

# WRITERS OF THE STORM

WFO PUEBLO / SOUTHEAST COLORADO NEWS

VOLUME 14

JULY 2020

**In this issue:**

<b>New Meteorologist in Charge: Ariel Cohen, Ph.D.</b>	<b>2</b>
<b>Welcome Michael Garberoglio!</b>	<b>3</b>
<b>Spring of 2020 Climate Review</b>	<b>3-4</b>
<b>Lightning Safety in Colorado</b>	<b>5-8</b>
<b>Snowpack Doesn't Always Mean Runoff</b>	<b>9</b>
<b>What Does it Mean?</b>	<b>10</b>

# **New Meteorologist in Charge:**

## **Ariel Cohen, Ph.D.**



Ariel E. Cohen, Ph.D., will be the new Meteorologist in Charge of the National Weather Service Forecast Office in Pueblo, CO starting in August 2020. He will be coming to the NWS Pueblo from his previous position of Science and Operations Officer (SOO) of NWS Miami, FL, where he has served as a leader for science integration into NWS operations.

Ariel's formal NWS operational experience extends back to 2007, when he started as a meteorologist at NWS Great Falls, MT. After working in Great Falls from 2007 to 2008, he worked as a meteorologist at the Tropical Analysis and Forecast Branch of the National Hurricane Center, where he played an important role in their transition to creating forecasts using the Graphical Forecast Editor. In 2009, he became a meteorologist at NWS Jackson, MS, where he earned a Regional Director's Award. From 2001 to 2017, Dr. Cohen was a forecaster at the Storm Prediction Center (SPC) in Norman, OK, before moving to Kansas to serve as the SOO of NWS Topeka from 2017 to 2019, prior to becoming the NWS Miami SOO.

Dr. Cohen received his Bachelor's Degree in Atmospheric Sciences from The Ohio State University (2006) and his Master's Degree and Doctorate in Meteorology from the University of Oklahoma (OU, 2008, 2015). His doctorate research investigated weak-instability, strong-vertical-wind-shear tornadic environment across the southeastern United States. He completed his Ph.D. while concurrently serving as forecaster at the SPC. At the SPC, Dr. Cohen was a Mesoscale Assistant/Fire Weather Forecaster from 2011 to 2017. He also completed numerous research projects addressing a multitude of convection-related topics, and was also responsible for developing outlook-verification tools.

In addition to his operational experience in the NWS, Ariel has also served in a variety of Adjunct Professor and Instructor roles at OU, University of Kansas, Florida International University, University of Louisiana at Monroe, and Ohio State. During his time at OU, he founded and led the collaborative Severe Thunderstorm Forecasting Video Lecture Series, containing 91 video lectures recorded from the graduate-level OU course that he collaboratively created and taught.

Additionally, Ariel has mentored several students in the NOAA Hollings and the Research Experiences for Undergraduates programs, along with the OU Senior Capstone program and the SPC Career Experience Program. In working with the Operational Proving Ground, he was served in a pivotal leadership role for the "Exploring the Collaborative Forecast Process for Severe Convective Weather" project while also collaboratively creating the "Forecasting Organized Severe Storms" video lecture series. Dr. Cohen has either lead or co-authored over 30 articles, including over 20 formal publications in the American Meteorological Society and National Weather Association journals. He has awarded NOAA Employee of the Month for March 2019. Ariel is looking forward to working with NWS partners and customers across the NWS Pueblo service area in doing our part to support a Weather-Ready Nation!

# **Welcome Michael Garberoglio!**

## **New Forecaster at NWS Pueblo**



My name is Michael Garberoglio, and I recently moved to Colorado from the Midwest. I was raised in Ohio and received my undergrad degree from Ohio University; completing my honors thesis with a focus on Antarctic climate change. While working on my undergraduate studies, I completed a brief internship at the National Center for Atmospheric Research (NCAR) Mesa Lab in Boulder, where I completely fell in love with the mountains, and spent a few months as a student volunteer at the NWS office in Cleveland. I then moved to central Iowa, where I completed my master's degree with a focus on boundary layer modeling.

