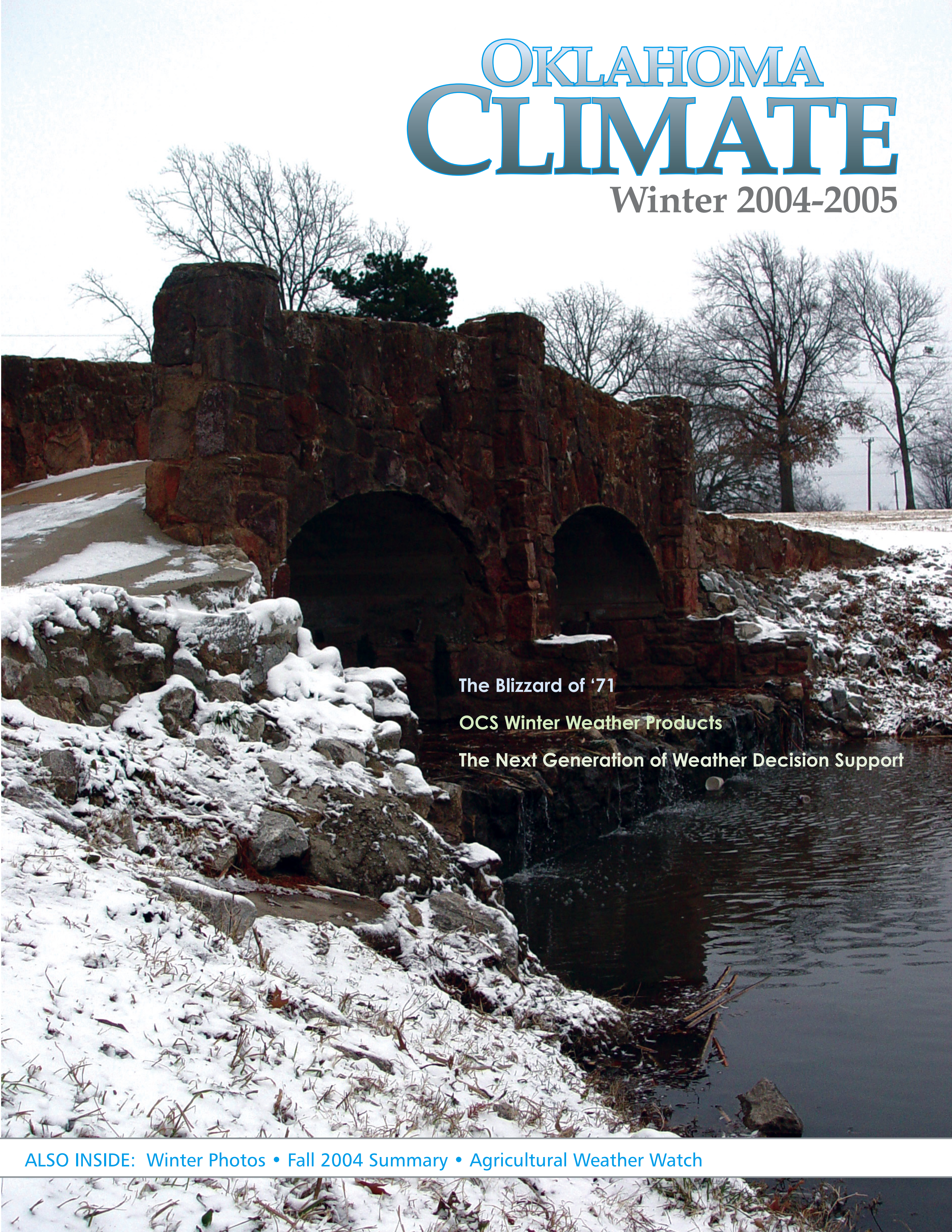
OKLAHOMA CLIMATE

Winter 2004-2005



The Blizzard of '71

OCS Winter Weather Products

The Next Generation of Weather Decision Support

ALSO INSIDE: Winter Photos • Fall 2004 Summary • Agricultural Weather Watch

MESSAGE FROM THE EDITOR

Having grown up in Buffalo (the Oklahoma variety…I'm more apt to say "y'all" than, well, whatever it they say up in upstate New York), I can appreciate a good snowfall or two, provided I'm not driving anywhere. I would recount my 1992 Thanksgiving trip home through 19 inches of snow, but I've tried to erase that journey from my memory. I will be forthcoming in my opinion about driving a Ford Mustang in a blizzard, however: bad idea. Regardless, other than the "fun" it provides for driving, I love snow in small doses. Oklahoma snow storms seem to fit that variety; it really doesn't snow a lot in Oklahoma, and if it does, it's probably not going to stick around for too long. Opinions on winter wonderlands seem to vary widely. Many move south to escape it, only to miss it after their first winter without. Others move away from the frozen north and never look back. Unfortunately, for those that love snow, all the desire in the world isn't going to transform Oklahoma into Minnesota. On average, most of the southeastern two-thirds of the state can expect a four-inch snowfall once every 1-3 years, an eternity for a kid with an unused sled. For an eight-inch snowfall, the wait can be even longer – on the order of once every 5-20 years.

There is an area of the state where the snow flies a bit more frequently, however. In the high plains of the far northwest, the familiar jibe of "Oklahomans can't drive in the snow" is met with the easy laughter of the farmers and ranchers in their trusty four-wheel drive pickups, bought not for style points, but out of necessity. In this region, snow is not only expected, but welcomed for the gentle way in which it provides moisture. Given that, not even the eldest of old-timers expected a storm the likes of which struck Buffalo in February of '71. In a matter of 36 hours, a three-foot deluge of snow, and drifts of up to 20 feet, paralyzed much of the area for more than a week, resulting in more than $2 million in damages. We invite you to relive that storm in this, the Winter 2004-05 edition of "Oklahoma Climate."

Sticking with the winter theme, this issue also contains a rundown of winter weather products made available online by the Climate Survey. Plus, in addition to our normal feature articles, learn about the Oklahoma Mesonet's latest foray into agricultural meteorology with a description of the spinach white rust model. Finally, we are honored to include an article chronicling the bird species that make Oklahoma their home during the winter, penned by Dan L. Reinking, a biologist with the George M. Sutton Avian Research Center and editor of the "Oklahoma Breeding Bird Atlas."

Gary McManus – Editor

Oklahoma Climate
Winter 2004 - 2005

Cover Photo: Norman, OK on December 22, 2004. Photo by Ryan Davis. If you have a photo that you would like to be considered for the cover of Oklahoma Climate, please contact Gary McManus at gmcmanus@ou.edu.

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Derek Arndt, Acting State Climatologist

Editor
Gary McManus, Climatologist

Contributors
Derek Arndt
Loren Gmachl
Gary McManus
Andrea Melvin
Dan L. Reinking
Al Sutherland

Design
Stdrovia Blackburn
John Humphrey
Ryan Davis

Editorial Board
Derek Arndt
Stdrovia Blackburn (advisor)
Brad Illston
Cerry Leffler
Gary D. McManus
Dr. Renee A. McPherson
Andrea Melvin
Al Sutherland

Oklahoma Climatological Survey

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The Blizzard of '71

By Gary McManus - Climatologist

Joan Adams and her husband Don considered shoveling their driveway late in the evening on February 20, 1971. A foot of snow had fallen at their Buffalo home by then, but the flakes continued to fall. “It was a pretty snow, not much wind and it fell on the level...but (we) thought we needed to wait until it quit snowing,” Joan recalled. That seemed a reasonable assumption. Significant snowfalls do occur from time to time in Oklahoma, especially in the far northwest, but rarely do they exceed 12 inches. Little did she know, however, that the snow would continue unabated for another 36 hours. The foot of snow on the Adams’ driveway would soon become three, and gale-force winds would drive the snow into drifts that rivaled a two story building, paralyzing the entire region for days. The blizzard that weekend became known as the worst in Oklahoma history, but to those that experienced it, the storm is known simply as “The Big One.”

The February Surprise

The blizzard started rather innocuously. A week of pleasant weather with temperatures reaching the upper-60s was interrupted by a weak cold front on the 18th. Buffalo’s high temperature on the 17th was 69 degrees, and the low that night was a balmy 50 degrees, almost twice the normal low temperature for that date. A reinforcing shot of cold air was set to arrive a few days later on the 21st. As the cold air arrived, a powerful upper-level storm was approaching the area from the west. The two features would eventually interact and spawn a weak surface low pressure system in north Texas. As the surface low tracked across eastern Oklahoma into Missouri, it continued to intensify, drawing abundant moisture into the region from the Gulf of Mexico. The winds increased to more than 50 mph, and the snow began falling in earnest. Soon, a garden-variety Plains snowstorm had been transformed into a blizzard for the ages.

Between 6 p.m. on the 20th and 6 p.m. on the 21st, 23 inches of snow fell at Buffalo, which still stands as the greatest 24-hour snowfall on record in Oklahoma. The wind began to howl overnight, and visibilities on the 21st were reduced to near zero for most of the day. Another 13 inches fell between 6 p.m. on the 21st and the morning of the 22nd. Residents ventured outside to find the snow piled 20 feet high against houses under a bright blue sky. Some were forced to escape their buried houses by second-story windows.

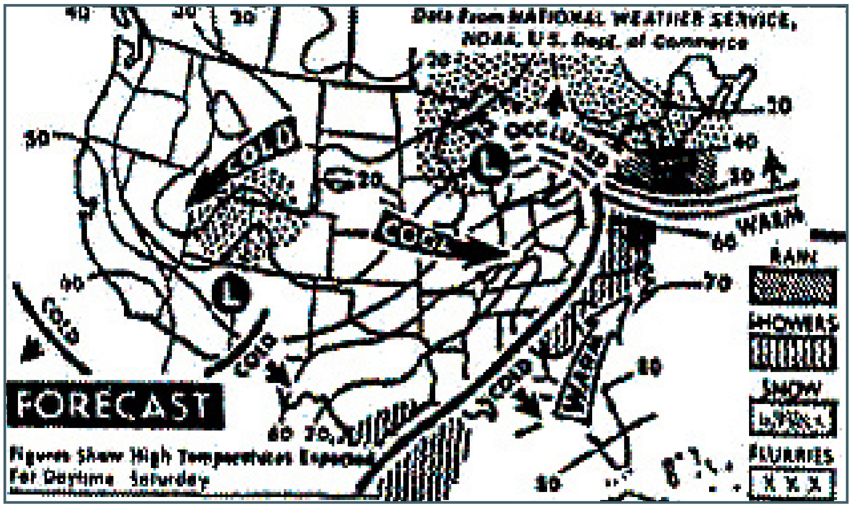
Officially, the snow stood at a depth of 36 inches, the largest reported snow depth on record in Oklahoma. Another 3.5 inches of snow had fallen on February 5th to set the mark for the greatest reported monthly snowfall at an individual location at 39.5 inches. The greatest snowfall for a season is held by Beaver during the winter of 1911-12, with a total of 87.3 inches.

Caught Unawares

One of the more remarkable aspects of the storm was the lack of warning prior to its arrival. Predicting winter weather in Oklahoma can be maddening, even with today’s vast improvements in forecast technology. The task 30 years ago probably seemed Herculean in comparison. As Buffalo residents unfolded their newspapers early on the morning of the 20th, the forecast they were greeted with read:

> “...fair and mild Saturday with a high in the mid-60s. Increasing cloudiness and a chance of showers. Mostly cloudy and a chance of showers or thunderstorms Sunday and turning colder...High Sunday in the lower 40s.”

Being unprepared for the coming onslaught, area residents went ahead with plans, unaware of the monster looming on the horizon. Bob and Jacquita McVicker traveled from their farm south of Buffalo into town to play cards with friends, leaving their children with relatives close-by. “When we were getting ready to head for home, the radio only called for a ‘skif’ of snow. We didn’t want to wake the kids, so we left them in town, thinking we would pick them up in the morning. It took us three days to make it into town to get them,” Jacquita McVicker said. Many Buffalo townspeople had traveled to Alva to see the local basketball teams play in a tournament. The snow had already begun to pile up on the roads by



The forecast for February 20th, 1971.

Snow blocks the way in downtown Buffalo on the 22nd. (photo courtesy of Joanne McVicker)

the time the games ended. “The farther west we drove, the deeper the snow became. The snow was dragging on the undersides of the car by the time we arrived home,” recalls Buffalo resident Meredith Waugh.

Other area residents were not so lucky as to make it home that night. The Leedey girls basketball team became stranded at the Beaver gymnasium after their game, along with about 80 other motorists. Similarly, the Hammon boys team was stuck at a Forgan hotel after their game. Hundreds of other motorists were stranded for up to 37 hours in their vehicles along the road as the highways became impassable.

