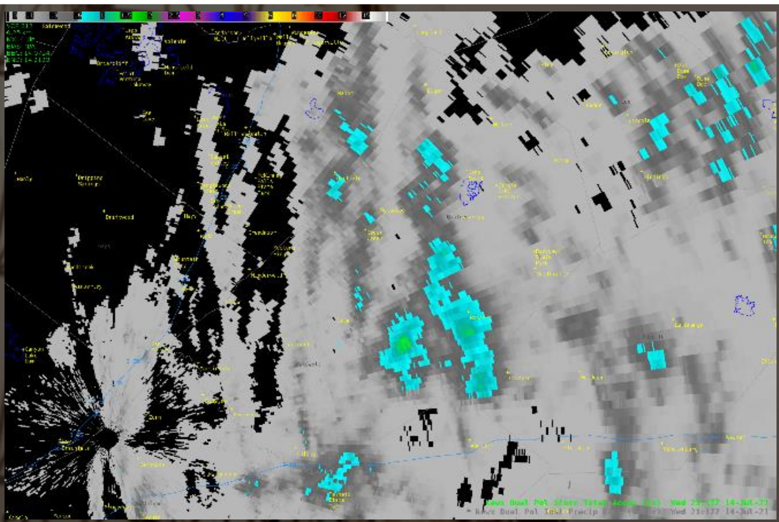
One Hour Precipitation

This product is produced using both the legacy and the dual-pol estimations. The product can have two different resolutions (2 km and 250 m) and can sometimes have a bias applied to it. Regardless of the product differences, it considers the precipitation estimation over the last hour of time. These one hour totals help forecasters make decisions on issuing flash flood warnings using flash flood guidance produced by the River Forecast Centers. If rainfall amounts exceed a certain amount over a one hour period, flash flooding is likely. That amount varies based on land cover, topography, and antecedent conditions.



Storm Total Precipitation

This product is also produced using both the legacy and the dual-pol estimations. Similar to the one hour precipitation product it has two resolutions (2 km and 1 degree by 0.25 km). This product takes into account all precipitation estimated during the duration of a storm. It can be manually reset or will reset itself one hour after no precipitation is detected by the radar. It provides a good overview of how much rainfall has fallen during a single storm event and allows for easy detection of areas that have seen the highest estimated rainfall amounts. Again, comparing these estimated totals to gauge observations is key.



These eight products are used routinely by meteorologists at the National Weather Service to estimate precipitation totals and make determinations on whether life saving Flood Advisories and Flash Flood Warnings are needed. They, along with ground truth data from rain gauges, are also used by River Forecast Centers to estimate runoff into nearby streams, creeks, and rivers to determine if a River Flood Warning is needed. While these products all originate from individual radars, like the ones in New Braunfels, near Brackettville, and near Granger, they are only a portion of the tools meteorologists use to estimate precipitation. In the next installment of the newsletter we will look into Multi-Radar Multi-Sensor precipitation estimation products that stitch together output from all of the NWS radars to create a more holistic picture of precipitation amounts and their impacts over urban areas and within river systems, and how current estimated rainfall compares with historic rains.

NWS Austin/San Antonio Forecasters Provide Support to Core Partners through the Pandemic

By: Jason Runyen, Lead Meteorologist

The National Weather Service (NWS) has a strong partnership with local, state, and federal emergency management agencies, which are considered core partners. We support them with Impact-Based Decision Support Services (IDSS) not only through weather events but a variety of hazards.

IDSS are forecast advice and interpretative services the NWS provides to help core partners, such as emergency personnel and public safety officials, make decisions when weather, water and climate impacts the lives and livelihoods of the American people. This support may be needed in response to a particular event or routinely to support high-value decision making. NWS staff across the U.S. work hand-in-hand with partners at local, state and national levels to ensure these decision-makers have the most accurate, reliable and trustworthy weather, water and climate information. NWS Austin/San Antonio accomplishes this task not only through a commitment to science and technology, but by decades of building trust through deep relationships with key decision-makers.