I applied to the Weather Service in the fall of 2019, and quickly moved the NWS forecast office of Pueblo to the top of my list. Two days after successfully defending my thesis, I packed everything and moved to Colorado. Since arriving in Pueblo, I have begun working through my training program, and I'm excited for all the complexities that mountain forecasting has to offer! While I'm here, I want to learn as much as possible about the unique forecasting situations and expand my skillset. Just my first few weeks here, I've learned a lot about fire weather; which is probably one of the more interesting topics I've learned about. I'm also interested to see what winter will be like around Southern Colorado!

---

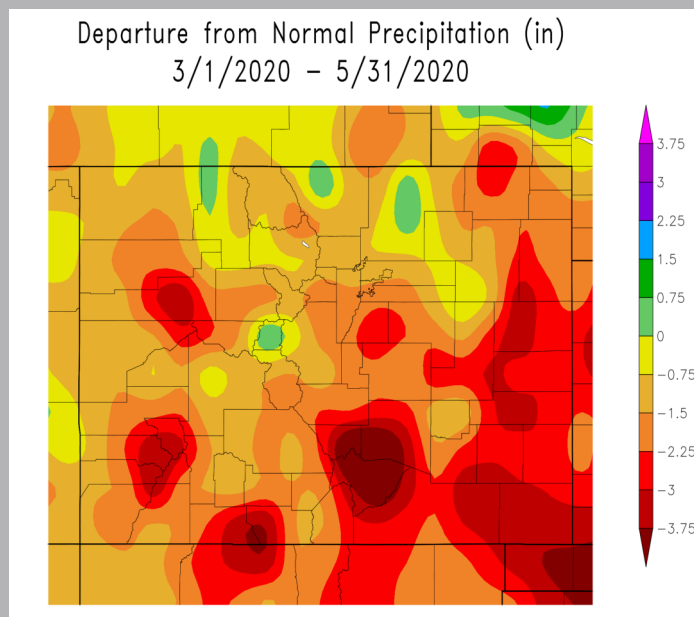
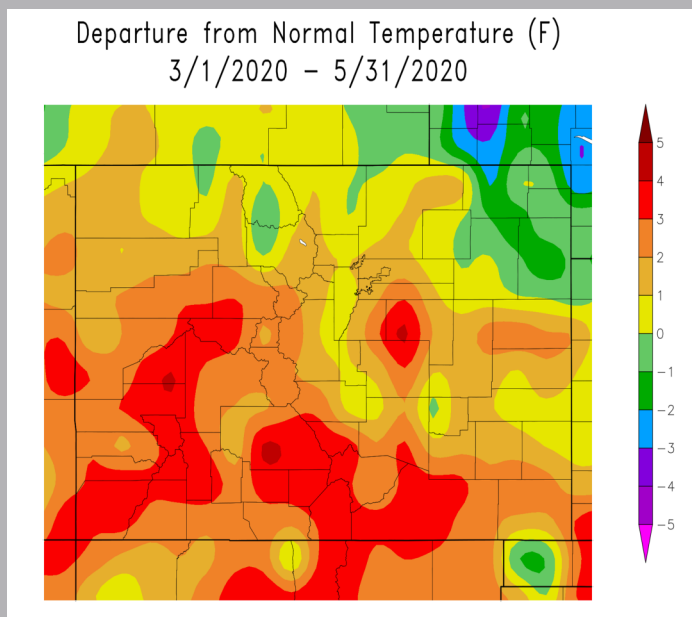
## *Spring of 2020 Climate Review*

By Mark Wankowski

Meteorological Spring 2020 (March, April and May) started out like a "lion" as a passing weather system brought rain and snow to portions of south-central and southeast Colorado through the first two days of March. A few more weather systems moved across the Rockies through the rest of the month, bringing scattered precipitation which favored western and northern portions of the state. March, however, ended like a "lamb" with warm and dry conditions recorded across all of south-central and southeast Colorado. April of 2020 brought periods of warm and dry conditions, as well as periods of cold and wet conditions to northern and eastern portions of Colorado through the first half of the month, while warm and mainly dry conditions prevailed across southwestern portions of the state. Warm and relatively dry conditions prevailed across the area through the rest of the month, with record breaking heat experienced over portions of south-central and southeast Colorado through the last week of April. May of 2020 was a roller coaster type of month across south-central and southeast Colorado, with periods of warm and dry conditions followed by periods of cool

and wet conditions, as a few weather systems moved across the state. However, for the month of May as a whole, above to well above normal temperatures and below to well below normal precipitation was experienced across most of south-central and southeast Colorado

For the Spring of 2020 as a whole, generally above to well above normal temperatures and below to well below normal precipitation were experienced across south-central and southeast Colorado. The following graphics indicate seasonal temperature and precipitation departures from normal across the state for the Spring of 2020.



