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Randy Gray began his weather experience in 1974 as a weather observer in the Air Force. After training at Chanute AFB, his first assignment was at Air Force Global Weather Central at Offutt AFB, Omaha, Nebraska. He admits that it took a while to adapt to working in a large data center, but once he did, his appreciation for data collection, and forecast development and guidance grew. One of the highlights of the time there was working in proximity with Robert Miller, who pioneered tornado and severe storm forecasting.

In 1976, Randy was assigned to Camp Humphreys, South Korea, providing Army Aviation support. Rather than accept an early discharge, he extended his tour by five months, and came back to the Detroit area, his original home, in May 1978.

Randy was hired as a Meteorological Technician at the Weather Service Office (WSO) in Ann Arbor, Michigan in 1980. At the WSO, he was exposed to a number of National Weather Service programs. Randy really enjoyed working in data quality and applications, and working with the service hydrologist and the cooperative network program manager. He was also able to train at the nearby WSO at Detroit Metro Airport in surface observations, pilot briefings and network radar operations.

In 1982, Randy was selected to fill a vacancy at the WSO in Pueblo, Colorado after Congress decided to re-staff part-time offices which had been slated to close under the Reagan era budget cuts. Even though Cooperative Observer Program (COOP) work was to be delayed, working with that program was still in his vision. In Pueblo, Randy worked as the Automation of Field Operations and Services (AFOS) Focal Point for the office, and as the secondary climate focal point.

When NWS modernized in the mid 90’s, Randy became the COOP Program Focal Point, and eventually became the Observing Program Leader in 2007. Randy’s passion since that time has been the COOP program, data quality and customer support on the public service desk. The first MIC at the NWS Pueblo was Bill Fortune, with whom he worked when Bill was a forecaster at the Air Force Global Weather Center.

In retirement, Randy plans to work part-time, to continue to reconnect with family in Ohio and Michigan, to cook and work around the house, possibly take some classes and to develop a normal sleep pattern.
NWS Pueblo began seeing issues that were klystron (the heart of the radar system) related in October, 2018. We discussed at length how to proceed at that time with the Radar Operations Center (ROC) and the Central Region Headquarters Regional Maintenance Specialist (CHR RMS). We were able to peak the radar power up to an acceptable level by adjusting the klystron cavities. It was not recommended by the ROC to replace the klystron at that time.

The HVAC system, which keeps the radar cool, had issues this Summer due to the hot temperatures at the radar site. This certainly didn’t help a klystron that had already been showing its age.

Then in August, we saw the peak power dropping down to concerning levels. We were not able to adjust the power up through normal alignments and we had to go to the end of life settings. This signaled us to start planning the klystron replacement. We were able to get through a few weeks of weather that threatened area burn scars, but it began dropping at a rate that was not sustainable. We had made the all of the end of life adjustments that are safe to the rest of the transmitter.

So we proceeded with ordering all of the parts needed for the klystron replacement and began looking for the most suitable day to do the replacement. Dutch Bravo, Everett Briggs, and Chris Price were the techs on hand for the replacement. With all three of us working together, replacing the klystron went smoothly. It was a lot of hard work, but it went well.

After the install we brought the radar up and it transmitted fine, so we began performing a transmitter alignment. Everything was going well until we started trying to make adjustments to the long pulse. In long pulse we started getting arcing which compromised a cable. This meant we weren’t able to transmit in short pulse either. We traced cables, but there were no visible signs of arcing. Then we noticed that when we tried to bring the radar up, we could hear an arc. Then we positioned ourselves in different areas, turned off the lights and transmitted. We were able to see where the arc was coming from. Everett was able to tape up the arcing cable so the system would operate until a new cable came in.

Thanks to Dutch, Everett and Chris for their hard work in getting this installation completed. The klystron is working great now.
Once again this year, NWS Pueblo participated in a school supply drive. Joining NWS Pueblo were the offices in Goodland and Boulder! Many donations were brought in, including paper, pencils, pens, glue and much more. Donations were distributed to those in need. Here in Pueblo, we donated our box of supplies to Sister Nancy at Los Pobres. Los Pobres provides aid to more than 5000 families of migrant workers in the Pueblo area.