The last year and a half has brought many challenges to our emergency management, public safety, and health officials, with the COVID-19 pandemic being arguably the greatest. Early in the pandemic it was recognized that weather would impact both logistical and safety efforts at outdoor COVID testing clinics, and eventually in 2021 at mass outdoor vaccination sites. Beginning in March of 2020 NWS Austin/San Antonio forecasters began providing daily weather briefings to the Bexar County Office of Emergency Management, City of San Antonio Office of Emergency Management, Travis County Office of Emergency Management, and City of Austin Office of Homeland Security and Emergency Management. This support expanded to other jurisdictions across South-Central Texas through 2020 and into 2021.

Customized weather briefings were emailed to emergency management partners daily by forecasters, addressing specific wind, lightning, and temperature thresholds that would begin causing impacts at outdoor testing and vaccination clinics. The weather briefings were created in a format that could easily be inserted into the core partner's daily Incident Action Plans, and also were dynamic, containing QR codes that a partner could scan to get the very latest forecast and current conditions.

(Images: Drive through vaccination site at the Alamodome in San Antonio. During certain weather conditions mitigative actions were required to keep health responders and the public safe and to prevent damage to tents and other temporary structures).

These impact-based forecasts aided in advanced planning to protect deployed resources to outdoor testing and vaccination sites, such as camera systems, light towers, and tents which could be damaged if not secured. Advanced notifications of high heat, cold, ice, lightning, and high winds also enhanced personnel and public protection.

As the days of the pandemic turned into weeks and months, a variety of weather events impacted our core partner’s response to the pandemic. This included severe storms, high winds, lightning, floods, heat, tropical systems, and even the historic winter storm this past February. Ahead of and during these rapidly evolving weather events forecasters also provided forecasts to core partners via phone calls, virtual conference call briefings, and NWSChat, which is an internal weather chat room between the NWS, emergency management partners, and the media. The impact-based forecasts provided in these situations allowed core partners to make better informed decisions in the operational movement of both personnel and equipment.

“The National Weather Service personnel in New Braunfels are one of our most valued partners for all operations. Their professionalism, commitment to providing rapidly actionable weather products, and subject-matter expertise enables us to better protect responders, the public, and our community”, said Mark Chadwick, Emergency Management Specialist for the Bexar County Office of Emergency Management. NWS Austin/San Antonio (New Braunfels) provided 442 consecutive days of weather support to aid decision making of core partners during the pandemic. Weekly briefings continue for some partners.

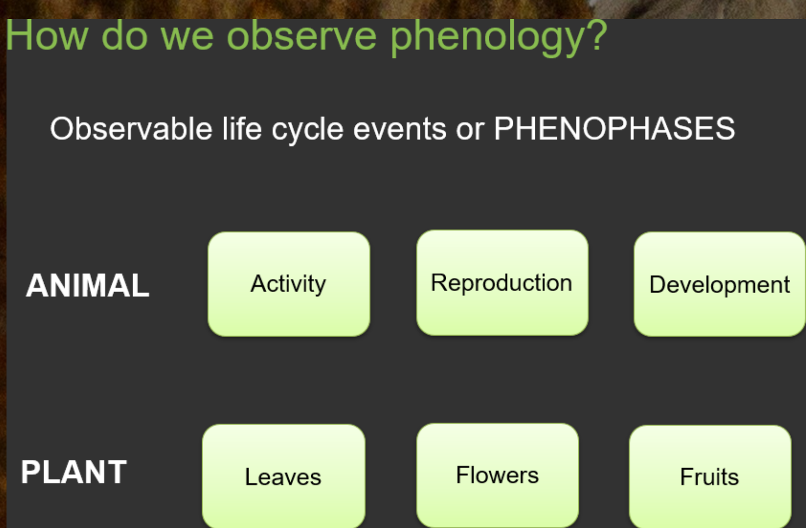
NWS Austin/San Antonio forecasters stand committed to serving our emergency management partners through the remainder of the pandemic and any future all-hazards responses.

