COYOTE CRIER

National Weather Service—Tucson, AZ

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Fall/Winter 2017

2017-2018 Winter Outlook for Southeast Arizona

Glenn Lader, General Forecaster & Assistant WCM

As a very warm 2017 comes to a close with near to below normal precipitation for the year, we look ahead at what the upcoming winter will bring us. The most significant factor that goes into our seasonal forecasting for the winter months is El Niño or La Niña. El Niño is a warming of the equatorial Pacific Ocean temperatures while La Niña is a cooling of those waters with below normal temperatures. Heading into this winter we are at a weak La Niña which is defined by waters in this region being at least 0.5°C below normal. La Niña has a 65-75% chance of continuing through the winter.

What does a La Niña mean for our winter weather? The typical La Niña pattern, results in above normal temperatures and below normal precipitation as the jet stream and associated storm track stays over the northern tier of the U.S. While not every La Niña results in this scenario, the vast majority do for southeast Arizona, so from that standpoint alone, we'd be looking at much better chances of above normal temperatures and below normal precipitation.

The official forecast from the Climate Prediction Center which looks at La Nina and other factors including seasonal climate forecasting models is also predicting much better chances of above normal temperatures and below normal precipitation. Even if the winter does end up being warmer and drier than average in southeast Arizona, that doesn't mean we won't still be affected by a winter storm or two. Remember, those storms can still bring periods of

Graphical depiction of a typical Winter La Niña pattern.

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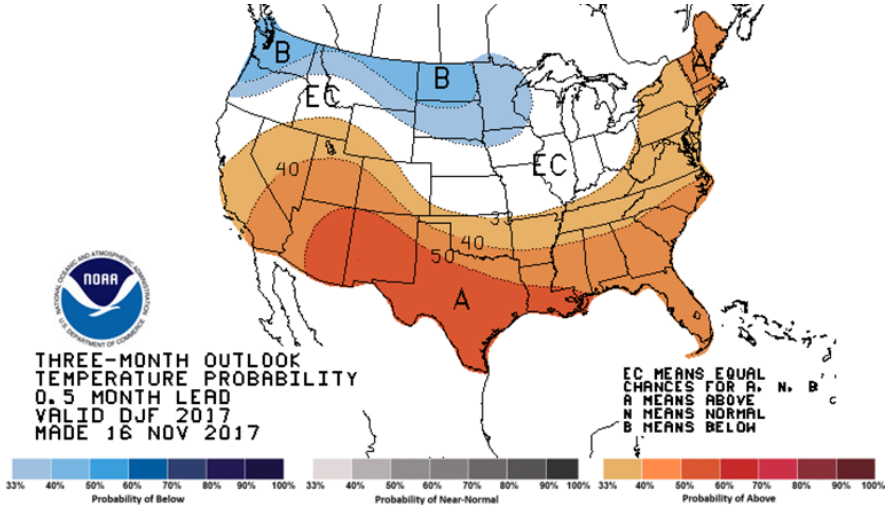
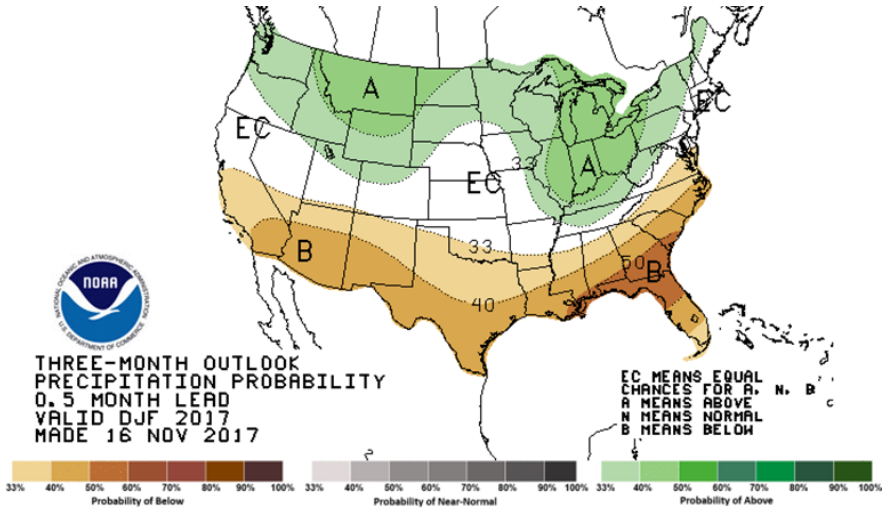
heavy precipitation, wind, and freezing temperatures that can cause hazards for motorists and other impacts. So, always keep on top of the latest forecast information so you don't get caught unprepared. In the longer term, impacts from a warm and dry winter include the possible development of drought and/or dangerous fire weather conditions, especially as spring approaches.