Central Region Headquarters Staff Visits...

By Jennifer Stark

The National Weather Service office in Pueblo had the pleasure of hosting several guests from our regional headquarters office in Kansas City over the Summer.

In June, the Deputy Regional Director, Mr. Ken Harding visited the office. Ken shared information and answered questions about the budget, hiring process, scheduling principles, and the goals of the Central Region Weather Ready Nation Roadmap. In return, we were able to share the unique challenges of southeast Colorado weather with Ken.

In August, we had several visitors from Central Region Headquarters, including the Scientific Services Division Chief, an Emergency Response Specialist, and a Hydrology Specialist from the Integrated Services Division. Ahead of the visit, we completed a Service, Science and Observations Checklist which details our progress on several program areas. We also provided detailed information on our outreach and public preparedness efforts on several burn scars in southeast Colorado, a review of the historic March 2019 “bomb cyclone” and other local research efforts.

This was a great opportunity for the NWS staff in Pueblo to put faces to the names of regional headquarters staff whom we normally communicate with through email and phone calls. The staff in Pueblo was able to showcase the outstanding science and services they provide day in and day out for communities all across southeast and south central Colorado. Our guests from Kansas City enjoyed the green chile and hospitality of several local restaurants!
The monsoon of 2019 brought with it an active season on the burn scars around southeast and south-central Colorado. Three burn scars in particular, the Spring Fire, the Junkins Fire, and the Hayden Pass Fire, are fresh and large enough to merit constant vigilance. The Spring Fire is the largest of these at 108,000 acres in Costilla and Huerfano Counties. The Junkins Fire burn scar (16,000 acres) primarily in Custer County and Hayden Pass Fire burn scar (18,000 acres) primarily in Fremont County are smaller but retain the potential for loss of life and property damage from large events.

Frequent pop-up storms during the Spring and Summer caused NWS Pueblo to issue 76 flash flood warnings in the County Warning Area. Thirty-five of those warnings (46%) were issued for rainfall on the three burn scars. This is despite the fact that the three burn scars only make up 0.06% of the county warning area. The Spring Fire drew most of the attention with 27 warnings. Eight warnings were issued for the Junkins, while the Hayden Pass scar has had a quiet year with only one warning.

July 22 was a particularly active day on the Spring Fire burn scar. Precipitation gages installed by the Colorado Department of Water Resources recorded heavy rainfall directly on the burn scar. One gage on Middle Creek, a few miles west of La Veta, reported 0.95” of rain in just 15 minutes. The storm total was just under 1.7” in just over 2 hours. Reports from Emergency Manager Larry Sanders indicated several creeks flowing from the burn scar over-topped roads, washed out culverts, and isolated bridges upstream from La Veta. County Road 442 had been badly damaged in earlier storms but was almost completely washed out over a mile.

Residents in the area were temporarily isolated until washouts could be repaired and damaged roads investigated for safety. A Code Red alert was issued for the residents of La Veta. Fortunately, the flood was insufficient to impact the town. However, the highway 12 bridge over Middle Creek was isolated by flood-waters inundating the northern approach.

The event was a first opportunity for the NWS Pueblo and the Emergency Managers to use the data from the state Department of Water Resources gages. Those gages report precipitation, stream stage, and stream velocity at frequencies of every 3 minutes during an event. The gages proved to be a useful addition to the NWS Pueblo warning operations.
June was a roller coaster month for weather across Colorado, with a few warm and dry spells followed by unseasonably cold and strong weather systems that brought rain, mountain snow and severe storms across the area. Accumulating snowfall was recorded across the high peaks on June 22nd, the first full day of Summer! High pressure aloft developed across the region bringing a period of summer warmth for the last week of the month.

July of 2019 saw temperatures rise to more "summer-like" conditions across most of south-central and southeast Colorado. In addition, bouts of monsoonal moisture brought bursts of heavy rainfall along with a few rounds of severe thunderstorms throughout the month.

August of 2019 was generally hot and dry across south-central and southeast Colorado, as upper level high pressure persisted across the Desert Southwest and Four Corners region limiting the amount of monsoonal moisture moving into the region.