Phenology – Nature's Calendar

By: Jon W. Zeitler, Science and Operations Officer

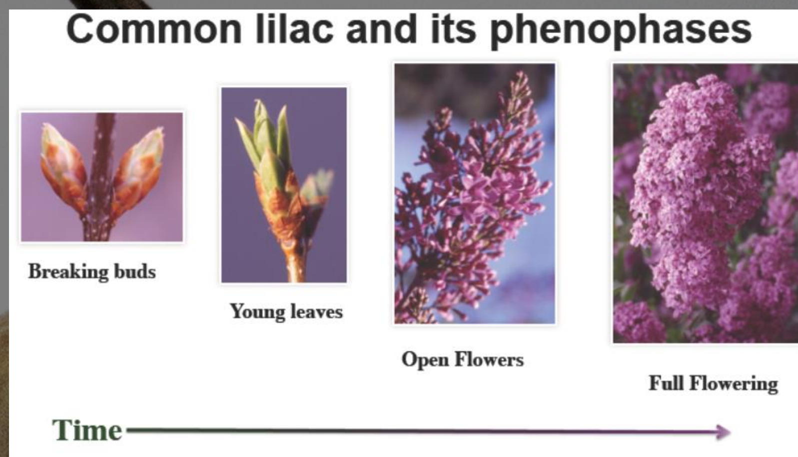
While it makes sense that plants and animals are strongly influenced by short-term weather and long-term climate, the reality is more dramatic and intricate. Phenology is the study of recurring plant and animal life cycle stages, and how those stages relate to weather, climate, and changes in daylight. Another way to look at it is phenology is nature's calendar. Just as we use calendars to keep track of time as well as plan and anticipate regularly recurring events, plants and animals do the same in their life cycles. But nature itself is the calendar.

The figure below shows the basic life cycles of plants and animals broken down into observable events, called phenophases. I grew up in Minnesota, and one of the phenophases people looked for was the first sighting of a robin in the late winter – a sure sign spring would be coming soon. In fact, in addition to the life cycle events shown below, hibernation and seasonal migration are also examples of how birds and animals react to changes in temperature, precipitation, or both.



As you might imagine, knowledge of phenology is very important to farmers, ranchers, fishers, and hunters. By tracking events and their relation to weather, climate, and the length of day, one can make good decisions for planting, fertilizing, harvesting, and taking care of livestock. Even for your own backyard, knowing the best conditions for planting and taking care of plants can make a big difference. Plants do the same by nature – when to bud, develop flowers, etc., while birds and other animals know when to look for flowers, fruits, and nuts for food.