> **"...always keep on top of the latest forecast information so you don't get caught unprepared".**

Official forecasts from the Climate Prediction Center which depict better chances of above normal temperatures (top) and below normal precipitation (bottom).

Rainfall Reports

When reporting your rainfall amounts to the NWS, remember we only need reports that are considered significant. This generally means rainfall greater than or equal to a half inch (0.50") in less than an hour. Be sure that if your rainfall amount does exceed this threshold, to promptly report it so that it can be used in our decision making process for warnings and advisories. We no longer collect rainfall amounts on a monthly basis. Due to the advent of CoCoRaHS (Community Collaborative Rain, Hail and Snow) and RainLog, we no longer need you to send us your rainfall data. If you would like to report your rainfall amounts on a daily or monthly basis, we invite you to learn more about CoCoRaHS or RainLog by visiting their webpages.

CoCoRaHS—https://cocorahs.org/ or **RainLog**—https://rainlog.org/

A Friendly Reminder

Please help us keep in contact with you! If you think we may not have your current phone number, address, and/or e-mail address, the easiest way to update your information is to send an e-mail to: emily.french@noaa.gov.

Monsoon 2017 Wrap-Up

Jordan Pegram and Aaron Hardin, Meteorologist Interns, Storm Data Co-Focal Points

The 2017 Monsoon Season started off on the quiet side, as the main focus was the 105+ degree heat sweltering southeast Arizona for the first half of summer. A few strong wind gusts occurred in June in relation to thunderstorm outflows, including a 72 miles per hour gust at the Nogales airport on June 20th, but no damage was reported. July was a different story as the monsoon really kicked into high gear with many severe thunderstorms, flash flooding events, and even two weak landspout tornadoes. August also saw a few significant events before things tapered off heading into September. Below is a look at a few highlights from Monsoon 2017.

Landspout Tornado near Marana on July 14th

On the afternoon of July 14th, a broad area of thunderstorms developed along the Rim and progressed to the southwest toward Tucson and Phoenix. These storms produced strong winds, localized blowing dust, and isolated rainfall amounts of over three-quarters of an inch. One storm in particular showed signs of rotation, therefore our office issued its first tornado warning since June 30, 2015. This storm crossed I-10 and moved into the northern fringes of Marana where it went on to create a landspout tornado. This landspout was very brief and remained over open desert, so no damage was reported. We refer to it as a "landspout" because it forms through a different process than the tornadoes in other parts of the country. Here in the Southwest, our tornadoes often form when dust devils underneath the storm are stretched and pulled up to the base of the cloud by the inflow (air rising into the storm)—once that rotating column of air reaches the base of the cloud, it is classified as a landspout. These are typically

A landspout tornado forms near Marana on July 14, 2017. Photo courtesy of Audria Abney.

Monsoon 2017 Wrap-Up

weak and short-lived, like the one we saw this year.

