Coyote Crier

Spotter Newsletter For All of Southeast Arizona

National Weather Service, Tucson Arizona

VOLUME 17, ISSUE 2

AUTUMN/WINTER 2011-2012

Inside this issue:

Another Dry Winter??

Glen Sampson, Meteorologist-In-Charge

Another La Niña is present in the equatorial Pacific Ocean and is expected to strengthen and continue through this winter. La Niña is indicative of cooler than normal sea surface temperatures. These cooler water temperatures favor a winter-time storm track oriented towards the Pacific Northwest rather than the Southwest. During these ocean conditions the Pacific Northwest receives more storms than average and the Southwest fewer. A La Niña does not affect the intensity of these storms, so severe weather can occur regardless of the Pacific Ocean conditions. The temperature and precipitation outlooks for December, January and February are:

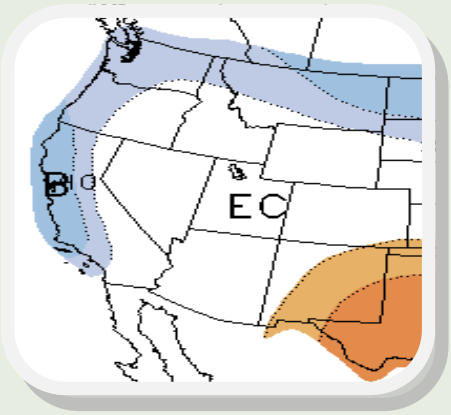


Figure 1 - Winter outlook for near average temperatures across Arizona.

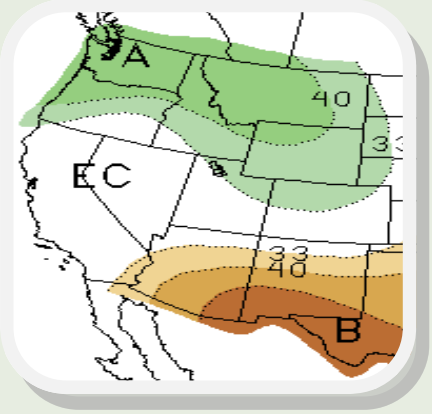


Figure 2 - Winter outlook for below average precipitation over southeast Arizona.

During last winter the La Niña was quite strong. The models for this upcoming winter forecast a much weaker La Niña. The strength of the La Niña helps determine how much influence it has on the storm track. Therefore the precipitation this winter may be higher than last year. Figure 3 describes how a La Niña or El Niño (warm sea surface temperatures) affects the average wintertime precipitation amounts in southeast Arizona.

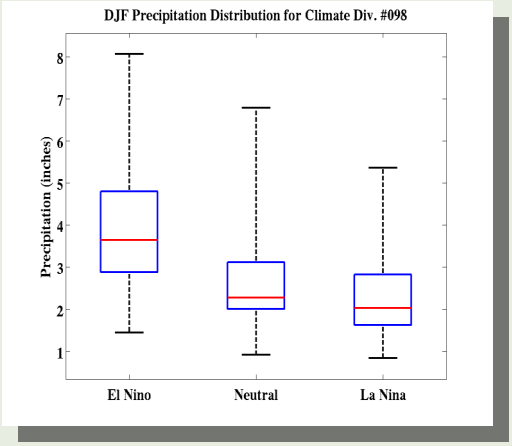


Fig. 3 - La Niña precipitation; red line represents average precipitation and blue line is variability.

Dry Winter Brings a Spring Inferno:

How the La Niña of 2010 Resulted in a Record Fire Season

Steven M. Reedy, Fire Weather Program Manager and Incident Meteorologist

An Aerial Photo of the scarring on the Chiricahua Mointains due to the Horseshoe 2 Fire.

"The Horseshoe 2 fire, would consume nearly the entirety of the Chiricahua Mountains, an acreage of 222,954 acres"

Another example of the damage that was done to the Chiricahua Mountains as a result of the Horseshoe 2 Fire.