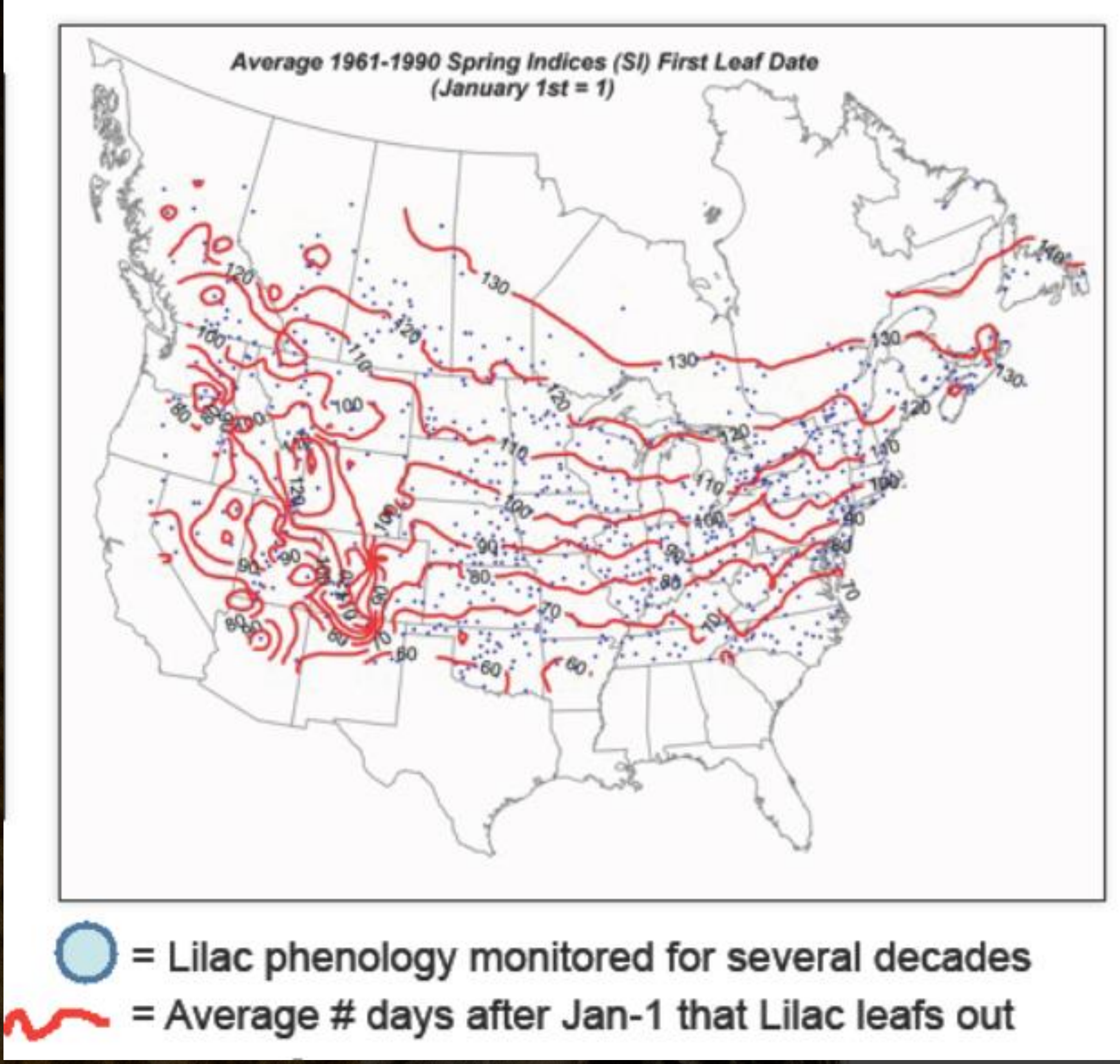
The ways we can measure phenology are through our own sight, sound, touch, smell, and sometimes even our own general health. Examples include: 1) seeing the first tree buds or flowers appear, 2) hearing the first call of a particular migrating bird, 3) smelling or touching when flowers, fruits, or vegetables are ripe or at full bloom, and 4) when our allergies act up due to the pollen released in the spring.



Source: National Phenology Network

The figure above shows phenophases of the common lilac. These occur each year, and the dates are tracked by a network of people around the country. This allows researchers to relate the date changes (i.e., lilac blooming earlier than 30 years ago) to changes in temperature and rainfall, as those affect the plant's development. It's one of the ways we can track changes in climate without using direct measurements of temperature or rainfall.

The next figure shows a map of the average first leaf dates across the United States.



Source: National Phenology Network

Sometimes, phenology can even impact tourism. For example, the cherry blossoms bloom in Washington, DC each spring. But the peak bloom period is not very long, so knowing the average dates, and how the weather in the winter leading up to those typical dates may affect the bloom, can help you plan in advance for the best time to make the trip. The National Park Service helps keep track of this as shown to the right:

If your group would like a more in-depth presentation on phenology, please contact me at: jon.zeitler@noaa.gov. We can do a virtual presentation via Zoom, Google Meet, or similar software, or hopefully if the COVID situation keeps improving, a live presentation at your group's meeting this coming fall/winter.

You can also find more information on phenology at these sources:

USA National Phenology Network

Dr. Pam Knox's Climate and Agriculture in the Southeast Blog

Texas A&M Natural Resources Institute

Texas Master Gardeners

Texas Master Naturalists

Employee Awards

Information Technology Officer John Sullivan on the New Braunfels 88D Radar tower

Meteorologist-in-Charge Joe Arellano [right] presenting Senior Forecaster Jason Runyen [left] with the 2020 NWS National Cline Award

NWS Austin/San Antonio's Information Technology Officer John Sullivan was awarded the 2020 NWS Southern Regional Cline Award for Support Services! John was presented this prestigious award for the high level of information technology support services provided to the several operational programs, services, and staff at NWS Austin/San Antonio as well as throughout the Southern Region of the NWS.