Of course, not everybody was dismayed by the paralyzing snowfall. Area schools were closed for days on end, and the children made the most of their unexpected vacation. Great sport was made of jumping off of the roof of the local movie theatre in Buffalo into the giant drifts. A clever entrepreneur appeared in Buffalo on the 25th with a load of 30 snowmobiles. All sold quickly to area farmers, eager to check on their isolated livestock herds. Other men found work scooping snow off of buildings as the tremendous weight of the snow threatened to buckle the flat roofs. The local Chevrolet dealership became a casualty of the storm when the tin building that housed it crumpled under the snow.

The Losses

Initially, many area farmers looked upon the snow as a Godsend, a welcome remedy to the dry conditions prevalent during the months leading up to the blizzard. Buffalo had received a scant three inches of precipitation for the five-months prior to the blizzard, close to 50 percent of normal. As the snow continued mercilessly, however, emotions quickly turned to anxiety and fear with the realization that the loss of entire livestock herds was becoming a real possibility. “Our first thought was of all the good moisture in the snow after the long dry spell, not giving thought to the havoc the blizzard had cost the livestock industry,” remembers Waugh, who himself had lost a registered bull and other livestock in the storm.

Overall, the losses to the region were staggering, totaling over $2 million. Livestock losses included: 11,000 cattle; 3500 hogs; and 1000 sheep. While some cattle undoubtedly froze to death, it was discovered later that many had actually drowned. The cattle became mired in the deep drifts and breathed the powdery snow into their lungs, eventually drowning as it they were in water. Other livestock died due to lack of water, being unable to reach an available water source. This was a particularly galling circumstance, considering the doomed animals were mired in the frozen version of approximately three inches of rainfall.

Help From Above

The loss of life and property undoubtedly would have been more severe had helicopters from the Oklahoma National Guard and the U.S. Army base at Ft. Sill in Lawton not arrived to help. The Army helicopters, unable to carry hay or supplies due to a technicality, concentrated on the search for stranded motorists first. The large Chinooks, notable due to their twin rotors and immense size, scoured the countryside, plucking unlucky people from cars buried up to the tops of their antennas. Many answered distress calls, including delivering food and medicine to those in need. A police dispatcher in Woodward reported receiving up to 25 pregnancy-related calls on the 22nd. One of the guard choppers on the 22nd was sent with a dose of insulin to Laverne for an elderly diabetic who had not received her medication since the 19th.

Once the humanitarian missions were complete, and the roads began to open, the Army cleared eight of their helicopters for livestock relief efforts. The National Guard helicopters, which had been operating in the area early on, continued to lift hay and farmers to stranded cattle, returning to pick up the farmers once the cattle had been fed. The first relief for Buffalo cattlemen arrived on the 25th, nearly five days after the first flake fell, which angered many of the nerve-wracked residents. The first relief for Buffalo cattlemen arrived on the 25th, nearly five days after the first flake fell, which angered many of the nerve-wracked residents. The only help up to that point had come from a private helicopter, which had to be rented.

An Oklahoma National Guard Chinook helicopter is loaded with hay in preparation of a livestock relief effort. (photo courtesy of Don and Joan Adams)

Local residents, more familiar with the area, were recruited by the Air National Guard to help locate the herds. The National Guard pilots made an effort to drop the hay upwind of the cattle so the scent would draw the cattle towards it. If that attempt failed, the cattle had to be driven towards the hay, and also towards any water available to them. The herds were quite scattered, however, and many had drifted up to 25 miles from their owners due to the storm. Those that were caught against a fence line suffocated in drifts. Several herds were found in a corner of a fence, 30 or 40 each with their noses pointed towards the corner. The moisture in the air had frozen over their nostrils, and they suffocated as they stood motionless.

In addition to the National Guard and Army helicopters, Air National Guard C-124 Globemaster supply planes based at Will Rogers Airport also dropped hay to the starving herds. The huge four-engine planes would swoop in close to the herds at 500 ft above the service, slow to 130 mph, and drop their bales. In all, it was estimated that one million head of cattle were in distress across the region, and enough supplies to feed only 70,000 was dropped overall.

With comic relief in short supply, area residents often found humor in the strangest places. “I was in the back yard watching a helicopter loaded with hay fly over the neighbors to the north. As it flew over and dropped some bails, one of the bails hit an old cow. Now each of these bails weight about 50-60 lbs, but the cow hit the ground, rolled over, and then jumped right back up and started eating,” Bob McVicker chuckled.

I would like to thank the following for their help in writing this article: Joan Adams, Jacquita McVicker, Joanne McVicker, Toni Parlett, Meredith Waugh.

Buffalo resident Mark Waugh stands next to the piles of snow that helped paralyze the area

A road northwest of Buffalo (left and center photos courtesy of Meredeth Waugh)

Buffalo residents Meredith Waugh, Greg Adams, and Dwight Waugh prepare to enter a Chinook helicopter to aid in the livestock relief effort. (photo courtesy of Don and Joan Adams)

OCS **Winter** WEATHER PRODUCTS

By Derek Arndt - Acting State Climatologist

In Oklahoma, winter often comes in bursts of several days at a time. Rarely does the state endure protracted bouts of winter weather like those seen in northern parts of the country. The coldest arctic invasions occur intermittently, and usually offer a suitable period of recovery in their wake. Subtle encores of autumn and outright previews of spring are common, despite the calendar's three-month designation of winter.

Winter may not take up an entrenched residence in Oklahoma, but it can strike with full force and fury. It comes equipped with a complete arsenal of winter weather hazards, ranging from merely inclement to utterly life-threatening. Real-time hazards include bitterly cold temperatures, high winds, blizzards, sleet and – possibly the costliest of winter events – ice storms. Less dramatic, but certainly costly, winter hazards are untimely freezes. A late freeze can wipe out a fruit crop, or much of a wheat crop, early in the year.

During the cold season, Oklahoma's weather is driven by synoptic-scale systems, which feature large-scale storms that carry fronts and air masses across the country. However, precipitation type is very sensitive to tiny changes in temperature in the lowest levels of the atmosphere. A small change in temperature near the surface may make the difference between a snow storm or a rainy day – or sleet, freezing rain, or all of the above. So, even though the system might be large, its immediate impact can vary based on local temperature variations.

To meet the winter needs of Oklahoma's citizens, OCS continues to expand its suite of winter-weather products, many of which are made possible by the Oklahoma Mesonet's timely and accurate weather observations. These products can provide useful local information on a number of time scales, ranging from real-time (during an event) to a post-event assessment to the climate scale (for planning purposes).

The following OCS tools are available online for Oklahoma's citizens. They are arranged by time scale, from real-time to seasonal.

Wind Chill Index

Source: Mesonet Data Pages: Current Maps and Interactive Maps
Updated: Every 15 minutes

The wind chill index is an important indicator that combines air temperature and wind speed to estimate the heat lost from humans exposed to the elements. In wind chills below –18F, frostbite of exposed extremities can occur in 30 minutes or less. Below –25F, it can occur in 15 minutes or less. At –33F, frostbite can occur in less than ten minutes!

Unfortunately, the phrase "feels like" often accompanies wind chill reports, even though the index isn't intended to indicate discomfort. Instead, wind chills indicate the rate at which one's body loses heat. Low wind chill values don't separate the tough from the weak. A tough person in a –10F wind chill loses just as much heat as anyone else!

Current Weather Map / Latest Weather Map

Source: Mesonet Data Pages: Current Maps and Interactive Maps
Updated: Every 15 minutes

When it comes to multi-purpose usefulness, few products can beat a good old-fashioned Mesonet station plot. It provides several valuable pieces of winter-weather information from one source. Each station is surrounded by variables that indicate its temperature (red numbers, upper-left), dew point (green, lower-left), rainfall (blue, lower-right) and wind speed, direction and gusts (purple wind barb and numbers).

For a quick assessment of the probable precipitation type, a scan of air temperatures can show which parts of the state are above or below freezing. Stations that are below freezing can indicate locations where frozen or freezing precipitation can occur. During a freezing rain event, Mesonet wind barbs can serve like a miner's canary. Wind observations that unrealistically dip to near zero can indicate ice accumulating on the Mesonet wind sensor ten meters off the ground.

Wet Bulb Temperature

Source: Mesonet Data Pages: Interactive Products
Updated: Every 15 minutes

Many people can remember a case when rain switched to sleet or freezing rain during a winter storm. Sometimes, the drop in surface temperatures is caused by precipitation falling into less-than-saturated air near the surface. Some of this precipitation will evaporate, slowly cooling the air until eventually saturating it. In these conditions (persistent precipitation into a stable layer near the surface), the wet bulb temperature can provide an approximate estimate of this ultimate temperature.

Hours Below Freezing

Source: Mesonet Data Pages: Current Maps
Updated: Every 15 minutes

This product was created with horticulture and agriculture in mind. During a freezing event, it provides the duration of the current freeze, in hours, along with the lowest temperature achieved during that freeze.

Mesonet Meteogram

Source: Mesonet Data Pages: Meteograms
Updated: Every 15 minutes

The amount of meteorology and information that can be gleaned from one meteogram is huge. Suffice it to say that meteograms are a rich resource for many meteorological applications, including winter weather. Meteograms can show detail on length and severity of an overnight freeze, or when precipitation began and ended. A number of useful applications are detailed in this issue's "Classroom Exercises" section.

Peak Mesonet Wind Gusts

Source: Mesonet Data Pages: Statistics
Updated: Current Day, every 15 minutes. Previous day created shortly after midnight.

Oklahoma's cold winds can upset people and their things, including plants, greenhouses and fences. These maps show the highest wind gust recorded by each Mesonet station for the current day, and for the previous day.

Oklahoma Fire Danger Model

Source: Mesonet AgWeather Pages (also accessible via Mesonet Data Pages: Public Safety)
Updated: Every 1-3 Hours (hourly during afternoon)

Winter is Oklahoma's driest season, in terms of rainfall and in terms of dew point temperatures. Add the dry winds of winter, and it's not hard to see why late winter is one of the state's most vulnerable periods for wildfire. The Oklahoma Fire Danger Model provides a suite of products specifically designed to monitor wildfire danger across the state.

The OCS/Mesonet Ticker

Source: OCS/Mesonet Ticker Page
Updated: Daily (well, almost daily)

The Ticker was originally launched in 1998 to provide updates during a drought. It has since evolved to present developments in science, research, emerging climate issues and interesting weather phenomena to a wide audience. Sometimes the Ticker is a bit silly, but it sincerely tries to capture, define or elaborate on Oklahoma's climate issues of the day. Ticker subscribers range from 2nd-grade students to media outlets to college professors to members of the U.S. House of Representatives.

Seasonal Freeze Map

Source: OCS/Mesonet Ticker Page
Updated: Daily

This product shows the cumulative number of hours below freezing since October 1st, along with the lowest temperature observed during the season. It is updated daily through May 31st.

Mesonet Monthly Climatological Data (MCD)

Source: Mesonet Data Pages: Summary Products
Updated: Daily

For people seeking documentation of winter's doings in a particular location, this tool provides a very handy and convenient look at how the season has evolved at a nearby Mesonet station. It provides a day-by-day listing of high temperatures, low temperatures, rainfall, sunlight, pressure, prevailing winds and soil temperatures. In addition, it gives monthly totals of rainfall, degree-days, and the number of days meeting certain thresholds (days below freezing, days with precipitation, etc.).

OCS COOP Monthly Climate Calendar

Source: OCS Climate Pages: COOP data
Updated: Annually

One of the newest climate tools to roll onto OCS's climate product showroom, the monthly climate calendar provides a quick insight into the month-by-month climate of about 250 stations across Oklahoma. Presented in a convenient calendar format, it details each day's average high and low temperature and historical probability of significant precipitation. Each day's extremes (records for high and low temperatures, rainfall and snowfall) are listed as well. COOP is shorthand for the National Weather Service's Cooperative Observer Network, which has been in operation in some Oklahoma locations since the 1890's. Many sites have more than fifty years of data and records.

Dates of First and Last Freeze

Source: OCS Climate Pages: Normals and Extremes
Updated: Permanent

These maps help planners determine the risk of an early or late freeze in their area. Basic products such as the average date of the last freeze of spring are included. For those who know their tolerance for risk, percentile dates are included. For example, for those who play it safe, the 90th percentile spring freeze map shows the date by which the last freeze of spring has occurred in nine out of ten years.

These are just a selected set of useful winter-weather tools provided by OCS and the Mesonet. The web pages that house them contain literally thousands of valuable products. Exploring the web pages is highly recommended!