The winter of 2010/2011 is most noted for a La Niña pattern being in place. This would lead to a significantly drier winter season over Southeast Arizona. And while one does not immediately think about it, that dryness ended up impacting the local vegetation and this would lead to the record setting fire season of 2011. With another La Niña pattern being expected for this winter, it's important to look back on the impact of the last one in the hopes that the following fire season will not be on the scale as this year's.

Sometimes, wildfire is just unavoidable. At the developing stages of the North American Monsoon, dry conditions at the surface coupled with moistening conditions aloft and an unstable atmosphere produces a phenomenon known as a dry thunderstorm, accompanied by dry lightning. This dry lightning, should it strike dry fuels, such as dry grass or dead tree, can result in the beginnings of a wildfire.

These are natural and can be very helpful in maintaining the life of a forest by clearing away dead and dying trees and other plants, improving the overall health of a forest. In this article, the three major fires in Southeast Arizona this past fire season, the Wallow, the Monument and the Horseshoe 2 will be looked at. All three of these fires were human caused and as such, could have been avoided.

The smallest of the three, the Monument, started in the Coronado National Monument and ended up spreading out over 30,526 acres before it was contained, some of those acres in far northern Mexico. The fire started on Sunday, June 12th and would continue until being contained in the first week of July, aided by the influx of moisture from the start of the Monsoon. This would impact the areas in and around Ash, Carr and Ramsey Canyons as well as the outskirts of Sierra Vista. In those three weeks would come a series of evacuations displacing over 10,000 people and the loss of over 100 structures, nearly 60 of those structures the homes of local residents. Over 1,300 fire fighters, crews and support personnel (including incident meteorologists) were needed at the height of the fire's activity.

The "middle child", the Horseshoe 2 fire, would consume nearly the entirety of the Chiricahua Mountains, an acreage of 222,954 acres. This made it the fifth largest fire in Arizona history. Starting on May 8th, it would burn the entirety of May and June before the seeping moisture from the start of the Monsoon would end containment efforts in the first days of July. Due to its fairly rural location, where some evacuations were still needed, only 23 structures were lost. Like the Monument, though, 1,300 fire fighters, crews and support personnel (again, including an incident meteorologist…the author!) were needed in containment efforts. These containment efforts, when all was said and done, ended up totaling in excess of $50 million.

Lastly, the newly crowned largest fire in Arizona History, the Wallow Fire would burn 522,642 acres in Arizona and an additional 15,407 acres in New Mexico, making a total of 538,049 acres burned. Starting on May 29th, it, like the above mentioned fires, would wait for the Monsoonal moisture before being contained on July 8th. Like the Horseshoe 2 fire, smoke from the Wallow Fire was visible from space and photographed by satellites. While, also like the Horseshoe 2, the Wallow occurred in a mostly rural area, it was more like the Monument with regards to the sheer number of communities that had to be mobilized and evacuated. These communities included Alpine, Blue River, Greer, Nutrioso, Sunrise and Springerville in Arizona and Luna in New Mexico, ultimately resulting in over 10,000 people. Over 70 structures were reported lost with the total cost of the fire exceeding $100 million.

Over 3,000 fire personnel were needed at the height of the fire, including FIVE incident meteorologists at one time. The sheer size of the fire resulted in it being divided up between THREE incident command teams with an additional team assigned to oversee and coordinate these three teams.

One thing to keep in mind with each of these fires, as all three of them burned within the same time frame, incident response resources in Arizona were taxed to their limit, in many instances requiring resources from not just neighboring states, but from all over the country. For instance, one of the incident meteorologists stationed on the Monument Fire was based out of Cleveland, Ohio!

Two of the incident command teams on the Horseshoe 2 fire were from Utah and Montana. In addition, this would lead to the rare occurrence of all National Parks in Arizona being closed due to the extreme fire danger.

While the dry and breezy conditions were the immediate contributors to each of these fires, it was the dry winter that primed the fuels. With the fuels that dry, having missed their usual winter's allotment of moisture, they were ready to burn at the slightest chance of ignition. These factors, combined with increased human activity and carelessness, resulted in a 2011 fire season that few will forget. The experience attached to that will hopefully prevent a similar 2012 fire season.