NWS Austin/San Antonio's Senior Forecaster Jason Runyen was awarded both the 2020 NWS Southern Regional Cline Award and the 2020 NWS National Cline Award for Program Management! Jason was presented with these prestigious awards for initiative, innovation, and creativity displayed in the Impact Based Decision Support Services Program and technical proficiency and teamwork in the Tropical Program.

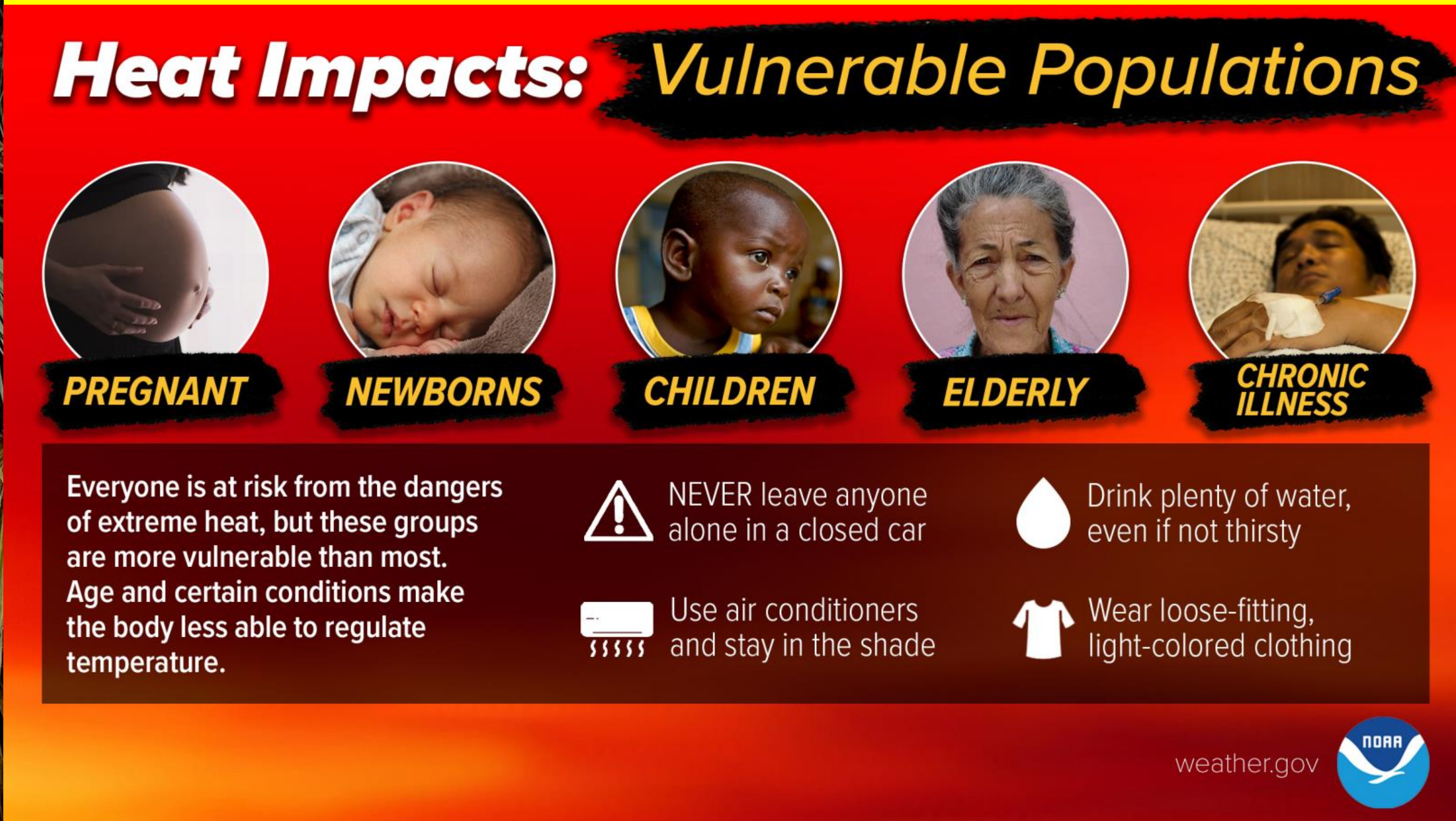
The Isaac M. Cline Award recognizes operational excellence of line and program staff employees in the delivery of products and services supporting and enhancing the achievement of NWS strategic and operating plans.