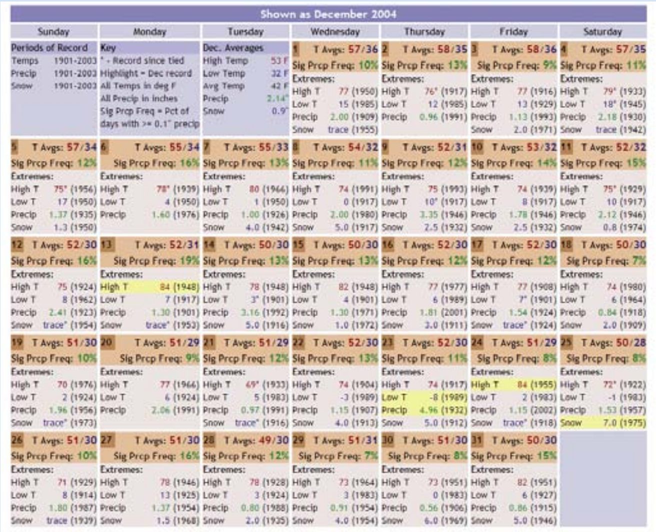
Key to Data Sources: The products listed below are contained in the web presentations of OCS and the Oklahoma Mesonet. The source listed indicates the major web source for the product, plus the section in which the product can be found.

Mesonet Data Pages: The Oklahoma Mesonet's Public Data Pages: http://www.mesonet.org/public/

OCS Climate Pages: OCS's "Oklahoma Climate Data" resource: http://climate.ocs.ou.edu/

Mesonet AgWeather Pages: An multi-purpose agricultural data resource resulting from the Mesonet's inter-campus partnership between Oklahoma State University and the University of Oklahoma: http://agweather.mesonet.org/

The OCS/Mesonet Ticker: A daily e-publication of OCS's Climate Information Group: http://ticker.ocs.ou.edu/

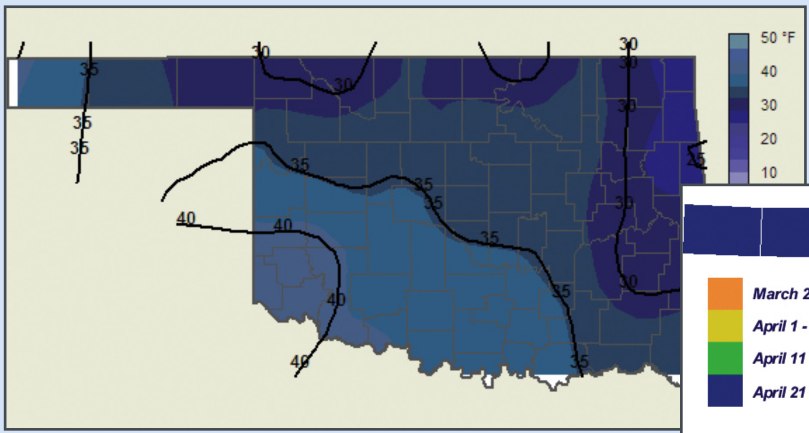


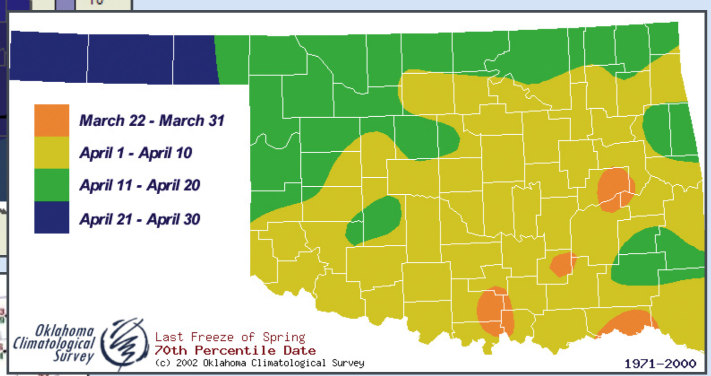
Shown as December 2004

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Periods of Record Temps 1901-2003 Precip 1901-2003 Snow 1901-2003	Key * - Record since tied Highlight = Dec record All Temps in deg F All Precip in inches Sig Prcp Freq = Pct of days with >= 0.1" precip	Dec. Averages High Temp 53 F Low Temp 32 F Avg Temp 42 F Precip 2.14" Snow 0.9"	1 T Avgs: 57/36 Sig Prcp Freq: 10% Extremes: High T 77 (1950) Low T 15 (1985) Precip 2.00 (1909) Snow trace (1955)	2 T Avgs: 58/35 Sig Prcp Freq: 13% Extremes: High T 76* (1917) Low T 12 (1985) Precip 0.96 (1991)	3 T Avgs: 58/36 Sig Prcp Freq: 9% Extremes: High T 77 (1916) Low T 13 (1929) Precip 1.13 (1993) Snow 2.0 (1971)	4 T Avgs: 57/35 Sig Prcp Freq: 11% Extremes: High T 79* (1933) Low T 18* (1945) Precip 2.18 (1930) Snow trace (1942)
5 T Avgs: 57/34 Sig Prcp Freq: 12% Extremes: High T 75* (1956) Low T 17 (1950) Precip 1.37 (1935) Snow 1.3 (1950)	6 T Avgs: 55/34 Sig Prcp Freq: 16% Extremes: High T 78* (1939) Low T 4 (1950) Precip 1.60 (1976)	7 T Avgs: 55/33 Sig Prcp Freq: 13% Extremes: High T 80 (1966) Low T 1 (1950) Precip 1.00 (1926) Snow 4.0 (1942)	8 T Avgs: 54/32 Sig Prcp Freq: 11% Extremes: High T 74 (1991) Low T 0 (1917) Precip 2.00 (1980) Snow 5.0 (1917)	9 T Avgs: 52/31 Sig Prcp Freq: 12% Extremes: High T 75 (1993) Low T 10* (1917) Precip 3.35 (1946) Snow 2.5 (1932)	10 T Avgs: 53/32 Sig Prcp Freq: 14% Extremes: High T 74 (1939) Low T 8 (1917) Precip 1.78 (1946) Snow 2.5 (1932)	11 T Avgs: 52/32 Sig Prcp Freq: 15% Extremes: High T 75* (1929) Low T 10 (1917) Precip 2.12 (1946) Snow 0.8 (1974)
12 T Avgs: 52/30 Sig Prcp Freq: 16% Extremes: High T 75 (1924) Low T 8 (1962) Precip 2.41 (1923) Snow trace* (1954)	13 T Avgs: 52/31 Sig Prcp Freq: 19% Extremes: High T 84 (1948) Low T 7 (1917) Precip 1.30 (1901) Snow trace* (1953)	14 T Avgs: 50/30 Sig Prcp Freq: 13% Extremes: High T 78 (1948) Low T 3* (1901) Precip 3.16 (1992) Snow 5.0 (1916)	15 T Avgs: 50/30 Sig Prcp Freq: 13% Extremes: High T 82 (1948) Low T 4 (1901) Precip 1.30 (1971) Snow 1.0 (1972)	16 T Avgs: 52/30 Sig Prcp Freq: 12% Extremes: High T 77 (1977) Low T 6 (1989) Precip 1.81 (2001) Snow 3.0 (1911)	17 T Avgs: 52/30 Sig Prcp Freq: 12% Extremes: High T 77 (1908) Low T 7* (1901) Precip 1.54 (1924) Snow trace* (1924)	18 T Avgs: 50/30 Sig Prcp Freq: 7% Extremes: High T 74 (1980) Low T 6 (1964) Precip 0.84 (1918) Snow 2.0 (1909)
19 T Avgs: 51/30 Sig Prcp Freq: 10% Extremes: High T 70 (1976) Low T 2 (1924) Precip 1.96 (1956) Snow trace* (1973)	20 T Avgs: 51/29 Sig Prcp Freq: 9% Extremes: High T 77 (1966) Low T 6 (1924) Precip 2.06 (1991)	21 T Avgs: 51/29 Sig Prcp Freq: 12% Extremes: High T 69* (1933) Low T 5 (1983) Precip 0.97 (1991) Snow trace* (1916)	22 T Avgs: 52/30 Sig Prcp Freq: 13% Extremes: High T 74 (1904) Low T -3 (1989) Precip 1.15 (1907) Snow 4.0 (1913)	23 T Avgs: 52/30 Sig Prcp Freq: 11% Extremes: High T 74 (1917) Low T -8 (1989) Precip 4.96 (1932) Snow 5.0 (1912)	24 T Avgs: 51/29 Sig Prcp Freq: 8% Extremes: High T 84 (1955) Low T 2 (1983) Precip 1.15 (2002) Snow trace* (1918)	25 T Avgs: 50/28 Sig Prcp Freq: 8% Extremes: High T 72* (1922) Low T -1 (1983) Precip 1.53 (1957) Snow 7.0 (1975)
26 T Avgs: 51/30 Sig Prcp Freq: 10% Extremes: High T 71 (1929) Low T 8 (1914) Precip 1.80 (1987) Snow trace (1939)	27 T Avgs: 51/30 Sig Prcp Freq: 16% Extremes: High T 78 (1946) Low T 13 (1925) Precip 1.37 (1954) Snow 1.5 (1968)	28 T Avgs: 49/30 Sig Prcp Freq: 12% Extremes: High T 78 (1928) Low T 3 (1924) Precip 0.80 (1988) Snow 2.0 (1935)	29 T Avgs: 51/31 Sig Prcp Freq: 7% Extremes: High T 73 (1964) Low T 3 (1983) Precip 0.91 (1954) Snow 4.0 (1954)	30 T Avgs: 51/30 Sig Prcp Freq: 8% Extremes: High T 73 (1951) Low T 0 (1983) Precip 0.56 (1906) Snow 6.0 (1969)	31 T Avgs: 50/30 Sig Prcp Freq: 15% Extremes: High T 82 (1951) Low T 6 (1927) Precip 0.86 (1915) Snow 5.0 (1946)	

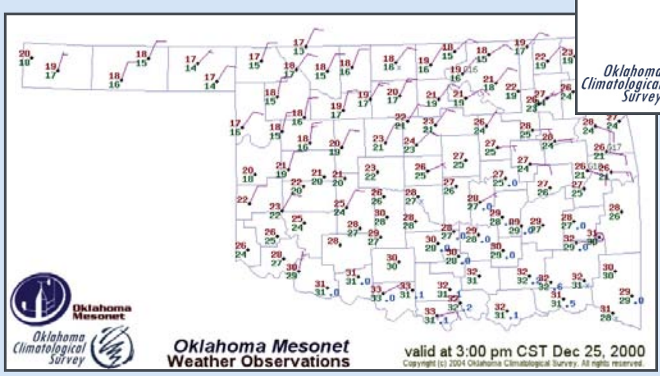
OCS COOP Monthly Climate Calendar:
The OCS COOP Monthly Climate Calendar for December shows daily records, averages and historical precipitation chances for Holdenville. This calendar was based on information collected from 1901-2003.

Wind Chill Map
Real-time Mesonet wind chill values at 4:00 pm November 30th, 2004. This map is updated every 15 minutes at the Mesonet data pages.





Dates of First and Last Freeze:
A map showing the 70th percentile dates for the last freeze of spring. The yellow shade indicates that the last freeze of spring has occurred by the first ten days of April in seven out of ten years.



Current Weather Map / Latest Weather Map:
Mesonet "Current Weather Map" for 3:00 pm December 25th, 2000, during a major winter storm. Wind measurements were near zero across the southeastern third of the state, indicating frozen Mesonet wind vanes.

photo courtesy of Pete Thurmond

Heavy snow caved in the roof of a local car dealership in Buffalo during the Blizzard of '71 (photo courtesy of Joanne McVicker)

Snow buries a farm near Buffalo during the Blizzard of '71 (photo courtesy of Meredith Waugh)

photo courtesy of Pete Thurmond

Winter Birds and Birding in Oklahoma

By: Dan L. Reinking

Bird watching, or "birding," as it is called by those who are actively involved in it, is one of the most popular and fastest growing outdoor hobbies in the U.S. It is popular in Oklahoma as well, with several hundred people involved enough to join the Oklahoma Ornithological Society, a statewide organization promoting the enjoyment and study of birds. Nearly one million more Oklahomans are at least casual birders, part of the one-third of adult Americans who feed wild birds near their homes. The amount of money spent annually on bird feed, binoculars, field guides, travel to see birds, and other related birding expenses amounts to over $20 billion dollars annually in the U.S.—a very significant economic impact! Here in Oklahoma, $193 million was spent on feeding or observing wildlife in 2001, with an undetermined but no-doubt large portion of that total coming from birders.

Why are birds so popular? A variety of reasons make birds the focus of wildlife observation for so many people. First, birds are everywhere. Whether one lives in a downtown urban area or on a farm or ranch, birds are found nearby. Birds are more easily observed than tiny insects or elusive, nocturnal mammals. Birds come in the entire spectrum of colors, and are beautiful to look at, as well as listen to. Their behavior is interesting to watch, and many species are easily attracted to feeders for close observation. Finally, humans have long been fascinated with flight, and gaze enviously at the aerial acrobatics of swallows or the graceful soaring of hawks making those lazy circles in the sky.

Oklahoma's location in the center of the country and its 645 km (400 mile) length means that both eastern birds and western birds can be found within the state. A total of 459 species have been recorded in Oklahoma as of November 2004, giving it one of the largest state lists of birds. Many of these species occur here only a few weeks each year, during spring and fall migration as they pass through Oklahoma heading north or south. Others have occurred here only once, or very rarely as vagrants. The remaining species occur in Oklahoma for a significant portion of their lives, either as breeders here in the summer, as wintering birds here in the colder months, or as year round residents.