Night burnout operations help strengthen fireline. Credit: US Forest Service, Apache-Sitgreaves National Forest

Please keep your personal information up-to-date. Do we have your correct mailing address, location, phone number and e-mail address? If not, please update us so that our database is as current as possible. The best way to update your information is by e-mail, or to call and speak with Greg Mollere. Thanks!

Greg.mollere@noaa.gov

"The Wallow Fire would burn 522,642 acres in Arizona and an additional 15,407 acres in New Mexico, making a total of 538,049 acres burned".

National Weather Service Tucson Office Staff

Meteorologist in Charge…….Glen Sampson

Administrative Support Assistant…….Stephanie Spease

Warning Coordination Meteorologist…….Kenneth Drozd

Science and Operations Officer…….John Brost

Service Hydrologist…….Erin Boyle

Electronic Systems Analyst…….Chris Carney

IT Specialist…….Evelyn Bersack

Electronic Technicians……Rick Leupold, Keith Sapp

Senior Forecasters…….Jeff Davis, Brian Francis, John Glueck, Jim Meyer, Greg Mollere

General Forecasters…….Glenn Lader, Chris Rasmussen, Steve Reedy, Craig Shoemaker, Gary Zell

Meteorologist Interns…….Scott Minnick, Raymond McLeod

Observation Program Leader…….Mic Sherwood

Hydrometeorological Technician…….Hans Hanson

Show Low Fire Engine 311 Stands by as the Wallow Fire burns near Hannagan Meadow. Photo by Firefighter Chris Francis.

Credit US Forest Service.

WFO Tucson Installs Two Portable Weather Stations in Post-Wildfire Burn Areas

John Brost, Science and Operations Officer

Installation of one of the weather stations in the burn area.

Devastating wildfires impacted southeast Arizona during the spring and early summer of 2011. The Wallow fire became the largest wildfire in state history burning 522,642 acres. The Horseshoe 2 and Monument fires destroyed or damaged over 100 residences, businesses and other structures. Additionally, these fires so profoundly modified soil conditions that flash flooding occurrence and severity could be increased by 10 to 100 times. Thus any post-wildfire flash flooding and debris flows that occur may cause damage more devastating than what the fires produced and could become an even greater threat to human life.

Southeast Arizona rapidly transitioned from the spring drought conditions to the wet summer convective, or "Monsoon", season by the first week of July. The Monsoon is characterized by frequent thunderstorm activity (almost daily over the mountains), severe convection, heavy rainfall and flash flooding. WFO Tucson recognized the immediate need to raise awareness of the increased potential for flash flooding and debris flows in the burned area. Representatives from WFO Tucson attended numerous community meetings and served as guest speakers to address the flash flood potential and other public concerns. They produced multi-media web briefings and posted articles on the flood potential on their Facebook and local office web pages. In addition, they developed two pamphlets which described the effects of wildfires on the hydrology of an area and provided guidance on taking action when flash floods occurred.

"WFO Tucson had to increase their internal situational awareness of the increased flash flood threats."

WFO Tucson ESA, Chris Carney, explains the new weather station to National Park Service staff.

WFO Tucson also had to increase their internal situational awareness of the increased flash flood threats. Hydrologist Erin Boyle used BAER (Burned Area Emergency Response) team results to adjust flash flood guidance for the forecasters. Two ALERT gauges were installed by the Arizona Department of Water Resources in the Huachuca Mountains (Monument Fire) which provide real time rainfall data on the internet. This website is monitored on a situational awareness display in the operations area. Also, burned area maps produced by the BAER teams were displayed on Google Earth to help forecasters visualize the high risk areas for flash flooding.

There was a significant data void for the Chiricahua Mountains where the Horseshoe 2 fire burned. WFO Tucson needed rainfall data from this area to help provide flash flood warnings. The solution to this problem came from WFO Flagstaff. The Flagstaff office faced similar issues in 2010 due to the Schultz fire. They developed a cost effective method for transmitting real time weather data using a commercial weather station. WFO Tucson used the same concept to deploy two mobile weather stations to the Chiricahua Mountains. These commercial Davis weather stations are engineered to send data across the HAM Radio Network via APRS (Automatic Packet Reporting System) to a public website (http://aprs.fi/?addr=Portal%2C%20AZ) .