Flash Flooding and Wind Damage Cause Problems across Southeast Arizona on July 19th

This particular event spanned several counties as strong thunderstorms progressed their way across our corner of the state throughout the afternoon of July 19th. Flooding was seen in Graham, Santa Cruz, and Pima Counties as these storms dropped anywhere from three-tenths of an inch to over two inches of rain. The mountains saw the highest totals, which caused issues for the surrounding burn scars from the wildfires earlier in the year. In particular, flash flooding from runoff originating from the Frye Fire burn scar on Mount Graham caused a pipeline to be washed away from Cluff Pond and several private outbuildings to be damaged.

This day was the first big event of the season for the Tucson metro as widespread flooding occurred throughout the city. Many streets were closed due to deep water flowing across the roadways causing them to become impassable. There was more than eight feet of water under the Stone Street underpass downtown as runoff from the surrounding streets poured into the low-lying area. These storms also produced some wind damage as a tree was uprooted outside of the McKale Center on the University of Arizona's campus. Unfortunately, there were two cars located underneath that tree that sustained damage.

A tree falls on top of 2 cars at the McKale Center at the U of A on July 19, 2017. Photo courtesy of KVOA.

Storm waters flood the Stone Street underpass in Tucson on July 19, 2017. Photo courtesy of KVOA.

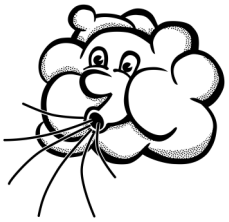
Flash Flooding in Nogales on July 20th

Storms producing heavy rainfall caused major problems around Nogales on the afternoon of July 20th. These slow-moving storms dropped close to one inch of rain in localized areas both in the city of Nogales and across the border in Nogales, Sonora. This runoff from Mexico combined with the rainfall occurring in the city resulted in a large and rapid flow of water to be pushed down the Nogales Wash. Many streets and bridges became flooded and were closed. The above-normal rise in water also inundated two homes in the area causing property damage. A Nogales Police Department vehicle became trapped in the rising water during a rescue attempt—no one was injured, but the vehicle did have to be towed out. This strong flow within the Nogales Wash caused damage to the structure of the wash that would ultimately lead to a month-long repair effort by local, state, and federal officials.

Severe Thunderstorm Rips through Tucson on August 10th

One of the most noteworthy severe events for parts of Tucson this summer was on August 10th as a severe thunderstorm developed and pushed through the city as most residents were leaving work/school that afternoon. Most of the damage was confined to a localized area on the east side of the metro, leading us to believe that a microburst was to blame. This quick, powerful downward rush of wind toppled over one-

hundred trees and downed power lines. A weather station near the hardest hit area recorded a maximum gust of 48 miles per hour, though there were more than likely stronger winds just to the east of this station where the damage occurred. The Woodridge Apartment complex sustained significant damage when a large tree fell onto one of the buildings. Over 7,000 residents were without power as a result of this storm with some remaining in the dark until the next afternoon.



A large tree falls on the Woodridge Apartment Complex in Tucson on August 10, 2017. Photo courtesy of KVOA.

60-Second Spotter Review

What you should report:

Tornado:	Either on the ground or a funnel cloud aloft
Heavy Rain:	**1/2" or more**, if it fell in less than an hour
Hail:	Generally **dime size or larger**
High Wind:	Estimated or measured **50 mph or greater**
Flooding:	**"Water where it shouldn't be",** closed roads due to flooding
Snow:	**1"** or more (2" or more if above 5000 ft.)
Visibility:	**Less than 1 mile** for any reason (fog, dust, snow)
Death/Injury:	**Any** weather-related reason
Damage:	**Any** weather-related reason (most often from wind)

Tucson Medical Center Recognized as 2017 Weather Ready Nation Ambassador of Excellence

Glenn Lader, General Forecaster & Assistant WCM

NOAA and the National Weather Service have developed a Weather Ready Nation (WRN) Ambassador program to help improve the nation's readiness, responsiveness, and overall resilience against extreme weather, water, and climate events. WRN Ambassador's commit to working with NOAA, the NWS and other Ambassadors to strengthen national resilience against extreme weather. WRN Ambassador's span across government, non-profits, academia, and private industry with the goal of making the nation more ready, responsive, and resilient against extreme environmental hazards.