The awards are named in honor of Isaac M. Cline, one of the most recognized employees in weather service history. Mr. Cline made numerous contributions to the mission of the Weather Bureau. Most noteworthy of his accomplishments were the actions he took during the Galveston hurricane of 1900, the deadliest weather event in U.S. history. Isaac Cline's acute understanding of weather conditions, and his heroic forecasts and hurricane warnings saved several thousand lives.

The Isaac Cline Award has 3 levels: Local, Regional, and National.

Congratulations to both John and Jason on achieving these regional and national awards!

It's been a cooler than usual summer thus far, but the peak of our summer heat is typically during the first half of August. Here's some reminders and recommended heat safety practices:



Look Before You Lock!

Hot Cars and Children Safety

38 KIDS

Die each year by being left in an unattended vehicle

88%

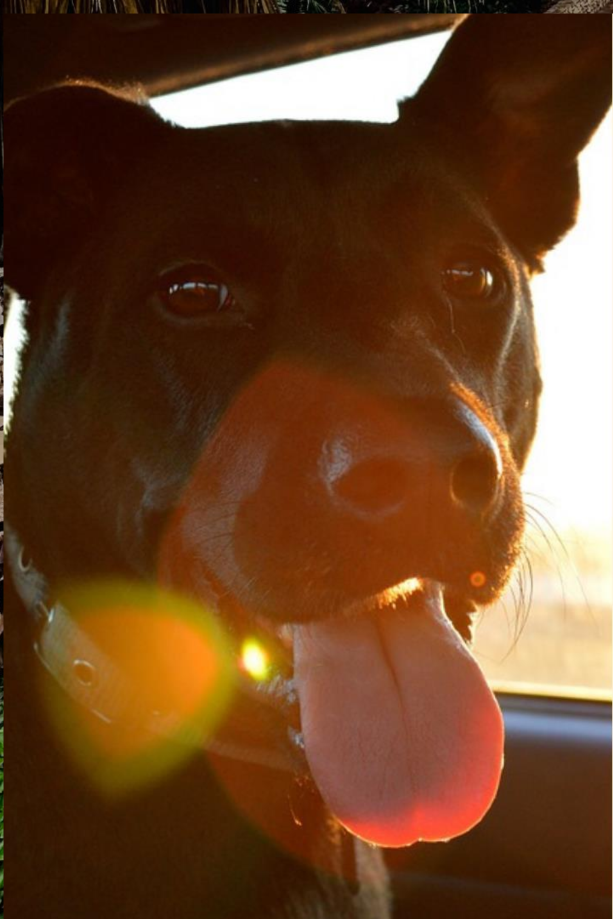
Are ages of 3 & Under

54%

Were forgotten by caregiver

100% of These Deaths Can Be Avoided!

Statistics courtesy of noheatstroke.org



PET HEAT SAFETY

SAVE A PET'S LIFE IN A HOT CAR

Animals can die of heatstroke within 15 minutes.

Cracking the windows does not help, the inside still gets dangerously hot.

During hot weather, keep your pets at home.

If you see a pet in an unattended vehicle, do not leave until the problem has been resolved!

weather.gov/heat

National Weather Service Austin/San Antonio

2090 Airport Rd
New Braunfels, TX, 78130
(830) 629-0130

weather.gov/ewx

Find us on social media! (images are links)

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