The preliminary average temperature for the Spring of 2020 in Colorado Springs was 49.8°F. This is 2.6°F above normal, making the Spring of 2020, tied with the Spring of 1963, as the 10th warmest on record. This remains well behind the warmest Spring on record, 2012, when the average temperature was 53.4°F in Colorado Springs. Colorado Springs recorded 3.00 inches of precipitation through the Spring, which is 1.45 inches below normal. Colorado Springs recorded 17.1 inches of snow through the Spring, which is 3.4 inches above normal. This brings the 2019-2020 seasonal snowfall in Colorado Springs to 56.4 inches. This is 18.7 inches above normal to date, and makes the 2019-2020 snow season the 15th snowiest on record in Colorado Springs.

The preliminary average temperature for the Spring of 2020 in Pueblo was 54.0°F. This is 2.9°F above normal and makes the Spring of 2020, tied with the Spring of 1963, as the 10th warmest on record. This remains well behind the warmest Spring on record, 1981, when the average Spring temperature was 55.8°F in Pueblo. Pueblo recorded 0.70 inches of precipitation through the Spring. This is 3.14 inches below normal and makes the Spring of 2020 the 4th driest Spring on record. This remains behind the driest Spring, 2002, when only 0.42 inches of precipitation was recorded in Pueblo. Pueblo recorded 3.9 inches of snow through the Spring, which is 6.1 inches below normal. This brings the 2019-2020 seasonal snowfall in Pueblo to 36.2 inches. This is 4.4 inches above normal to date, and makes the 2019-2020 snow season the 32nd snowiest on record in Pueblo.

\*\*\*data for the Spring of 2020 in Alamosa is still being verified and not included at this time\*\*\*

# Lightning Safety in Colorado

By Stephen Hodanish, Senior Meteorologist and Lightning Safety Specialist

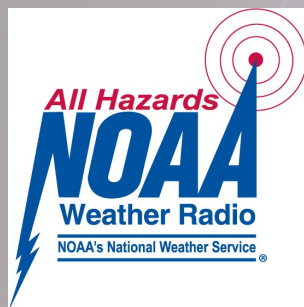
Lightning strikes the ground in the state of Colorado about a half million times each year. Unfortunately, 2 to 3 people in Colorado are struck and killed each year, with a dozen or so being injured. With many of us participating in outdoor activities, we need to learn how to reduce our risk from the lightning threat.

Lightning in Colorado is most common in the summer months, but can be a hazard throughout the year. And although nearly all lightning victims are struck outdoors, lightning can pose a threat to those indoors as well.

All thunderstorms produce potentially deadly and destructive lightning. Knowing lightning is in the forecast and being prepared to react to the first sound of thunder are the initial key safety steps. Outdoors is the most dangerous place to be during a thunderstorm. Each year, nearly all people in Colorado who were injured or killed by lightning were involved in an outdoor activity. They were struck while working outside, were at or participating at an outdoor sporting event, or were hiking, boating or fishing. Unfortunately, there is no place outside that is safe from lightning. The only safe place to be when lightning is occurring is either inside a substantial building, or an enclosed automobile.

Here are some important things to remember before venturing outdoors:

- An informed decision will help you avoid being in an area where lightning is expected to occur. Before heading out, get an updated forecast. Stay tuned to NOAA Weather Radio, check National Weather Service web sites, go to your favorite broadcast media, or access your favorite weather apps on your cell phone for the latest forecast.



- In Colorado, it is important to remember that thunderstorms typically develop in the mountains after 11 am. So it is best to plan your climbing or hiking trip so that you are coming down the mountain by late morning.
- If thunderstorms are in the forecast, consider planning an alternate indoor activity or, if you still plan to be outside, make a plan which will allow you to quickly get to a safe shelter if a storm should develop.