Installing the first station was no easy task. ESA Chris Carney, and ET Terry Bohannon traveled via helicopter to a remote site on the mountain to install the station. Low clouds began to develop just as the station was ready to transmit data. Chris and Terry were accompanied by two U.S. Forest Service employees who were becoming increasingly nervous that the helicopter would not be able to reach them due to the low clouds. Thunderstorms were expected to develop soon after the low clouds dissipated so the window of opportunity to fly off the mountain was closing fast. Fortunately, a long hike down the mountain was averted as the data began to flow and the helicopter was cleared to fly.

Installing the second station was less stressful. Chris and Terry were accompanied by ET Keith Sapp, Hydrologist Erin Boyle, and SOO JJ Brost along with several representatives from the National Park Service (NPS). They installed the station within a few feet of another weather station operated by the NPS. The NPS station was burned during the Horseshoe 2 fire and no longer transmits data. Fortunately, a lightning rod survived the fire and will help deter lightning strikes on the new NWS station (http://aprs.fi/weather/a/KC2CPZ-2).

The day after WFO Tucson installed the first station in the Chiricahua's, heavy rainfall developed and caused a flash flood and debris flow. The rainfall observations helped forecasters make a timely flash flood warning decision. Video from this event can be found on YouTube at: https://www.youtube.com/watch?v=jiNcj7hC0YY&feature=player_embedded

These stations have already proven to be extremely useful and help serve our life-saving mission. The weather stations cost about $1,500 for the entire package. Nick Petro, former SOO of WFO Flagstaff, deserves a great deal of credit for developing the idea and helping WFO Tucson by providing the installation plans and guidance.

Also, both the National Forest Service and National Park Service were absolutely vital to the installations. The Forest Service provided the helicopters to transport the equipment and personnel to the installation site. They also graciously provided a site to place the new station. The Park Service was also extremely helpful during the process. They too provided a site to place the instruments and gave us access to the park while it was still closed to the public. These incredible partnerships are a testament to our shared interest in protecting lives during flash floods.

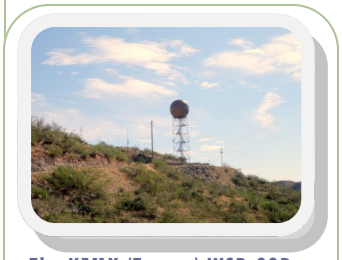
Burn Scar from the Horseshoe 2 wildfire in the Chiricahua Mountains of Southeast Arizona — Courtesy Chris Carney, WFO Tucson

Flash Flooding from the July 26, 2011 event—courtesy of Helen Snyder, Portal Arizona

"The day after WFO Tucson installed the first station… Rainfall observations helped forecasters make a timely flash flood warning decision."

From left to right: Erin Boyle (Service Hydrologist), Keith Sapp (Electronics Technician), Chris Carney (Electronic Systems Analyst), J.J. Brost (Science and Operations Officer) and Terry Bohannon (Electronics Technician) all from WFO Tucson.

Dual-Polarization Technology To Be Installed On The KEMX (Tucson) Radar In January 2012



The KEMX (Tucson) WSR-88D Radar atop the Empire Mountains in far Southeast Pima County.

Radars send out short bursts of radio waves called pulses. The pulses bounce off particles in the atmosphere and the energy is reflected back to the radar dish. A computer processes the returned signals and, through algorithms, can make conclusions about what kinds of particles it "saw," including the directions they are moving (the Doppler effect), and the speed of their movement. The WSR-88D radar transmits horizontal pulses, which give a measure of the horizontal dimension of the cloud (cloud water and cloud ice) and precipitation (snow, ice pellets, hail and rain particles).

Polarimetric radars, also called dual-polarization radars, transmit radio wave pulses that have both horizontal and vertical orientations. The additional information from vertical pulses will greatly improve many different types of forecasts and warnings for hazardous weather.