Over 200 species of birds nest in Oklahoma, of which about 40 percent disappear from the state during the winter. The Greek philosopher Aristotle explained the annual seasonal disappearance of birds by claiming that they buried themselves in the mud below ponds, but today we understand that that many species move south for the winter, either migrating a short distance to the Texas coast, an intermediate distance to Mexico or Central America, or all the way to South America for some species. Many individuals of our state bird, the Scissor-tailed Flycatcher, spend the winter in Panama, for example. This seasonal exodus might suggest that there are far fewer species of birds in Oklahoma during the winter. In fact, however, there are nearly 200 species in Oklahoma each winter, almost as many species as breed here. The reason for this, of course, is an influx of species from the north, to use Oklahoma's relatively mild winters and largely ice-free reservoirs to escape the harsher climate in Canada and the northern U.S.

Many of the kinds of bird species which leave Oklahoma for the winter months are primarily insectivores, meaning that they eat insects. Flycatchers, vireos, and most warblers are among the species to move farther south when colder

Top picture:
Eastern Towhees can be found in brushy areas across much of Oklahoma during the winter months, though they are only rare breeders in far eastern Oklahoma during the summer.

The Hooded Merganser breeds in a few areas of Oklahoma, but is more common on rivers and lakes during the winter months where it feeds on fish and invertebrates such as crayfish.

Trumpeter Swans are rare winter visitors to Oklahoma, a result of reintroductions of breeding swans in the upper Midwest.

weather renders insects inactive. The kinds of species moving into Oklahoma from the north during the winter months are primarily waterfowl, birds of prey such as hawks, falcons, and owls, and songbirds such as sparrows and finches. Ducks, geese, and a few swans use Oklahoma's lakes and rivers during winter while similar habitats to the north are frozen. Geese may graze on winter wheat and consume waste grain in fields, while some species of ducks feed on fish or aquatic invertebrates, such as the Hooded Merganser pictured feeding on a crayfish.

A number of raptors, including the Rough-legged Hawk, arrive in October and leave in April. Others, such as the Red-tailed Hawk, are resident year-round in Oklahoma, but become more common during the winter months as birds from farther north take advantage of plentiful rodent supplies in Oklahoma's grasslands. Every few years, a Snowy Owl or two makes a winter appearance in central or western Oklahoma, drawing birders from all over the state to see this beautiful arctic species.

Among the most widespread, common, and easily observed birds arriving in Oklahoma during the winter are the sparrows and related species. More than a dozen species arrive here in the fall, only to leave again in the spring. The Harris's Sparrow deserves special mention, in part because Oklahoma is at the heart of the small winter range of this arctic breeder, and also because the late George Miksch Sutton, professor emeritus at the University of Oklahoma for many years, was the first person to find and document a clutch of Harris's Sparrow eggs. Prior to his discovery of a nest near Churchill, Manitoba, Canada on June 16, 1931, the eggs of the Harris's Sparrow were unknown to science.

A few other common winter sparrows in Oklahoma include Dark-eyed Juncos, White-throated and White-crowned Sparrows, Song Sparrows, and Fox Sparrows. The larger Eastern Towhee (pictured) is somewhat elusive, but can sometimes be seen foraging for spilled seed near feeders. Birders can attract the largest variety of species during the winter months by offering a variety of food presented in a variety of feeders. Black oil sunflower seed is the single best seed to offer. It appeals to a large number of species, and can be placed in a variety of hanging or post mounted feeders. Sparrows are attracted to mixed seed scattered on the ground, while woodpeckers and a few other species will utilize suet cakes. Providing water in bird baths is also useful year round.

In certain years, Oklahoma receives large numbers of irruptive northern species, while in other years these species are largely absent. Birds in this category include Pine Siskins, Red-breasted Nuthatches, crossbills, and the rare Evening and Pine Grosbeaks. Early indications are that this winter may be a good one for these visitors from the north, so keeping bird feeders stocked with sunflower seeds may pay off if you watch closely over the coming months.

Dan L. Reinking is a biologist with the George M. Sutton Avian Research Center in Bartlesville (www.suttoncenter.org), an affiliate of the Oklahoma Biological Survey at the University of Oklahoma. He is the editor of the Oklahoma Breeding Bird Atlas published by the University of Oklahoma Press in 2004.

Photos by Bill Horn, an avid photographer who lives in Choctaw and maintains the www.birdsofoklahoma.net web site.

FALL 2004 SUMMARY | By: Gary McManus

In stark contrast to the excessively dry autumn of the previous year, the 2004 version finished well above normal. Diminished only by the 12th driest September on record, the surpluses of October and November combined for the 19th wettest autumn on the record books. The season was also a bit warmer than normal, enough so to rank as the 32nd warmest fall since 1895. After skipping the summer season, tornadoes made a return appearance to the state. Seven tornadoes touched down, one in October and six more in November. None were significant, all being rated F0 or F1 on the Fujita Intensity Scale, although some minor damage was reported with the twisters. Flooding was the main severe weather culprit during the three-month period, with east central and southwestern sections being the favorite target of those occurrences.

Precipitation

Numerous upper-level storm systems took up residence over the southwestern U.S., which provided the state with extended periods of wet weather. A very active tropical season also impacted the state with a visit from the remnants of Tropical Storm Matthew during mid-October, adding to the robust precipitation totals. The western half of the state benefited the most from the wet conditions, as the Panhandle, west central, and southwestern sections finished with autumn rainfall totals ranked in the top-eight wettest on record. The northeastern region fared poorly with an area-averaged deficit of nearly an inch. The far southeastern corner was the driest portion of the state, relatively, with a deficit of nearly eight inches.

Temperature

All three autumn months were warmer than normal. While October was the only month that was significantly warmer than normal, ranked as the 30th warmest on record, the temperatures were enough to help the season as a whole finish with the 32nd warmest fall on record. The Panhandle area, aided by cloud cover and frontal passages, had a normal seasonally-averaged temperature, while the southeast was just over three degrees above normal, the 11th warmest on record.

September Daily Highlights

September 1-4: The onset of September was a bit cooler than normal, and rain was quite sparse over the month's first four days. The nights were mild, with temperatures falling into the 50s and 60s. High temperatures were generally in the low-mid 80s to the low 90s. A weak upper-level disturbance on the 2nd triggered a few showers and thunderstorms, but the activity was not widespread. Another bout of showers occurred in the Panhandle on the 4th, but amounts there were less than a half of an inch.

September 5-6: A cold front entered the northwest during the afternoon of the 5th, generating showers and thunderstorms as the activity gradually traversed the state from northwest to southeast over the next 24 hours. Temperatures dropped considerably behind the front, accompanied by strong northerly winds. Lows ahead of the front remained in the 60s and 70s, but behind the front, temperatures managed to drop into the low-mid 50s. Winds were quite gusty from the south ahead of the air mass, allowing temperatures to reach into the low 90s before the front cooled temperatures into the 70s and 80s.

September 7-13: High pressure built in from the north following the front, ushering in cooler and drier weather. Temperatures finally moderated into more seasonable values beginning on the 10th. Highs reached into the triple digits on the 12th at Hooker, while 90s were the norm elsewhere from the 10th-13th.

September 14-16: Humidity returned overnight on the 14th, borne along on the gusty southerly winds, giving fuel to a few showers and thunderstorms in the northwest. A weak cold front the following day helped more showers form in the northwest, but as with the earlier activity in the area, amounts remained light. The front made its way south on the 16th and more storms fired ahead of it. A few isolated areas in north central and central Oklahoma reported more than an inch of rainfall. Temperatures were not greatly affected by the cold front, however. High temperatures remained in the 80s and 90s, quite seasonable for that point on the calendar.

September 17-20: The weather turned downright hot for the first couple of days of this four-day period. Triple-digit temperatures were widespread in the northern one-third of the state on the 17th. Drier, cooler air on the 19th dropped temperatures into the 70s and 80s on the 19th, although the southern edge of the state still reached into the mid-90s. Tahlequah only managed a cool 68 degrees for a high on the 19th. The 20th followed suit, and temperatures for the most part remained in the 80s.

September 21-24: This period was marked by a strong cold front that cooled the state considerably, while providing the month's best rain chances for some sections of the state. The northwest was the focus for showers and thunderstorms on the 21st. The rain lingered in the Panhandle and northwestern Oklahoma, along with the cold front, on the 22nd. Hooker received over 2.5 inches of rainfall, while most of the Mesonet sites in the Panhandle recorded more than an inch. The cold front made slow progress through the state, finally reaching southern Oklahoma and the 23rd. Southwestern Oklahoma was the focus for this round of precipitation, with one-to-two inches being commonly found in the region.

September 25-30: The month's final six days were more befitting of late September. High temperatures were generally in the 70s and 80s, while lows dropped into the 40s and 50s. A few showers popped up from time to time, but in all, the weather was dry and seasonable. This period was a very pleasant precursor to fall, and a sign that summer had lived its final days.

October Daily Highlights

October 1-7: Highs on the month's first day reached the 70s and 80s, but the cold front brought cooler and drier air to the region the following day. Northern Oklahoma dipped into the 30s on the 2nd, with Buffalo reaching the freezing mark. Another cold front brought widespread showers and thunderstorms the morning of the 4th. Very heavy rainfall was recorded in several areas, especially in the southwest corner of the state. The Mesonet site at Hobart received nearly five inches of rainfall, and Apache recorded over four inches. Heavy rain in the northeast caused flooding in Caddo, Creek, Kiowa, and Tulsa counties.

October 8-11: Dense fog overnight on the 8th hampered travelers in lieu of a cold front approaching from the northwest. The front pushed through the area during the day, generating isolated showers and storms. Heavier rainfall fell on the 10th. The rain continued overnight into the 11th. Most of the rainfall of the 10th and 11th was due to moisture provided by the remnants of Tropical Storm Matthew which moved over western Arkansas from the Gulf of Mexico and Louisiana. As the activity died down late on the 11th, much of the state was left with one to three inches of rainfall.

October 12-14: Skies slowly cleared from the west to east on the 12th as the upper level low which brought the unsettled weather of the previous couple days moved to the east. Northwesterly winds provided cooler temperatures, with lows in the 40s and 50s, and highs from the mid-60s to mid-70s. Another cold front moved in overnight on the 13th. Northerly winds from 15-25 mph combined with low temperatures in the 40s and 50s to produce a dreary pair of days. Rain showers behind the front dropped light rain in eastern sections on the 14th, and lows plummeted in the northwest into the 30s.

October 15-21: This week-long period remained dry for the most part, and was marked by several frontal passages, both cold and warm. An intense low pressure system moving east across southern Kansas kicked winds up from the south on the 18th, drawing up warm, moist air from the Gulf of Mexico. The period ended on the warm side, with Oklahoma City tying a record high on the 21st at 90 degrees.

October 22-24: More record warmth for Oklahoma City on the morning of the 22nd. The low temperature on the 22nd at Oklahoma City was 65 degrees, which ties the record for warmest minimum temperature for that date, previously set in 1941. A strong upper-level storm brought storms to the state once again. Many areas in the northeast received well over an inch of rain.

October 25-31: The month's final week was marked by unsettled weather. Widespread rains of more than an inch occurred on the 26th and 27th. The Mesonet site at Eufaula reported over four inches on the 27th, and Stigler had nearly three inches. Mostly cloudy skies and unseasonably warm high and low temperatures were the big story for the next couple of days, setting the stage for another stormy day on the 31st. Flooding was reported in Cherokee, McIntosh, and Muskogee counties.

November Daily Highlights

November 1-3: Widespread showers and thunderstorms greeted the new month on the 1st. The rain was quite heavy in the eastern half of the state with the east central section experiencing amounts generally between two and three inches. Flooding was reported in several locations due to the torrential downpours. Mostly cloudy skies were the norm throughout this cool, damp period. Light rain and drizzle seemed present consistently, with occasional bouts of heavier precipitation scattered across the area.

November 4-9: Fair skies and light winds dominated this pleasant stretch of the month. After a cool beginning, the temperatures began to climb into the 60s and 70s statewide, and even reached 80 degrees at Walters on the 7th.

November 10-12: Showers and storms returned overnight on the 10th in advance of the upper level disturbance near the Four Corners area. Severe thunderstorms formed in central Oklahoma, dropping six tornadoes, according to unofficial tallies. The storms spawned three weak tornadoes in northeastern Oklahoma County before traveling into Lincoln County, where three more twisters formed. Most of the tornadoes were weak, being rated F0 intensity, with the remaining two rated at F1. The longest-lived twister traveled on the ground for three miles north of Chandler. This F1 twister was on the ground for seven minutes. In addition to the tornadoes, hail and high winds accompanied the storms, with several reports of hail to the size of quarters in central and northeastern Oklahoma.