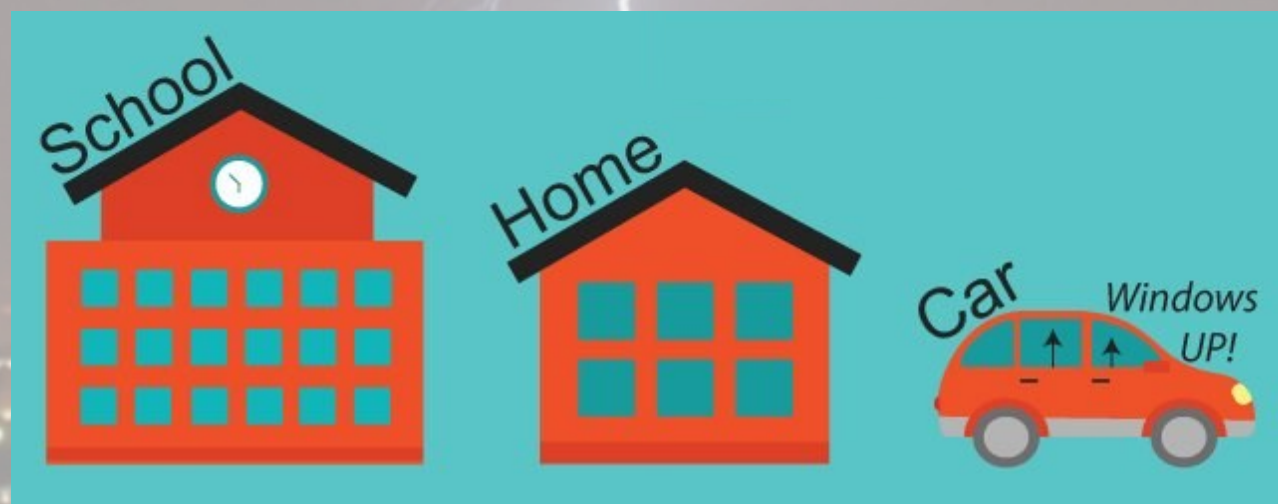
- Once you are outside, keep up-to-date on the weather via your smart phone or portable NOAA weather radio receiver. Check for updated forecasts. Determine if storms are near you by checking the latest radar imagery on your smart phone. There are now several smart phone apps you can purchase that show you real-time radar and lightning activity in your area. Do not forget to simply look around you to make sure storms are not developing in your vicinity.



*Lightning can be beautiful, but it also can be very deadly. Please seek shelter if you hear thunder or see lightning. Wait 30 minutes before going back outside.*

We will now discuss two outdoor scenarios. The first is what to do if you are outdoors and a safe location IS nearby...while the second scenario is what to do if you are outdoors and NO safe location is nearby.

If you are outside, such as at a park, a lake, or an outdoor sporting event, know where the nearest safe location can be accessed. A safe location is any substantial building (a substantial building is a structure which is fully enclosed and has electrical wiring and plumbing). Examples of substantial buildings include a business, a home, or a church. In addition, any enclosed hard-topped car or truck also offers excellent protection from a lightning strike. Once you hear thunder or see lightning, immediately stop what you are doing and quickly get to the safe shelter. Do not wait until the rain starts to seek safe shelter. Once inside a safe shelter, it is recommended you stay there for 30 minutes after the last rumble of thunder.



Past history has shown that most people who were outdoors and were injured or killed by lightning had access to a nearby safe shelter. Do not wait to seek safe shelter when lightning threatens. When you hear thunder or see lightning, it is important for you, and your family, to act quickly.

It is critically important to avoid shelters that are not safe from lightning, such as picnic shelters, bullpens, any tent (big or small), or any other small buildings that are open to the elements. **NEVER** get under a tree when a thunderstorm is nearby or overhead!!!

It is important that all sports leagues and other outdoor groups have a lightning response plan that is understood and consistently applied for the safety of the participants. Part of the plan would include a designated weather watcher at each outdoor event with the authority to postpone or cancel the event due to the threat of lightning. It is also important that people know where to seek safe shelter if a storm should threaten. Professional sporting leagues, including the NFL and MLB now delay games when lightning is in, or over, the area.

Our second scenario involves what you can do to reduce your chances of being injured or killed by lightning if no safe shelter is nearby. This situation typically occurs to people who are hiking or camping in the backcountry. Unfortunately, in this scenario, there is not much you can do to reduce your risk from being struck by lightning. The best thing to do is move away from tall isolated objects, such as trees. Stay away from wide open areas. Stay as low as possible with your feet close together if lightning is nearby. If you are with a group of people, spread out, that way if someone is struck by lightning, the others can offer first aid. If camping in the backcountry, set up your tent in a low area away from tall isolated trees.