NWS Tucson nominated Tucson Medical Center (TMC) for its work hosting its annual Be Safe Saturday event, which has provided a venue for dozens of organizations to help educate the public about how to stay safe for the past 13 years. The National Weather Service has participated in many of TMC's Be Safe Saturday events where it has been able to speak about weather safety to hundreds of families.

TMC Safety Manager Steven Barnes said TMC monitors weather conditions to ensure the safety of its HazMat team when wearing gear in the heat of the summer. The TMC Safety Department presents heat stress prevention classes to facilities personnel each June, followed by lightning safety in July. TMC is prepared for electrical outages during the monsoon storms with very extensive backup generator equipment for patient safety, Barnes noted, adding the hospital also has a fully equipped disaster command center and participates in local and statewide exercises every year.

"As you can imagine we are very dependent on accurate weather forecasts and prepare on a regular basis for all weather threats and situations," Barnes said, adding he was pleased with the recognition.

NWS Tucson now has over 30 local Weather Ready Nation Ambassadors across Southeast Arizona. The Ambassador initiative recognizes leaders in the community that help build community resilience in the face of extreme weather events – from promoting safety messages in outreach activities, to being a "weather-ready" role model. While not for individuals, any organization can become a Weather Ready Nation Ambassador. Schools, government agencies, private businesses, civic organizations, home owner associations and others can apply online at https://www.weather.gov/wrn/amb-tou If you have questions about the WRN Ambassador program, or the online application, please contact Ken Drozd at Kenneth.drozd@noaa.gov.

Warning Coordination Meteorologist Ken Drozd (left) presents Tucson Medical Center Safety Manager Steven Barnes (right) the 2017 Weather Ready Nation Ambassador of Excellence recognition.

The Catalina Snow Net

Carl Cerniglia, General Forecaster & Incident Meteorologist

When winter storms move across southern Arizona, one of our more significant forecast challenges pertains to snow forecasting. There are several details that need to be dealt with when forecasting a snow event; basically when, where, and how much. Of the three, the "when" is generally the least challenging overall. Although the "where" may only be considered as just locations on a map, with respect to snowfall the "where" is complicated by elevation. Snow amounts can vary significantly with changes in elevation, primarily due to changes in temperature. Then, due to a whole host of reasons, the "how much" is the most challenging of all as forecasting precipitation amounts is one of the most difficult weather parameters to predict. Thankfully for lighter rainfall amounts, an error in predicted rainfall, like 0.40 inches instead of 0.10 of an inch is usually somewhat difficult to notice and/or won't have a significant impact. However, for snow, which on average has a ratio of 1:10, (meaning one inch of rain generally results in 10 inches of snow), that error is magnified. In the previous example that would mean four inches of snow verses one inch, or a more significant and impactful difference.

Photo courtesy of CoCoRahs

The vast majority of the observations available to us (spotters or automated gauges) are located across lower elevations where most people live. However, the heaviest and most frequent snows occur across the higher elevations of the region's "Sky Islands" where snowfall data is very scarce. One of those mountain locations, Mt. Lemmon, has a fair sized year-round population and is a busy winter recreation area thanks to close proximity to Tucson, but unfortunately snowfall data has been limited during the past several years. As a result, the idea for a snow observation network was discussed and the Catalina Snow Net was born! After running a broadcast and social media recruitment campaign earlier this fall, a group of individuals and institutions volunteered to assist with measuring and reporting snowfall.