November 13-18: This six-day period was marked by seasonable temperatures, gray skies, heavy rainfall, and very little sunshine. The heaviest rainfall occurred on the 15th as a series of upper-level disturbances traveled outwards from the large upper-level storm. Rainfall amounts greater than two inches were common across the southwestern corner, but the entire state received precipitation. The remainder of the period saw plenty of fog and showers, with highs in the 50s and 60s being common, and very mild low temperatures in the 40s and 50s.

November 19-24: Skies finally cleared on the 19th, and highs in the 50s and 60s with light winds accompanied the sunshine. A weak cold front moved in overnight, however, becoming stationary across southern Oklahoma. Showers and thunderstorms formed along the front, with a few of the storms exceeding severe limits. Large hail was reported with the storms in Greer, Jackson, and Harmon counties. The upper-level storm that generated all the precipitation finally moved over and away from the state on the 24th, but not before providing northern Oklahoma with the state's first snowfall of the season. Several locations in the northwest reported snowfall of up to four inches, with other amounts commonly in the one-two inch range.

November 25-30: Thanksgiving morning on the 25th saw the first freeze for most of the state, which prompted freeze warnings to be issued by the National Weather Service. A strong cold front moved across the state on the 27th, bringing cloudy skies and colder weather. Another strong cold front plunged into the state on the 29th, generating rain showers ahead of the front and snow showers behind. Harper, Woods, and Woodward counties reported one-three inches had fallen by nightfall, with another inch falling overnight into the 30th. The month ended fittingly, with gray skies, light rain, and drizzle over much of the state.

Fall 2004 Statewide Extremes

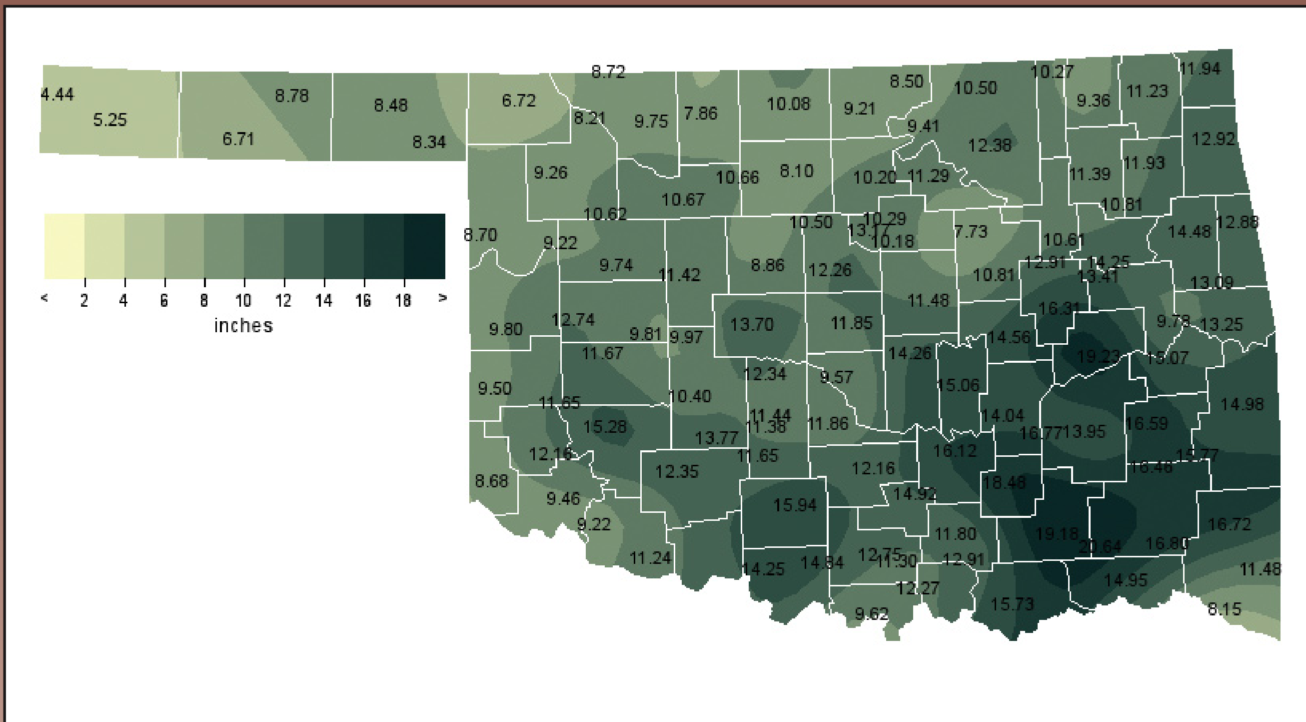
Description	Extreme	Station	Date
High Temperature	102ºF	Buffalo, Cherokee	Sept. 17th
Low Temperature	4ºF	Boise City	Nov. 30th
High Precipitation	20.64 in.	Antlers	
Low Precipitation	4.44 in.	Kenton	

Fall 2004 Statewide Statistics

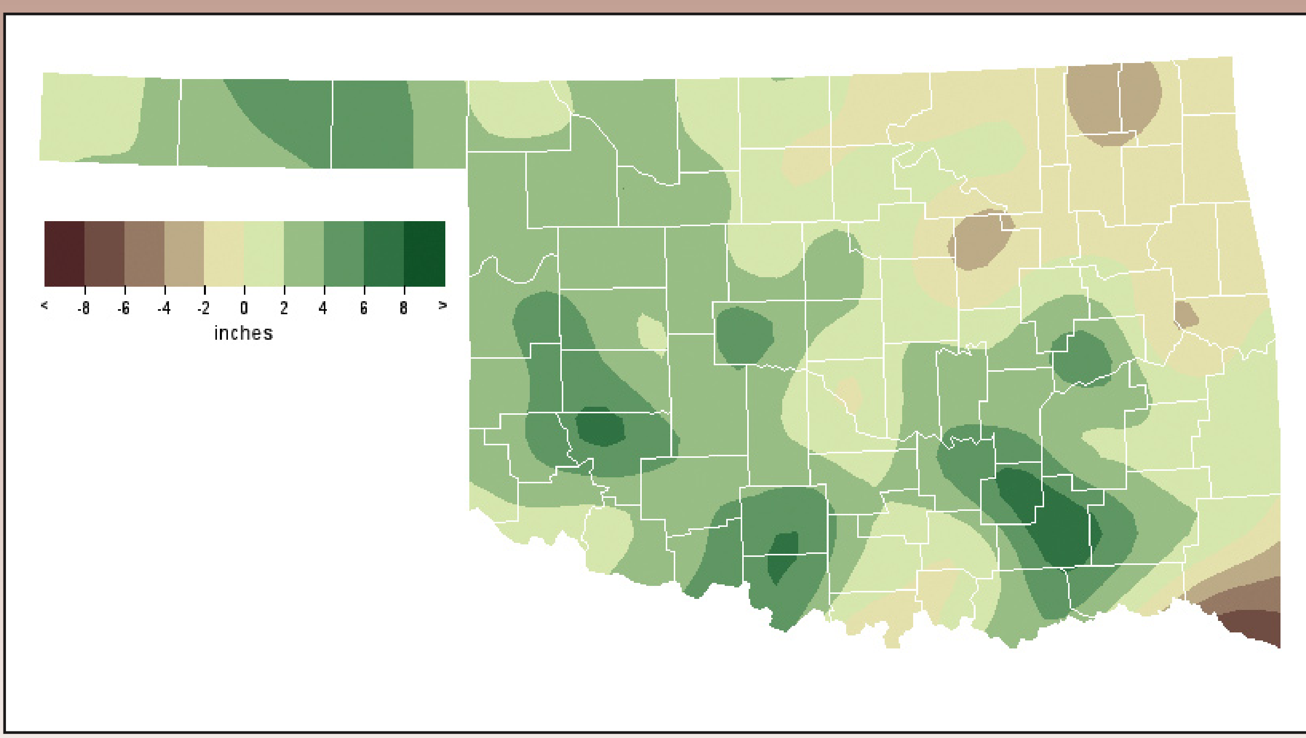
	Average	Depart.	Rank (1892-2004)
Temperature	62.2ºF	1.6ºF	32nd Warmest
	Total	**Depart.**	**Rank (1892-2004)**
Precipitation	11.60 in.	1.59 in.	19th Wettest