Technically speaking, a radio wave is a series of oscillating electric and magnetic fields. Of course, you can't actually see the oscillating electric and magnetic fields, but the radar can detect and interpret them just as your car radio can detect and interpret those transmitted at the slightly lower frequencies. If, however, we could see them, they would look something like the waves depicted below in Fig. 1.

"Polarimetric radars, also called dual-polarization radars, transmit radio wave pulses that have both horizontal and vertical orientations."

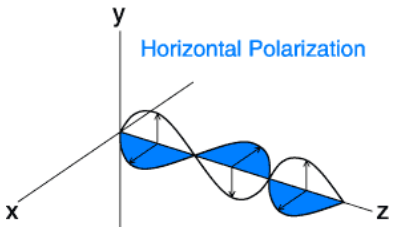


Figure 1a: Example of the structure of a horizontally polarized radio wave. The electric field wave crest is oriented in the horizontal direction (blue in this figure). The magnetic field wave crest is oriented in the vertical direction (white in this figure).

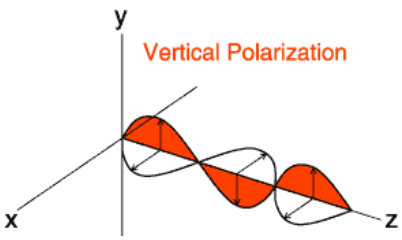


Figure 1b: Example of the structure of a vertically polarized radio wave. The electric field wave crest is oriented in the vertical direction (red in this figure). The magnetic field wave crest is oriented in the horizontal direction (white in this figure).

As can be seen in Fig. 1, the electric and magnetic fields are oriented at 90 degree angles to each other. This concept is important for understanding what is meant by polarization. That is, the polarization of the radio wave is defined as the direction of orientation of the electric field wave crest. Thus, in Fig 1a, the polarization is horizontal since the electric field wave crest (shown in blue) is aligned along the horizontal axis. In Fig. 1b, the polarization is vertical since the electric field wave crest (shown in red) is aligned along the vertical axis.

Polarimetric radars gain additional information about the precipitation characteristics of clouds by essentially controlling the polarization of the energy that is transmitted and received.

Some of the benefits of Dual-Polarization technology include:

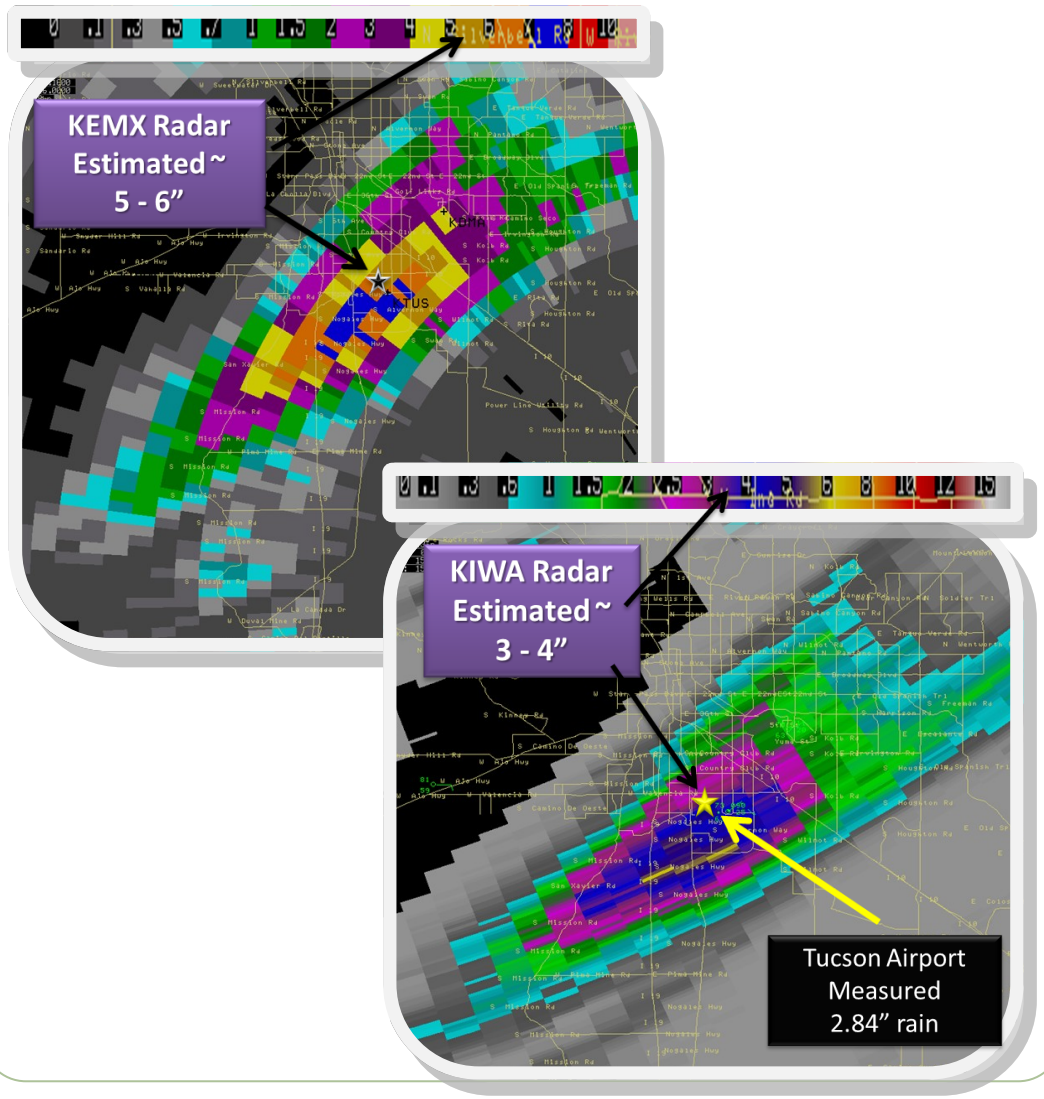
* Significantly improving the accuracy of the estimates of amounts of precipitation.
* Differentiating between very heavy rain and hail, which will improve flash flood watches and warnings.
* Identifying types of precipitation in winter weather forecasts, improving forecasts of liquid water equivalent or snow depth.
* Contributing to increased lead time in flash flood and winter weather hazard warnings.

The information contained on this page was obtained from the National Severe Storms Laboratory. Credit - Terry J. Schuur

A Local Example of Just One of the Advantages of Dual-Polarization Technology

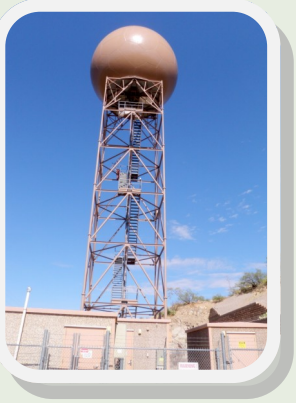
Greg Mollere, Senior Forecaster and Spotter Training Coordinator

On the afternoon of September 15, 2011 a thunderstorm developed on the southern fringes of the Tucson metro area. This storm remained relatively stationary and eventually produced 2.84 inches of rain at the Tucson International Airport. At that time WFO Phoenix had already implemented the dual-pol technology to the KIWA (Phoenix) radar. On this particular afternoon, one of the forecasters was viewing this storm utilizing the upgraded KIWA radar with the dual-pol technology and noticed a striking difference between the radar precipitation estimates from the KEMX (Tucson non dual-pol) and KIWA (Phoenix dual-pol) radars. As mentioned in the article on the preceeding page, one advantage of dual-pol technology is the ability to differentiate between rain and hail. On this particular afternoon, hail of 1.5 inches in diameter was reported near the airport. As you can see from the image on the left, the Tucson radar was estimating between 5 and 6 inches of rain with this storm. On the right image is the view from the Phoenix radar with dual-pol technology, and rainfall estimates were between 3 and 4 inches. The ASOS (Automated Surface Observing System) located at the Tucson International airport received 2.84 inches of rain from this storm which is significantly closer to reality than what the Tucson radar was showing given the obvious hail contamination.