The Catalina Snow Net presently includes five observers in and around the Summerhaven area including near the Ski Valley Recreational area and the Mt. Lemmon Observatory at the very top of the mountain. A sixth observer is located in the Willow Canyon area on the eastern side of the mountain. These eager volunteers have been given rain gauges, snow boards and measuring stakes and have agreed to call with reports or receive calls from us whenever snow begins to accumulate across the mountain top. The information will be archived and also shared with our media partners for dissemination. We are very thankful to receive these snowfall observations as they will fill a great need in our forecast and warning program and help us improve our mountain snow forecasts into the future.

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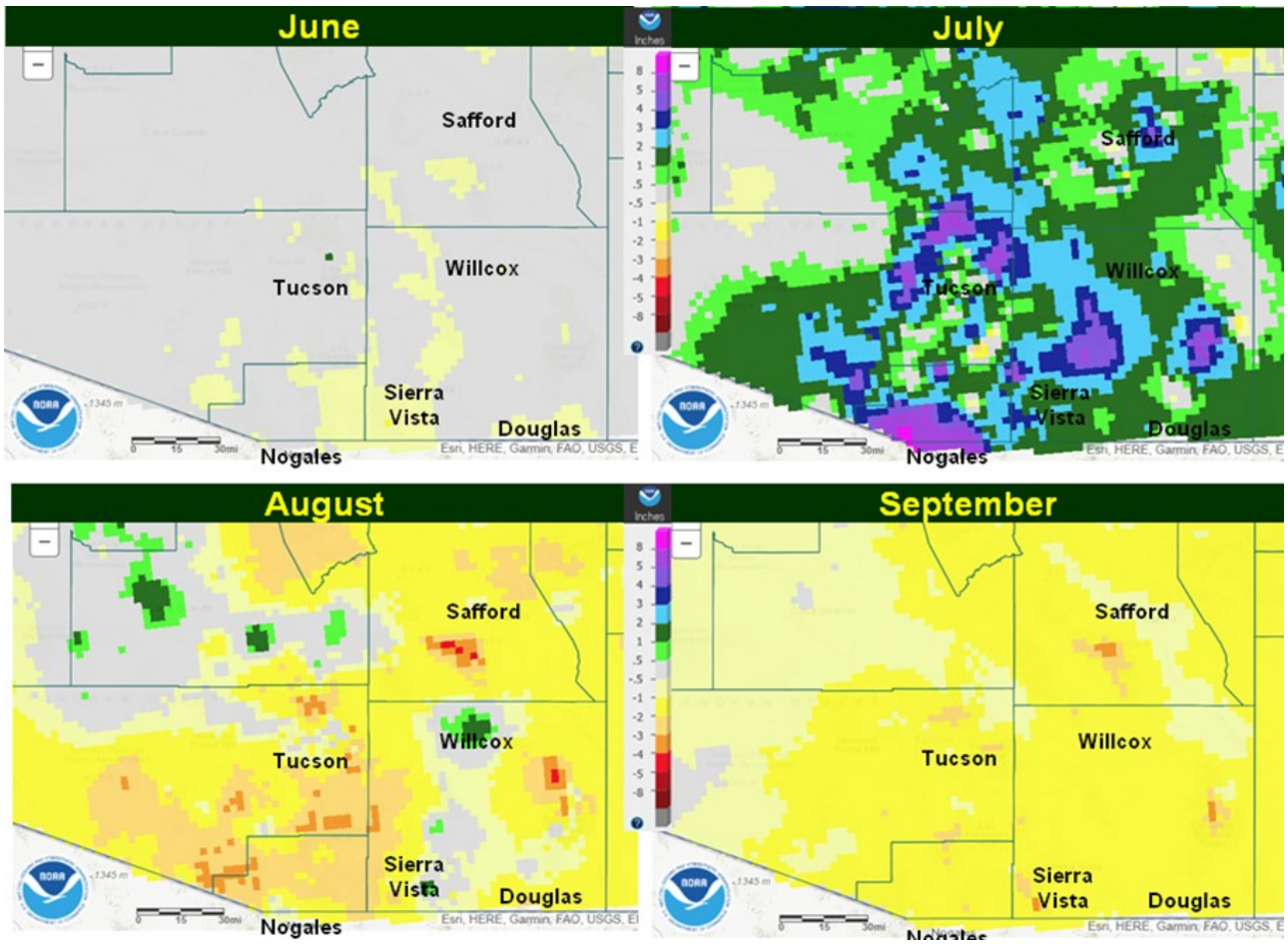
2017 Monsoon Summary