FALL 2004 SUMMARY

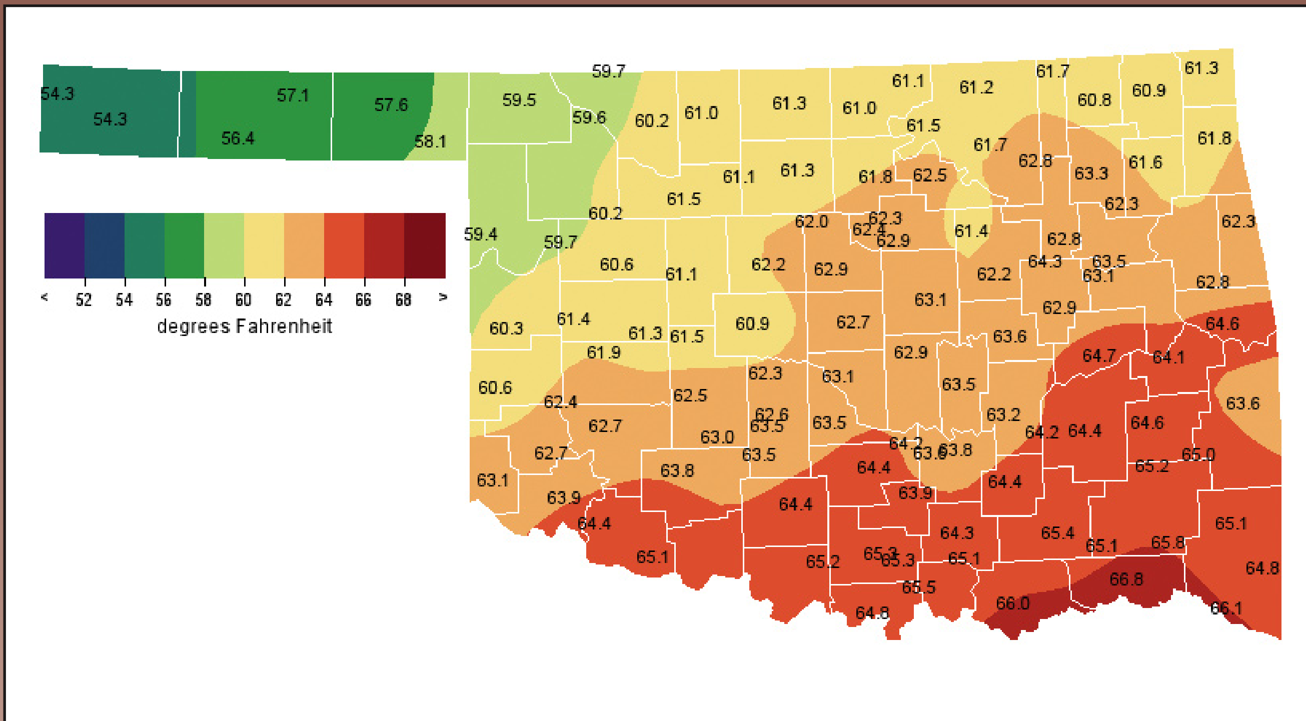
Observed Rainfall



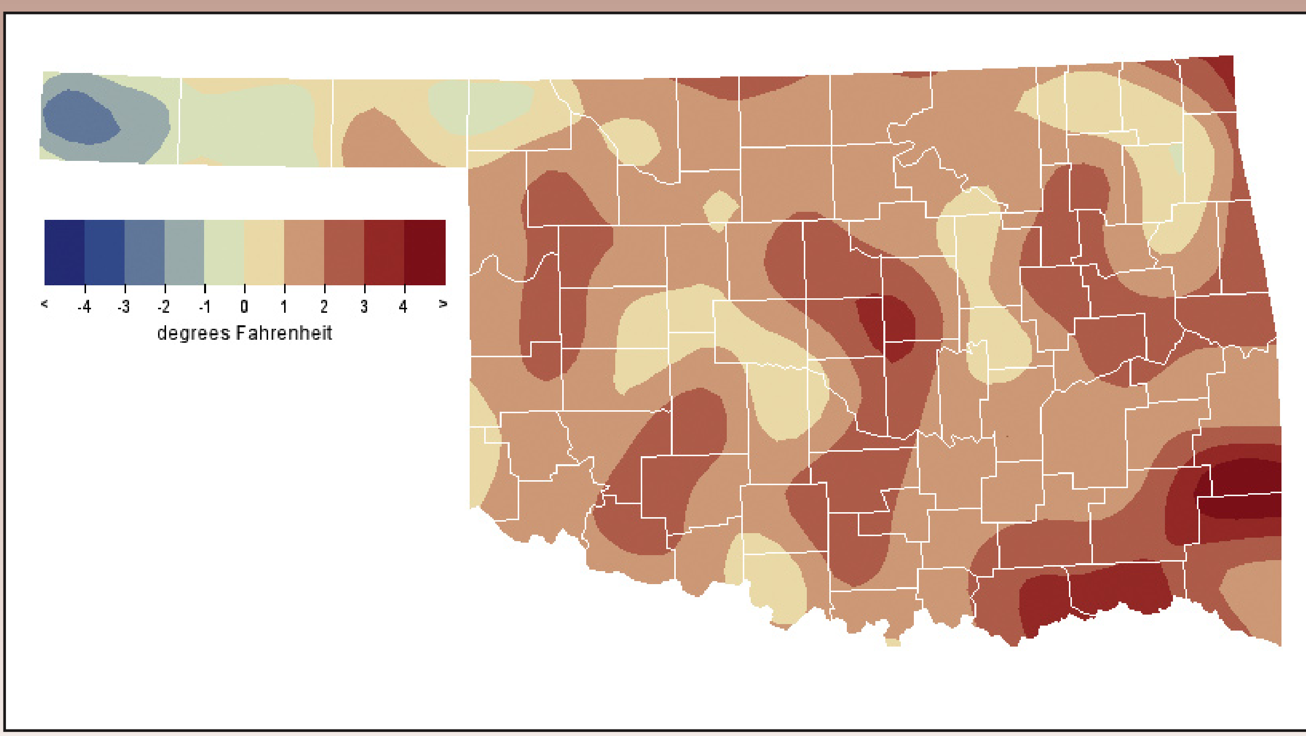
Rainfall Departure from Normal



Average Temperature



Temperature Departure from Normal



FALL 2004 SUMMARY

Fall 2004 Mesonet Precipitation Comparison

Climate Division	Precipitation (inches)	Departure from Normal (inches)	Rank since 1895	Wettest on Record (Year)	Driest on Record (Year)	2003
Panhandle	7.18	2.75	7th Wettest	10.34 (1941)	0.70 (1956)	3.54
North Central	9.37	1.50	24th Wettest	17.19 (1986)	0.97 (1910)	5.07
Northeast	11.31	-0.72	48th Wettest	27.94 (1941)	2.60 (1948)	9.27
West Central	10.62	3.30	8th Wettest	20.17 (1986)	1.01 (1954)	4.25
Central	11.65	1.07	25th Wettest	20.42 (1923)	2.11 (1910)	7.22
East Central	14.24	0.71	28th Wettest	22.86 (1923)	2.40 (1948)	9.54
Southwest	11.25	3.15	8th Wettest	18.40 (1986)	0.95 (1910)	2.56
South Central	14.15	2.46	21st Wettest	24.03 (1923)	2.18 (1948)	8.63
Southeast	15.25	0.65	26th Wettest	25.15 (1984)	3.11 (1963)	11.45
Statewide	11.60	1.59	19th Wettest	18.15 (1923)	2.44 (1910)	6.87

Fall 2004 Mesonet Temperature Comparison

Climate Division	Average Temp (F)	Departure from Normal (F)	Rank since 1895	Hottest on Record (Year)	Coldest on Record (Year)	2003
Panhandle	57.1	0.0	49th Coolest	62.7 (1963)	53.6 (1976)	57.3
North Central	60.8	1.2	40th Warmest	65.8 (1931)	56.0 (1976)	58.3
Northeast	62.0	1.9	23rd Warmest	66.6 (1931)	55.3 (1976)	59.7
West Central	61.0	1.3	35th Warmest	65.7 (1931)	55.9 (1976)	59.3
Central	62.7	1.5	25th Warmest	67.3 (1931)	56.9 (1976)	60.7
East Central	63.7	2.1	19th Warmest	67.6 (1931)	56.7 (1976)	62.1
Southwest	63.3	1.5	27th Warmest	66.9 (1931)	57.1 (1976)	62.1
South Central	64.7	1.8	23rd Warmest	68.3 (1931)	57.8 (1976)	62.9
Southeast	65.2	3.1	11th Warmest	68.3 (1931)	56.8 (1976)	62.7
Statewide	62.2	1.6	32nd Warmest	68.3 (1931)	56.2 (1976)	60.5

Fall 2004 Mesonet Extremes

Climate Division	High Temp	Day	Station	Low Temp	Day	Station	High Monthly Rainfall	Station	High Daily Rainfall	Day	Station
Panhandle	102	Sep 17th	Buffalo	4	Nov 30th	Boise City	8.78	Hooker	2.51	Sep 22nd	Hooker
North Central	102	Sep 17th	Cherokee	18	Nov 30th	Woodward	10.67	Fairview	1.78	Oct 10th	Red Rock
Northeast	96	Sep 17th	Pawnee	23	Nov 30th	Foraker	14.25	Porter	2.25	Oct 7th	Claremore
West Central	99	Sep 17th	Butler	20	Nov 30th	Cheyenne	12.74	Butler	2.01	Oct 26th	Butler
Central	100	Sep 17th	Ninnekah	21	Nov 30th	Oilton	15.06	Bowlegs	3.83	Oct 10th	Shawnee
East Central	96	Sep 17th	McAlester	24	Nov 30th	Cookson	19.23	Eufaula	4.03	Oct 27th	Eufaula
Southwest	101	Sep 17th	Mangum	25	Nov 30th	Mangum	15.28	Hobart	4.83	Oct 7th	Hobart
South Central	99	Sep 17th	Ringling	24	Nov 30th	Sulphur	19.18	Lane	4.34	Oct 10th	Centrahoma
Southeast	98	Sep 17th	Talihina	25	Nov 30th	Antlers	20.64	Antlers	4.52	Oct 10th	Antlers
Statewide	102	Sep 17th	Buffalo	4	Nov 30th	Boise City	20.64	Antlers	4.83	Oct 7th	Hobart

Agriculture Weather Watch

By Albert Sutherland, CPH, CCA
Mesonet Assistant Extension Specialist
Oklahoma State University

This is the first time that this writer has been able to skip over the subject of drought. But lest you feel slighted as a longtime Oklahoman, let me use the word drought in the context that western Oklahoma IS NOT facing droughty conditions for the first time in many years.

The easiest way to see the value of our repeating rains is to look at the deep level soil moisture maps on the Oklahoma AgWeather website (http://agweather.mesonet.org). At both 24- and 30-inch depths in early December, the soil moisture maps of Fractional Water Index (FWI) show good moisture across most of Oklahoma. Western Oklahomans have not seen this much deep soil moisture for many years. West of Interstate-35 on December 6, 22 out of 28 Mesonet sites had 24-inch soil moisture sensors with an FWI of 0.8 or higher. At the 30-inch depth, 17 out of 24 Mesonet soil moisture sensors showed an FWI of 0.8 or higher. It was only a few months back in September when the majority of soil moisture sensors at both depths had a majority of readings below 0.3 for western Oklahoma. Even eastern Oklahoma had many counties with little deep soil moisture.

Rain, rain, rain is good for next year's crops and pasture, but bad for crops still in the field this year. As December arrived only 69 percent of the sorghum had been harvested, 80 percent of the soybeans and 76 percent of the peanuts. That means a lot of farm revenue is still out in the field. Cotton producers are also hoping for dryer weather in December to move ahead with harvest. Harvest delays mean poorer quality cotton, which brings a lower price. Peanut growers are in a bind because recent freezes will cause the vines to breakdown before the peanuts can be dug.

Growers are torn between needing soil moisture and finishing up harvest. Those with crops already "in the barn" are in good shape, while those with acres yet to harvest may end up seeing this year's profits completely disappear.

Wheat fields and pasture are in reasonable shape. The cloudy weather has slowed wheat plant growth. The rains have moved nitrogen into deeper soil levels, to where it is just out of reach of the plants. This can be seen in the large light green to yellow colored areas in wheat fields. With sunny days the roots will soon grow into the soil area with the nitrogen and take it into the plant. So, we should see these poorly colored wheat fields turn to a dark green color by the third week in December.

This has been a mild fall season for livestock. While rain reduces the insulation value of an animal's coat, the air temperatures have been mild and the winds lighter than many Oklahoma fall months.

Note:
The fractional water index scale is a 0.0 to 1.0 scale. With 1.0 indicating a saturated soil and 0.0 a powder-dry soil. Below is a fractional index chart and generalized plant responses, when soils remain at this level for long periods of time.

1.0 = saturated soil
0.8-1.0 = Optimum water for plant growth
0.5-0.8 = Limited plant growth
0.3-0.5 = Plant wilting
0.1-0.3 = Plant death
<0.1 = Barren

Urban Farmer

December

- Complete yard clean-up. It is important to remove leaves from cool-season lawn areas to prevent grass die-out.
- Prune trees. Make proper pruning cuts by sawing on the outer edge of branch collars. This is a raised doughnut shaped area at the branch base. Do NOT use pruning paint, it slows gro wth that will cover over branch cuts.
- Clip holly or evergreen plants for Holiday Season decorations. Use florist foam and a container that can hold water to keep arrangements looking fresh.

January

- Spray dormant oil to control insect pests on ornamentals and fruit trees. Apply when the daytime temperature is above 50∞F and the nighttime temperatures above freezing for 3-4 days. Use the summer rate for evergreen shrubs.
- Roundup can be applied to dormant bermudagrass areas to control green winter weeds. For best results, apply on a day when the air temperature will be in the upper 40s or higher.
- Prune trees that are prone to excessive sap flow. These include pines, willows, elms, and maples. Do NOT apply pruning paint. It will not stop excessive sap flow and will slow callous growth over branch cuts.
- Plan spring landscape projects.
- Peruse plant and seed catalogs or websites. These colorful catalogs and websites will provide you many ideas for landscape projects and brighten a cold weekend.

- Collect seed trays, media, and seeds to start transplants. Start seeds for hardy herbs (cilantro, dill, parsley) and hardy vegetables (broccoli, cabbage, onion) to be transplanted after mid-March.

February

- Test lawn and garden soils. Contact your local County OSU Extension office for soil testing bags, pricing, and sampling information.

- Prune fruit trees.

- Spray peach trees with lime-sulfur soon after pruning and before bud swell to control peach leaf curl.

- Fertilize pecan and fruit trees based on a soil test. In general, apply one tenth of a pound of actual nitrogen per year of tree age per tree, up to a maximum of 3 pounds of actual nitrogen per tree for pecan, 1 pound of actual nitrogen per tree for apple and plum, and 0.5 pound of actual nitrogen per tree for peach, pear, and cherry.

- Fertilize ornamental trees and shrubs. Use a quick release fertilizer at a rate of 1 pound of nitrogen per 1,000 square feet of root area. Tree and shrub roots extend out 2-3 times the distance from the trunk to the branch ends (tree dripline).

- Fertilize tall fescue after mid-February. Use a quick release fertilizer at a rate of 0.5 to 1 pound of nitrogen per 1,000 square feet

- Start seeds for tomatoes and peppers to be transplanted in early April and flowers (wax begonia, seed geranium, impatiens, lobelia, salvia, verbena, and vinca) to be transplanted in late April.

- Shear evergreen shrubs and prune summer flowering shrubs. Wait to prune spring flowering shrubs until just after they bloom.

OAEC Touchstone Energy

Oklahoma Association of Electric Cooperatives

The Oklahoma Climatological Survey would like to thank the Oklahoma Association of Electric Cooperatives (OAEC) for its sponsorship of the "Winter 2004-2005" edition of *Oklahoma Climate*. OAEC is a statewide association created and supported by local electric distribution and generation/transmission cooperatives. OAEC is comprised of 30 member systems, 28 in Oklahoma and two Arkansas systems with a portion of their membership residing in Oklahoma.

Formed in September 1942, OAEC's purpose is to:

- Obtain the fairest possible treatment from state and local governments by acquainting legislators, congressional leaders and other governmental officials with the electric cooperative program.

- Enlist the active support of communities by explaining the value of electric cooperatives to the local community and its economy.

- Improve the service quality of member systems by acting as a clearinghouse where leaders can exchange ideas and experiences on common problems or opportunities.