The 2.84 inches of rain that fell at the Tucson Intl Airport on Sept. 15, 2011 was the fifth wettest day of all time for Tucson.

“ One advantage of dual-pol technology is the ability to differentiate between rain and hail.”



A Close-up View of The KEMX radar. Normally the radar domes are white, but this one was painted to blend in with the desert surroundings.

Two Employees Make WFO Tucson Their New Work Place

Rick Leupold, Electronics Technician

I was born & raised in Oswego, IL. After graduating high school in 1982, I served in the United States Air Force until separating in 1988. While in the Air Force I served as an Air Traffic Control Radar Maintenance Specialist assigned to the 3rd Combat Communications Group at Tinker A.F.B. Midwest City, OK. I have worked for numerous companies since departing the Air Force & have lived in numerous cities such as Las Vegas, NV, Tonopah, NV, Naperville, IL, & Oakland, CA. I started my career with the National Weather Service in 2004 at the Dodge City, KS. Weather Forecast Office. I have since been assigned to the Topeka, KS WFO & now Tucson, AZ WFO. I enjoy outdoor activities that include fishing, boating, camping, & four wheeling.

Rick Leupold, Electronics Technician

National Weather Service

520 N. Park Avenue

Suite 304

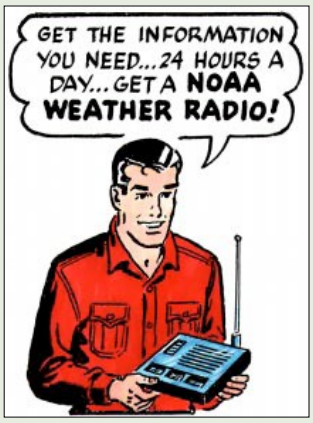
Tucson, AZ 85719

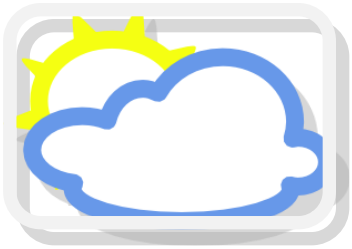
Phone: 520-670-5162

Fax: 520-670-5167

Erin Boyle, Service Hydrologist

I am the new Service Hydrologist. I started with the NWS in April of this year. Before coming to work for the NWS I worked for US Forest Service on the Coronado National Forest for 8 years. I grew up in Michigan and have lived in Tucson for the past 12 years. I received a B.S. in Geology from the Evergreen State College in 1999 and a M.S. in Hydrology from the University of Arizona in 2007. My areas of interest include surface water flow and measurements, including the effects of wildfires on runoff. I'm excited to continue working in the field of hydrology in the arid Southwest with the NWS.