For the Summer of 2019 as a whole, generally above normal temperatures and below normal precipitation were experienced across south-central and southeast Colorado, except for pockets of slightly below normal temperatures and above normal precipitation.

The average temperature for the Summer of 2019 in Alamosa was 62.9 °F, which is 0.6°F above normal. Alamosa recorded 1.36“ of precipitation through the Summer which is 1.37” below normal making the Summer of 2019 the 7th driest on record. This remains behind the driest Summer on record (1980) when only 0.75” of precipitation fell.

The average temperature for the Summer of 2019 in Colorado Springs was 70.2°F. This is 1.9°F above normal making the Summer of 2019 the 13th warmest Summer on record remaining well behind the Summer of 2012, when the average temperature was 73.3°F. Colorado Springs recorded 4.06” of precipitation. This is 4.60” below normal and makes the Summer of 2019 the 13th driest Summer on record. But this remains well above the driest Summer (1939) when only 2.47” of precipitation fell.

The average temperature for the Summer of 2019 in Pueblo was 75.2°F. This is 2.1°F above normal and makes the Summer of 2019 the 20th warmest Summer on record. This remains well below the warmest Summer on record (1970) when the average temperature was 77.7°F. Pueblo recorded 6.32” of precipitation, which is 0.58” above normal.
So what can we expect this Winter across southern Colorado? The answer can be difficult to predict, but there are several factors that we can be certain of. Temperatures look to remain warmer than normal through the winter months. This is due to a combination of factors; expected El Nino-Southern Oscillation (ENSO) conditions, projected storm path, and overall climate trends.

Expected precipitation trends are a bit tougher. The Climate Prediction Center believes the first half of the Winter will see wetter than normal conditions into December, with equal chances of above or below normal condition into the Spring months. I agree with the wetter than normal conditions through December due to a few reasons. First is ENSO. Current model forecasts have temperature anomalies in the NINO3.4 region of the Central Pacific remaining neutral, but on the warmer side with anomalies roughly around 0.3°C through the Spring months. The only outlier model is the NASA model which has anomalies on the negative side of neutral. With the consensus on the warmer side, this should lead to a more favorable storm track across the Rockies.

There are two other factors that favor above normal precipitation. The Madden Julian Oscillation (MJO) and Equatorial Rossby Waves (ERs). The MJO is an oscillation that moves around the globe every 40 to 60 days, and can promote periods of increased precipitation across the Western U.S. Models have two active periods, mid to late October and again mid to late December. If the MJO can remain active into the Spring, that would put another active period in February.
Equatorial Rossby waves have been the main player from this past Spring through early September. Did you notice how humid it has been? This can be attributed to ERs coming off the African coast, moving into the Gulf of Mexico, allowing moisture to move northward into Colorado. Model projections have this continuing into December, especially from late October to mid December.

The combination of ENSO neutral (but on the warmer side), MJO and ERs all favor wetter than normal conditions across Colorado. There is one other oscillation that we need to keep an eye on for this Winter. Negative Arctic Oscillation (AO) periods tend to favor enhanced periods of precipitation across mountain areas of Colorado. The AO is very hard to predict, with only about 2 weeks notice. This is something we will monitor, especially in the Spring months.

The storm track this Winter will also be key. La Nina tends to favor a more northern storm track, with drier, windier conditions across the region. El Nino on the other hand favors a more southern storm track (Albuquerque low set up) which really favors heavier snowfall. Most storms this winter will likely be in between, favoring more snowfall across the area.

So there you have it! Warmer than normal, wetter than normal with more uncertainty into the Spring, and likely less windy than normal.
This upcoming Winter season many weather forecast offices across the country, including our own, will have a new tool in their toolbox to alert customers and partners of a high impact weather phenomena: Snow Squall Warnings. Much like with Severe Thunderstorm, Tornado, and Flash Flood Warnings, when we feel conditions will become life threatening with an area of intense snowfall and possible white-out conditions we will have the discretion to issue Snow Squall Warnings for a localized geographic area.