Lightning is a powerful force of nature. It is important to realize there are no guaranteed safe shelters — rather only ways to reduce your chances of becoming a lightning strike victim.

Last year in the United States, lightning was reported to have killed 20 people. On average, over the past ten years (2010-2019 inclusive), lightning was responsible for 26 fatalities annually. Additionally, scores of people are injured by lightning. “Lightning survivors are often left with debilitating health effects, such as permanent nerve damage or brain injury,” says Dr. Mary Ann Cooper, Professor Emeritus at the University of Illinois’s department of emergency medicine.



To stress the importance of lightning safety for people of all ages, the Lightning Safety Alliance (link 1) created a cartoon character, Leon the Lightning Lion, who promotes the slogan “*When thunder roars, go indoors!*” This organization is one of several NOAA partners providing public information about lightning safety. Leon is featured in a new children’s coloring page that can be printed from NOAA’s lightning safety website.

The centerpiece of the National Weather Service’s lightning safety program (link 2), and offers “one-stop shopping” for lightning safety, including medical information on the treatment of lightning strike victims, and statistics and interesting facts about lightning. Visitors can download video presentations on everything from the causes of lightning to the medical consequences of being a lightning-strike victim.

Additional lightning information specifically for the State of Colorado is available at the Colorado Lightning Resource Page. The web link provided (link 3) shows the number of lightning casualties which occurred across Colorado since 1980, county-by-county lightning information, number of lightning flashes over the state per day, month, and year along with flash density maps and state-wide lightning climatology information. Lightning casualty case studies are also available.

**When Thunder Roars, Go Indoors!**

**STOP** all activities.

Seek shelter in a substantial building or hard-topped vehicle.

Wait 30 minutes after the storm to resume activities.

NOAA [www.lightningsafety.noaa.gov](http://www.lightningsafety.noaa.gov) NATIONAL WEATHER SERVICE

Link 1: <https://www.lightningsafetyalliance.org/>

Link 2: <https://www.weather.gov/safety/lightning>

Link 3: <https://www.weather.gov/pub/lightning>

# Snowpack Doesn't Always Mean Runoff!

By Tony Anderson (June, 2020)

Mountain snowpack is almost always a reliable predictor of spring and summer runoff. Not so in 2020! Snowpack accumulation in the Arkansas River and Rio Grande basins proceeded at a steady pace through the fall and winter and reached its peak just slightly earlier than usual. The snowpack in both basins peaked at about 90 to 98 percent of normal (Figures 1 and 2).

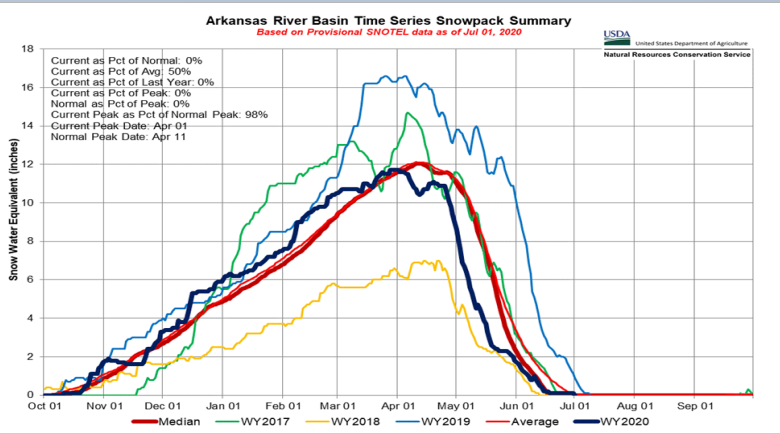


Figure 1. A graph of snowpack accumulation and depletion for the Arkansas River basin since October 1. This year's trace (in black) is compared to the last several years and to the mean and median traces (red). Note the early peak and the rapid depletion relative to the mean and median traces. The snow stopped early and began to melt very quickly.