- Preserve and strengthen individual cooperatives providing them with professional services:

    - Safety and Loss Control Program
    - Self-Insured Workers Compensation Group Insurance Pool
    - Legislative Research and Tracking Service
    - Professional Development Programs for directors, managers, supervisors and staff personnel.
    - Mutual Aid Disaster Planning and Coordination
    - Economic Development Programs
    - Publication of Oklahoma Living, a magazine that reaches over 280,000 homes monthly
    - Advertising and Marketing Campaigns

The Next Generation of Agricultural Decision Support

By Albert Sutherland

So many days come and go just like the last day. No real change, just the same old grind. When one looks at farming some things do stay the same, like planting seeds in the soil, praying for the right amount of rain at the right time and battling pests. Tractors move up and down Oklahoma fields just as they have for decades. While farming may look the same from a distance, there are many technology changes coming to today's farms. Many farmers drink their morning coffee, while checking weather and market information on the

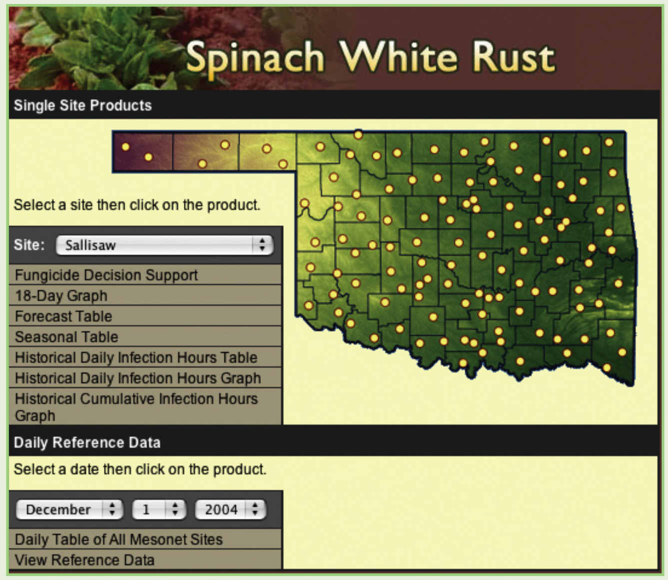


Figure 4: Spinach White Rust

Internet. They use global positioning satellites (GPS) to pinpoint field locations and record crop data. New variable rate fertilizer application makes it possible to use a different fertilizer rate in every 4 square feet area of a wheat field.

Oklahoma farmers now have another new tool to help them grow better crops and reduce farm inputs. The Oklahoma Mesonet team has just created the next generation in pest control decision support models. This new generation product is the Spinach White Rust Model, available on the Oklahoma AgWeather website (http://agweather.mesonet.org). While this model is specific for a single foliar spinach disease, it is the first of a number of new pest control alert products that adds a whole new dimension to pest management.

Spinach white rust is a fungal disease that causes white, blister-like leaf pustules on the lower leaf surface. Leaves with numerous pustules discolor and die. The white rust fungus flourishes when the relative humidity is above 90% and air temperatures are mild. This disease is common in spinach fields in Oklahoma, Texas and other southwestern US states.

The new Spinach White Rust Model products and features improve a grower's ability to implement integrated pest management (often referred to as IPM) principles. Integrated pest management seeks to manage pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks. The new Spinach White Rust Model provides an excellent weather-based tool for growers to better meet the goals of IPM pest management.

Farmers have long sought out ways to stay ahead of disease, insect and weed pests. Disease organisms are often a grower's biggest pest challenge, because they are an unseen pest. Most plant disease organisms are microscopic, so farmers can't just look at their crop plants and see disease pests at work. Diseases reveal their work as disease symptoms become visible on the plant, but this may be days or weeks after the initial infection. Plant disease protection must be in place before disease infection occurs. Fungicides must be on the leaf surface to protect penetration by germinating plant disease fungi. Once a fungus is in the leaf, it is too late.

Although disease organisms can't be seen, weather-based computer models make it possible to identify when the weather is prime for disease outbreak. Up to now, these models have only provided information about yesterday's conditions by calculating past disease infection hours. Infection hours are calculated based on the amount of time the relative humidity and air temperature are adequate for fungal growth. The shortcoming with past disease models has been that they are only able to look backwards. Imagine trying to drive forward by only looking in the rearview mirror. Sometimes, based on what has just occurred, growers guess right about what is coming. Other times, when the weather takes a sharp curve, they find themselves in a wreck.

The new Spinach White Rust Model is like adding a windshield view, while doubling the size of the rearview mirror as well. It adds an infection hour forecast component to current season data and provides a historical perspective in one easy to use graphical product. The forecast provides a predictive view of spinach white rust infection hours for up to 84 hours ahead. This provides growers a chance to decide if disease control is needed and lineup disease control resources, prior to disease outbreak. By using the Spinach White Rust Model, a spinach producer can stay ahead of the white rust fungi and avoid crop wrecks.

The basic Spinach White Rust Model product is an 18-day Graph that shows the spinach white rust infection hours for the last 14 days, the current day and up to 84 hours into the future (Figure 1). This is a quick access product that provides a good overall look at disease activity for each Oklahoma Mesonet tower location.

For a more detailed disease analysis, growers can access a Fungicide Decision Support product (Figure 2). It factors in spinach growth stage, last fungicide application, and the fungicide control window in estimating the likelihood of disease outbreak. When a last spray date is entered, the decision support product determines the end of the disease control window, calculates the disease infection hours from that time and provides a recommendation to apply or not to apply a fungicide. A recommendation to apply a fungicide is made when 12 or more infection hours have accumulated since the first true leaf stage or since the end of the fungicide control window.
Both the 18-day and Fungicide Decision Support Graphs provide a historical perspective of daily infection hours (Figure

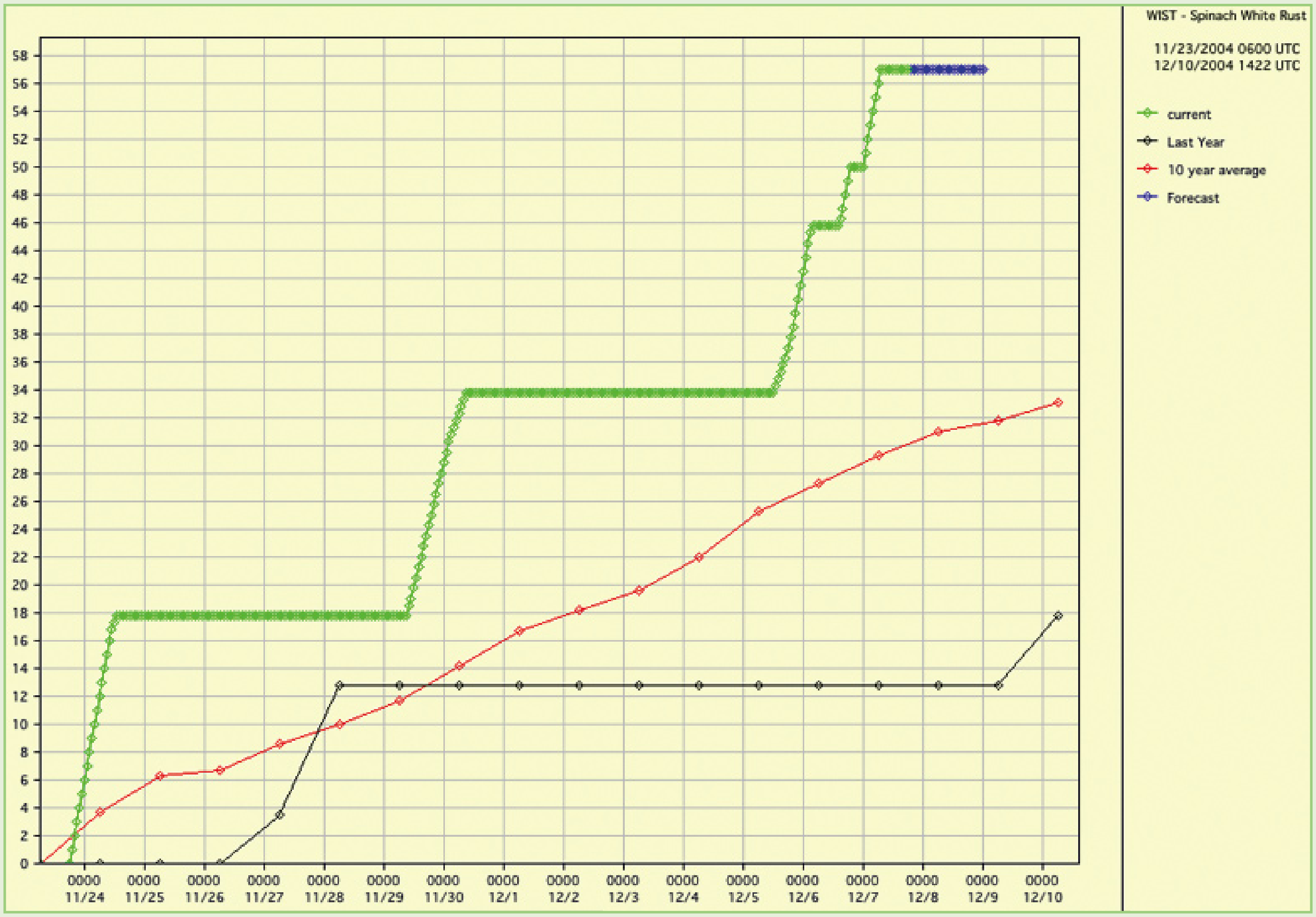


Figure 1: Spinach White Rust 18-day Infection Hour graph for Wister.

2). The 10-year average of daily infection hours, based on Oklahoma Mesonet data since 1994, is shown as a red graph line with diamonds. A black graph line with diamonds shows the daily infection hours for the last growing season.

Another product is the Historical Cumulative Infection Hours Graph. It shows the season long cumulative infection hours for each growing season since 1994 (Figure 3). This graph can be used to identify years similar to the current year. The effectiveness of disease control strategies from that year can be considered as decisions are made on disease management strategies for the current season.

Along with the new model features, a new product interface is being used with the Spinach White Rust Model (Figure 1). This interface allows the user to select any Oklahoma Mesonet tower location and then choose any product. That means most products pop onto the screen after only two clicks, rather than the four or five mouse clicks with older Oklahoma Mesonet agricultural models. Once an Oklahoma Mesonet tower location is selected, the tower location stays the same until changed again. This makes it easier to cruise through a number of model products for the same station.

The Spinach White Rust model is another example of the winning teamwork between agricultural specialists at Oklahoma State University and weather experts with the University of Oklahoma. The team members for the Spinach White Rust Model were John Damicone, OSU Plant Pathology Specialist, Rafal Jabrzemski, OCS Scientific Programmer/Analyst, Stdrovia Blackburn, OCS Visual Communications Specialist, Albert Sutherland, OSU Assistant Extension Specialist, Billy McPherson, OCS Software Engineer, and J.D. Carlson, OSU Agricultural Meteorologist.

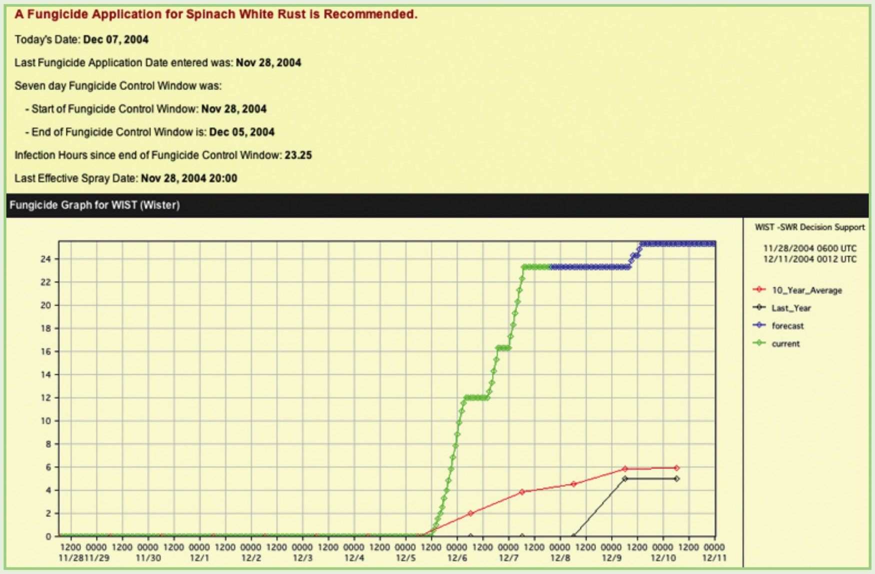


Figure 2: Spinach White Rust Decision Support Graph for Wister.

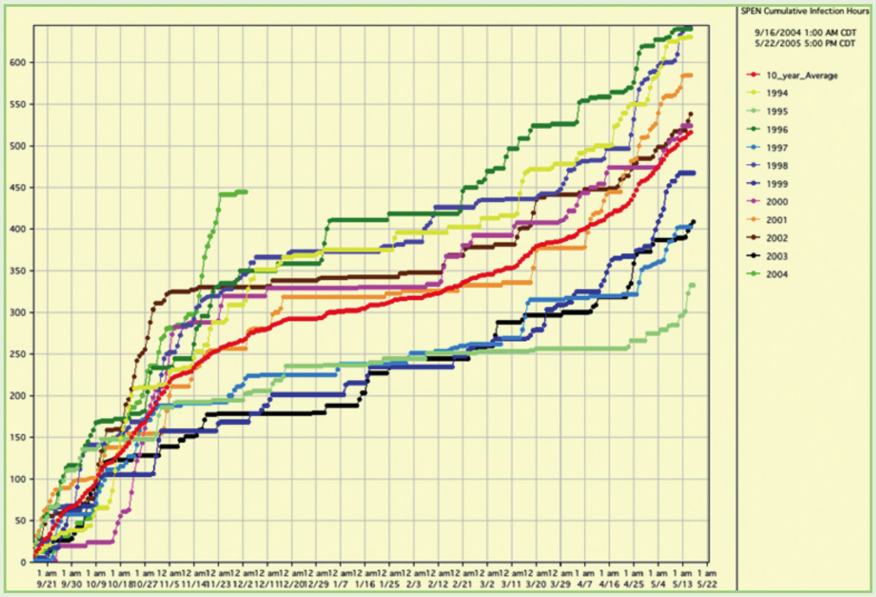


Figure 3: Spinach White Rust Decision Support Graph for Wister.