Snow squalls act much like a blizzard, with strong winds, blowing snow, and near zero visibility. However, unlike blizzards, snow squalls occur quickly and may only last for 20-30 minutes, affecting a small portion of an area. The greatest impacts are experienced by vehicle traffic when conditions are much like “driving with a pillow case over your head”. You can be driving with clear skies and within a matter of seconds, hit a wall of snow. This reduction in visibility can cause chain-reaction accidents resulting in injuries and deaths.

This new weather warning will use the current Alert and Early Warning notification system; NOAA Weather Radio, CDOT Virtual Message Signs, weather.gov website, TV media scrolls, and private sector partners and vendors.

If you’re interested in learning more about Snow Squall Warnings and safety please use the following link: https://www.weather.gov/safety/winter-snow-squall

Remain vigilant to quickly changing weather conditions, southern Colorado. Winter is indeed coming.
The National Weather Service (NWS) is transitioning towards more involvement in decision support, more interaction with our customers, and concentration high impact events. One aspect of this transition is the use of a new database as a starting point for our forecasts. This past June, the NWS at Pueblo, along with other offices across the Central Region, started using the National Blend of Models (NBM) as the initial forecast fields. The NBM provides a starting point for over 20 parameters including some fire weather and aviation parameters. The NBM domain includes the Continental United States, Alaska, Hawaii, and Puerto Rico. It utilizes output from over 150 models and ensemble members to create forecasts out to 10 days. The output from each model is adjusted for each point in the forecast grid to account for model biases and local effects. The output from these models are combined to create averaged fields.

Using the NBM has several advantages for the NWS. First, the unified starting point promotes better consistency among offices. The NWS Central Region offices are using the same grids at the start of the forecast process, and any changes are collaborated between offices and national centers. Second, the NBM uses data from many more models than what is available at a local office. The local NWS office only has a few models available because of bandwidth issues. The greater number of reliable models used in the averaging process increases the accuracy of the NWS forecast. Third, the large number of models allow for calculating probabilistic grids. For example, in the near future the NBM will be producing the probability of exceedance for precipitation and snowfall amounts along with the average. These probabilities will provide guidance for the chances of high impact events, such as heavy snow, heavy rain, extreme cold and extreme heat.

Finally, the NBM grids are often a great starting point for quiet weather days. This allows forecasters to spend more time on potentially higher impact events in the forecast. It also frees up time for the forecasters to do other projects. These projects include doing local research, doing training, and reaching out to our customers. This helps meet the goals of the NWS Roadmap for the future, which includes interacting more with our customers and having a better trained workforce.

The NBM will undergo an upgrade sometime this Fall or Winter. This upgrade will include better methodology to map the model outputs to the NBM grid points, increasing the accuracy of the initial forecast. It will also include the first probabilistic fields which can provide insight for the probability of significant events. There are plans to further improve the NBM and for it to provide more probabilistic guidance.
Watch....Warning....Advisory

WHATS THE DIFFERENCE???

How many times have you seen the TV crawler with “National Weather Service has issued a Watch/Warning/Advisory” and wondered “What’s the difference?”

The difference determines the risk to life and property of the citizens of the United States, and more specifically, those folks that are in the hazard area that is defined.

The National Weather Service issues a variety of products to keep our customers in-formed of unusual, inconvenient and hazardous weather conditions. A multi-tier concept is employed to accomplish this task with Outlooks, Watches, Warnings and Advisories to point out specific conditions.

Definitions:

**Outlook:** Used to give considerable lead time that a hazardous event may develop.

**Watch:** Issued when the risk of a hazardous weather or hydrologic event has increased significantly, but its occurrence, location, and/or timing is still uncertain. It is intended to provide enough lead time so those who need to set their plans in motion can do so.

**Warning:** Issued when a hazardous event is occurring or has a very high probability of occurrence. Warnings advise of a threat to life or property.

**Advisory:** Issued when a hazardous event is occurring or has a very high probability of occurrence. Advisories describe events that cause significant inconvenience.

Here at NWS Pueblo.. we tweet and we post, using Twitter and Facebook as additional sources to reach the citizens that rely on us.