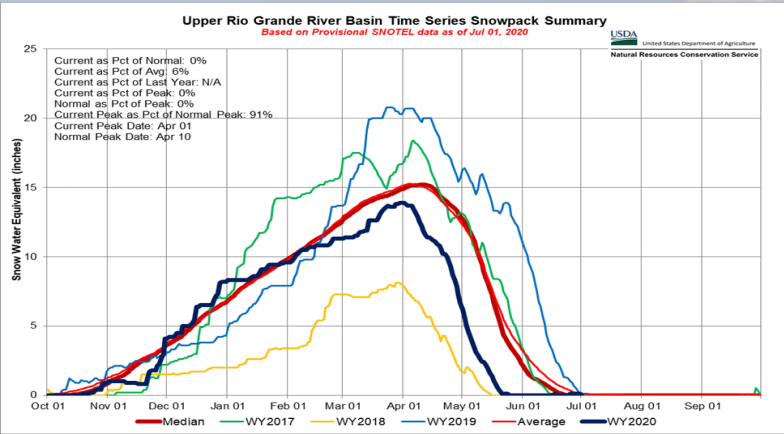


Figure 2. A graph of snowpack accumulation and depletion for the Rio Grande basin since October 1. This year's trace (in black) is compared to the last several years and to the mean and median traces (red). Note the early peak and the rapid depletion relative to the mean and median traces. The snow stopped early and began to melt very quickly.

In most years this would have indicated a healthy but slightly below normal runoff in the Spring and Summer. Twenty-twenty has not been most years. The Rio Grande basin runoff forecasts for the Spring and Summer have been consistently in the range of 50 to 65 percent of average on the mainstem rivers and 30-40 percent of average in the drier tributaries. The Arkansas River basin is slightly better off. Water supply forecasts on the mainstem are between 75 and 90 percent of average. Forecasts on the small tributaries are dramatically lower with values between 25 and 45 percent of average. (Figure 3.)

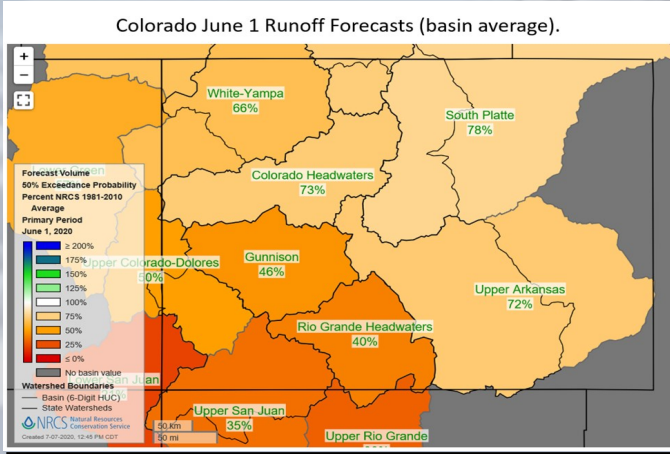


Figure 3. Forecast basin-averaged runoff values for each major basin in Colorado. Values reflect the average value of all runoff forecasts in the basin and may differ from more exact values in the text.

Why the disconnect between snow and water? The causes appear to have developed last summer and fall. Dry conditions started in July. Drought started in September and was firmly established before the snow began to fall. Soils and ground water in the mountains were depleted by the dry conditions. The snow that fell through the Winter and melted in the Spring first saturated the dry soils and filled the depleted ground water storage before it could produce runoff. That water, in wetter years would have filled rivers and streams. Warm and dry conditions in the Spring may also have accelerated the sublimation of the snowpack. Sublimation is the process by which snow transforms directly to water vapor without melting first. This process too would prevent the observed snowpack from melting and becoming runoff.

Colorado is a land of extremes and 2020 will represent another challenging year for many of the agricultural, commercial, and municipal users of south-central Colorado's rivers.

# Watch....Warning....Advisory

## WHATS THE DIFFERENCE???

WFO Pueblo  
3 Eaton way  
Pueblo, CO 81001

Weather.gov/pub  
Tel: 719-948-9429  
E-mail: nws.pueblo@noaa.gov



/NWSPueblo



@NWSPueblo



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 informed 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.

You can follow us either way, to stay in touch and stay informed, as the seasons, and weather, change.

**Stay safe, Stay dry and Stay informed.**

Stay up to date with your winter weather at:

**WEATHER.GOV/PUB**