John Glueck, Lead Forecaster & Climate Focal Point

The 2017 Monsoon was definitely a mixed bag with a very active three weeks in July dominating the whole season. June was once again really hot with a few thunderstorms occurring in the latter part of the month. The upper high, which drives the monsoon, didn't get into a favorable position until the 2nd week of July which led to a later than normal start to the season. Once in position near the four corners region, a dominate moist east to southeast flow aloft brought daily rounds of scattered afternoon and evening showers and thunderstorms which produced areas of heavy rain and flash flooding. This lasted until early August and then the upper level flow became less favorable for the remainder of August which led to a much less active and drier than normal August. The lack of any tropical moisture influences during September ended the annual summer thunderstorm season on a very dry note. Overall a lot of areas across southeast Arizona recorded below normal rainfall during Monsoon 2017.



The maps above show the percentage of normal rainfall, by month, for the 2017 Monsoon.
Green/Blue = Wetter than normal; Yellow/Red = Drier than normal

2017 Monsoon rainfall across southeast Arizona					
Pima County		**Pinal County**		**Cochise County**	
Sasabe	10.59”	Oracle	13.73”	Coronado Mem	11.19”
Arivaca	9.53”	San Manuel	6.16”	Kartchner Caverns	10.76”
Kitt Peak	9.16”	Picacho	3.58”	Chiricahua NM	10.42”
Tucson Intnl airport	8.57”	**Santa Cruz County**		Cascabel	9.30”
Redington	7.95”	Sonoita	12.57”	Bisbee	8.58”
Vail	6.32”	Nogales	10.91”	McNeal	7.26”
Green Valley	6.02”	Rio Rico	10.38”	Tombstone	7.83”
Organ Pipe Cactus NM	2.85”	Tubac	9.72”	Douglas	6.91”
Ajo	2.55”	Elgin	8.33”	Willcox	6.67”
Graham County		Patagonia	8.19”	Sierra Vista	6.18”
Safford	7.04”	Tumacacori NM	6.76”	Benson	5.40”

Thank You & Happy Holidays!

All of us at the National Weather Service in Tucson want to express our gratitude for having you be part of our team during severe weather this past year. We appreciate all of your phone calls and on-line reports notifying us of what kind of weather you were experiencing in your neck of the woods. We also want to wish all of you a happy holiday season!

The Staff at NWS Tucson

Meteorologist in Charge.....Arriving Feb 2018

Administrative Support Assistant.....Leslie Cole

Warning Coordination Meteorologist.....Ken Drozd

Science and Operations Officer.....Dan Leins

Electronic Systems Analyst.....Chris Carney

IT Specialist.....Evelyn Bersack

Electronic Technicians.....Rick Leupold, Keith Sapp*

Service Hydrologist.....Erin Boyle

Observations Program Leader.....Vacant

*Keith will be leaving our office in the new year for a promotion to Electronic Systems Analyst at the Phoenix WFO. Congrats Keith, we will miss you!

Senior Forecasters	Jeff Davis Brian Francis John Glueck Jim Meyer Vacant
Forecasters	Carl Cerniglia Emily Carpenter Glenn Lader Chris Rasmussen Gary Zell
Meteorologist Interns	Aaron Hardin Rob Howlett Jordan Pegram

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www.weather.gov/tucson

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