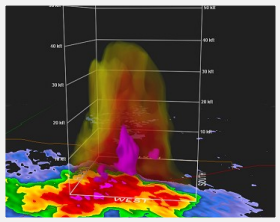




Erin Boyle, Service Hydrologist

2011 Monsoon Rainfall Totals

Location	June	July	August	Septem-ber	Total
Eastern Pima County					
Tucson International Airport	0.03"	1.64"	1.35"	5.60"	8.62"
Green Valley	0.00"	3.09"	1.94"	2.59"	7.62"
Redington	0.00"	4.17"	1.57"	1.00"	6.74"
Vail	0.00"	3.25"	0.82"	2.31"	6.38"
Western Pima County					
Ajo	0.00"	1.07"	1.70"	0.77"	3.54"
Organ Pipe Cactus N.M.	0.00"	0.22"	0.47"	0.87"	1.56"
Central Pima County					
Anvil Ranch	0.00"	2.48"	3.64"	1.39"	7.51"
Kitt Peak	0.00"	0.39"	1.42"	0.40"	2.21"
Sasabe	0.00"	3.49"	3.75"	2.13"	9.37"
Southeast Pinal County					
Picacho Peak	0.00"	0.27"	0.57"	1.11"	1.95"
Oracle	0.00"	2.88"	2.24"	3.43"	8.55"
San Manuel	0.00"	5.27"	2.38"	1.84"	9.49"
Graham County					
Safford (Agricultural Station)	0.24"	0.46"	1.40"	1.38"	3.48"
Ft. Thomas	0.00"	0.63"	5.35"	0.58"	6.56"
Santa Cruz County					
Canelo	0.00"	3.30"	3.60"	2.20"	9.10"
Nogales	0.00"	1.48"	1.24"	1.92"	4.64"
Tumacacori N.M.	0.00"	3.08"	2.85"	2.56"	8.49"
Cochise County					
Benson	0.16"	4.40"	1.55"	1.87	7.98"
Bisbee	0.00"	4.06"	3.71"	2.90"	10.67"
Chiricahua National Monument	0.08"	3.85"	2.22"	2.49"	8.64"
Coronado National Memorial	0.14"	5.50"	3.33"	0.92"	9.89"
Douglas	0.02"	3.57"	2.26"	1.02"	6.87"
Hereford (Y Lightning Ranch)	0.14"	2.34"	2.16"	1.79"	6.43"
McNeal	0.22"	2.56"	1.40"	1.70"	5.88"
Pearce-Sunsites	0.00"	2.89"	3.59"	3.09"	9.57"
Portal	0.42"	4.12"	2.39"	1.87"	8.80"
San Simon	0.00"	1.63"	1.58"	0.84"	4.05"
Sierra Vista	0.05"	2.72"	1.66"	2.60"	7.03"
Tombstone	0.18"	4.43"	5.00"	1.34"	10.95"
Willcox	0.00"	4.01"	4.02"	1.19"	9.22"
Greelee County					
Clifton	0.00"	3.34"	3.19"	1.95"	8.48"
Duncan	0.20"	0.63"	2.17"	0.94"	3.94"



A 3D image of the thunderstorm that produced the damage along Ina Road on August 16, 2011. The purple area represents the heaviest rainfall and thus the core of the storm.

"The Total Rainfall of 8.62 inches for the 2011 monsoon at the Tucson International Airport was 2.56 inches above normal".

View of downburst from down-town Tucson looking to the northwest. This storm produced extensive damage along Ina Road on August 16, 2011. Photo courtesy KOLD.

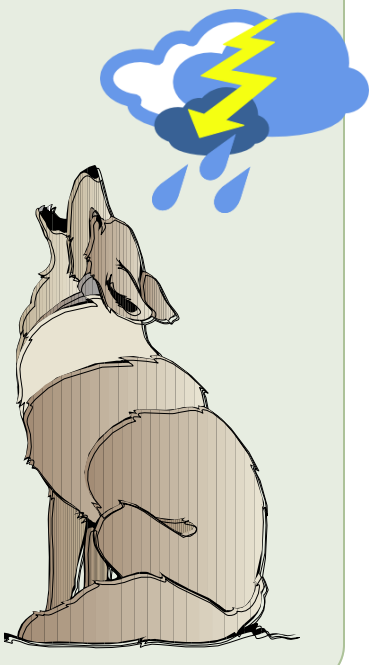
Be looking for the Spring Edition of the Coyote Crier sometime during late March or Early April 2012. In that edition we will publish the locations, times and dates of the Spotter Training sessions. If it has been a few years since you attended a spotter training class, we recommend that you clear a space on your calendar next spring to attend one of these informative sessions.

Greg Mollere, Senior Forecaster and Spotter Training Coordinator

For all your weather Information needs,

Visit us on the web at:

weather.gov/tucson



What You As A Skywarn Spotter Should Report??

Tornado: A Tornado or a funnel cloud

Heavy Rain: A Half Inch or more in less than an hour

Hail: Dime size hail (1/2 inch) or larger

High Wind: Estimated or measured 45 mph or greater

Flooding: Any Kind of Flooding

Snow: One inch or more (2 inches if above 5000 feet)

Visibility: Less than one mile

Death/ Injury: Any weather related reason

Damage: Any weather related reason

(520) 670-5162 or 1-800-238-3747