METEOGRAMS by Andrea Melvin

Meteograms are graphs of standard atmospheric variables, presented in an easy-to-read chart, for a given station. The graphs plot each 5-minute Oklahoma Mesonet observation over the past 24 hours. The charts include:

- air temperature and dewpoint (with the freezing line highlighted);
- wind speed, direction, and gusts;
- barometric pressure at the site (i.e., station pressure) (Note: This graph has been omitted from these examples.);
- accumulated rainfall; and
- solar radiation (with the theoretical maximum highlighted).

The example meteogram is from Norman, OK on January 29-30, 2002. As you read from left to right across the graph, you see data collected 24 hours ago to the most current data. Pay close attention to the scale when viewing meteograms from day to day. The numerical values of the scale adjust to fit the maximum value recorded. The minimum value may not be zero. Along the top of the graph, you will find the time axis. The axis is shown as a 24-hour clock (e.g. 00 is Midnight, and 15 is 3 pm). A vertical gray line marks 00 or midnight on each of the graphs.

Temperature (TAIR) and Dew Point (TDEW)

The pink curve represents air temperature and the green curve dewpoint temperature. The scale used is in degrees Fahrenheit (°F). A horizontal gray line highlights the freezing line. This line will not be visible on graphs with a scale minimum above 32°F. Notice that between 11 pm and 12 am the temperature at Norman drops below freezing.

Wind Speed (WSPD), Wind Direction (WDIR), and Maximum Wind Speed (WMAX)

The second graph shows both wind speed in light blue and wind gusts or maximum wind speed in dark blue. The winds are measured in miles per hour (mph) and the scale is shown on the left. The small yellow circles represent the direction of the winds. Using the scale on the right, the values are listed as N for north, NW for northwest, W for west, SW for southwest, S for south, SE for southeast, E for east, NE for northeast, and N for north. Usually, wind direction is given in compass degrees (e.g., north is 0° and 360°).

From 4 am to noon, the winds in Norman are from the north and northeast at less than 6 mph gusting to less than 9 mph.

Pressure (PRES)

The third graph on a typical meteogram is barometric pressure in millibars. All of the meteograms found on the Oklahoma Mesonet website contain this graph. For this example we have removed the pressure graph to save space.

Rainfall (RAIN)

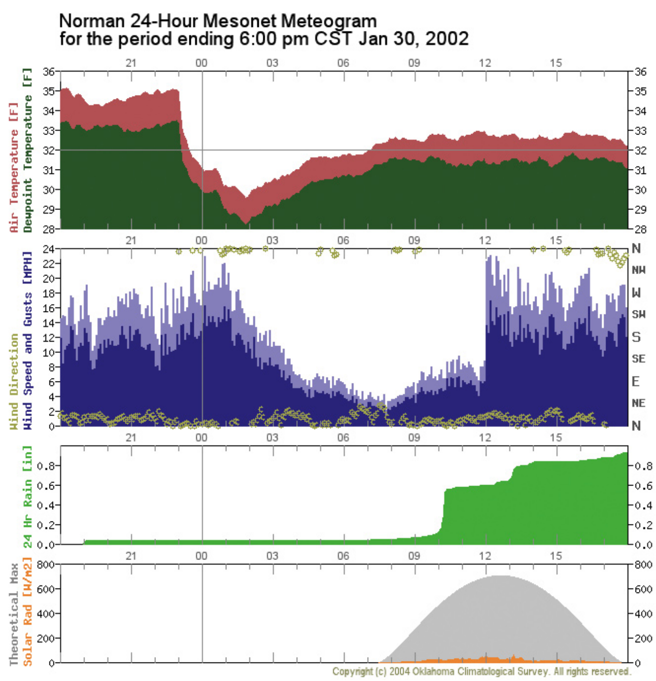
The third graph (i.e., fourth graph on a typical meteogram) is rainfall in inches. Unlike the other graphs of a meteogram, the rainfall graph represents a 24-hour accumulation of rainfall beginning at 0 UTC or 6 pm CST (7 pm CDT). Each day at 0 UTC the rainfall amount is reset to 0 inches. This is the only time the rainfall amount will appear to decrease. At all other times the graph will be blank (e.g., no rain) or steady (e.g., no rain falling at that time) or increasing (e.g., raining at that time). The graph will appear like a staircase. When rain is falling, the graph will increase. When the rain stops, the graph will level off and continue to report the same value until rain is detected or the time become 0 UTC.

In our example, it began to rain lightly in Norman at 7 pm on November 29th and quickly stopped. Drizzle or mist began again at 7 am on the 30th. At 10 am heavier rain was recorded.

Solar Radiation (SRAD)

The fourth graph (i.e., fifth graph on a typical meteogram) is solar radiation in watts per square meter (W/m2). Solar radiation is a measurement of the amount of sun energy absorbed by the earth's surface. High amounts of solar radiation correlate with clear skies while lower amounts represent cloudy skies. The gray curve shows the maximum amount of solar radiation the station could receive based on location, day of year, and time of day.

For Norman, the amount of solar radiation received is much less than the maximum value. This was an extremely overcast day. Little solar radiation actually reached the surface.



Classroom Activity

Winter weather events can be just as damaging as tornadoes. Winter weather impacts travel, school, and the ability of utility companies to supply electricity for lights and heat. In this activity, we will look back at a major winter storm during the winter of 2001-02. The following meteograms are based on data taken at the El Reno Mesonet site. El Reno is located in central Oklahoma, west of Oklahoma City. This event caused major damage to our electric utility infrastructure.

For questions 1-7, refer to the meteograms from El Reno. Day One refers to the meteogram ending 6 pm on January 30th, while Day Three refers to the meteogram ending 6 pm on February 1st (Day Two is not shown). Questions 8-11 look at the effects of a winter storm on an Oklahoma Mesonet station and our utility companies.

1. The Day One temperature trace indicates that temperatures dropped below freezing at what time? After midnight, what was the highest temperature observed at El Reno? What would happen to liquid water at this temperature?

2. Does the solar radiation panel of the Day One meteogram indicate clear or cloudy skies? Explain your answer.

3. After midnight on Day One, the wind speed slowly declined to near zero, and very little rainfall was recorded. However, moderate rain was falling at the time. Knowing this, what caused the Mesonet station's wind vane to stop turning, and prevented the rain gauge from recording rainfall?

4. Temperatures remained below freezing throughout Day Two (not shown). When did the temperature rise above freezing on Day Three?

5. Does the Day Three solar radiation panel indicate generally sunny or generally cloudy skies?

6. A few hours after the temperature rose above freezing, the wind vane sprung back into action and precipitation slowly accumulated in the rain gauge, despite generally clear conditions. What was happening?

7. Bonus question! The solar radiation panel of the Day Three meteogram shows sunlight well above the expected clear-sky values early in the morning. What caused this additional "sunlight" recorded by the Mesonet station?

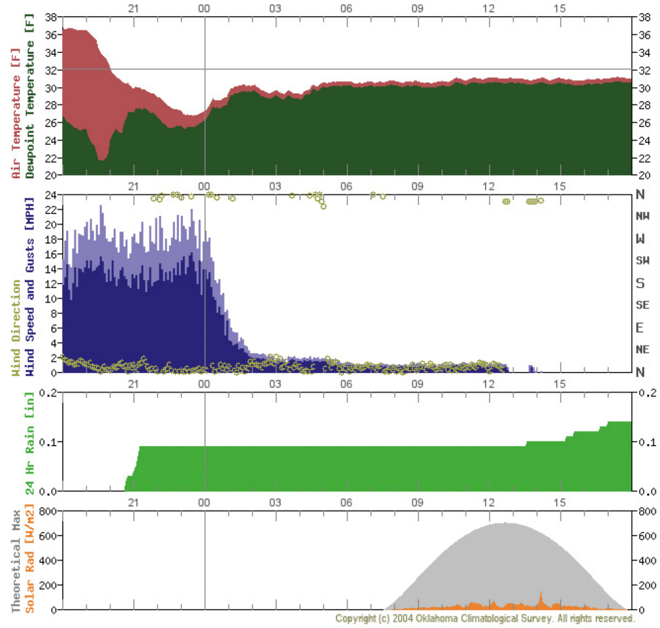
8. Each Oklahoma Mesonet station sits on a 10m x 10m plot of land. Using the conversions and equations provided, calculate the weight of ice 1 inch thick covering the entire plot. The density of ice is 0.00092 kg/cm3. (Hint: Think of the ice as a rectangular block 1-inch tall.) Be careful to use the same system of units for your calculations. Provide your answer in kilograms and pounds.

9. The utility company uses a network of power lines to provide homes and businesses with electricity. In freezing rain events, ice collects on the power lines. The distance between two power poles is 326 feet. The thickness of the ice around the power line is 4 inches. Calculate the weight of the ice. (Hint: Assume the ice forms a cylinder around the power line.)

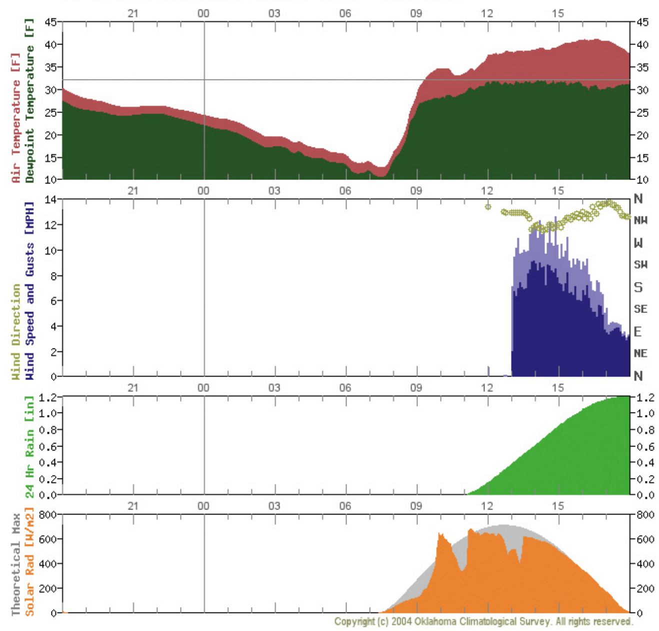
Conversions
1 inch (in) = 2.54 centimeters (cm)
1 foot (ft) = 12 in
1 meter (m) = 100 cm
1 kilogram (kg) = 2.205 pounds (lbs)

Equations
volume of a cube = length x width x height
volume of a cylinder = π r2 * length
mass = density * volume

El Reno 24-Hour Mesonet Meteogram
for the period ending 6:00 pm CST Jan 30, 2002



El Reno 24-Hour Mesonet Meteogram
for the period ending 6:00 pm CST Feb 1, 2002



Hypothermia...

When the body begins to lose heat faster than it can produce it, a condition called hypothermia begins to develop. The symptoms of hypothermia are listed below.

- Uncontrollable shivering
- Vague, slowed, slurred speech
- Memory lapses, incoherence
- Immobile, fumbling hands
- Frequent stumbling
- Apparent exhaustion, inability to get up after rest

When going outside, remember the following:

- Dress warmly in loose-fitting, layered, light-weight clothing
- Avoid alcoholic beverages
- Avoid overexertion
- Keep yourself and your clothes dry
- Frequent stumbling
- Check infants frequently for signs of frostbite

NOTE: If a person shows any signs of overexposure to cold or wet and windy conditions, take the following measures – even if the person claims to be in no difficulty. Often the person will not realize the seriousness of the situation until it is too late

Treatment for cold weather exposure

- Get the person into dry clothing and into a warm bed with a warm (not hot) water bottle
- Concentrate heat on the trunk of the body first so cold blood is not forced into the heart
- Give the person warm drinks
- Keep the person quiet
- Never give alcohol or pain relievers – they only slow down the body processes even more
- If the symptoms are extreme, call for professional medical assistance immediately

Wind Chill Chart

Temperature (°F)

Wind (mph)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes; 10 minutes; 5 minutes

$$\text{Wind Chill } (^\circ F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Photo courtesy of John Humphrey

Learn more about wind chill at:

http://www.srh.noaa.gov/oun/winterwx/windchill.php

Oklahoma Climatological Survey
100 East Boyd, Suite 1210
Norman, OK 73019-1012
phone 405.325.2541 fax 405.325.2550
http://www.ocs.ou.edu
email ocs@ou.edu