Eye on the Sky

National Weather Service
Louisville, Kentucky

Fall 2001, Volume 2, Issue 3

Phone: 502-969-8842 **Web Site:** www.crh.noaa.gov/lmk **E-mail:** w-lmk.webmaster@noaa.gov

A Newsletter for Emergency Managers, Core Storm Spotters, Media, and Public Officials in our County Warning Area.

What's Inside?

New Wind Chill Temperature Index Coming Soon

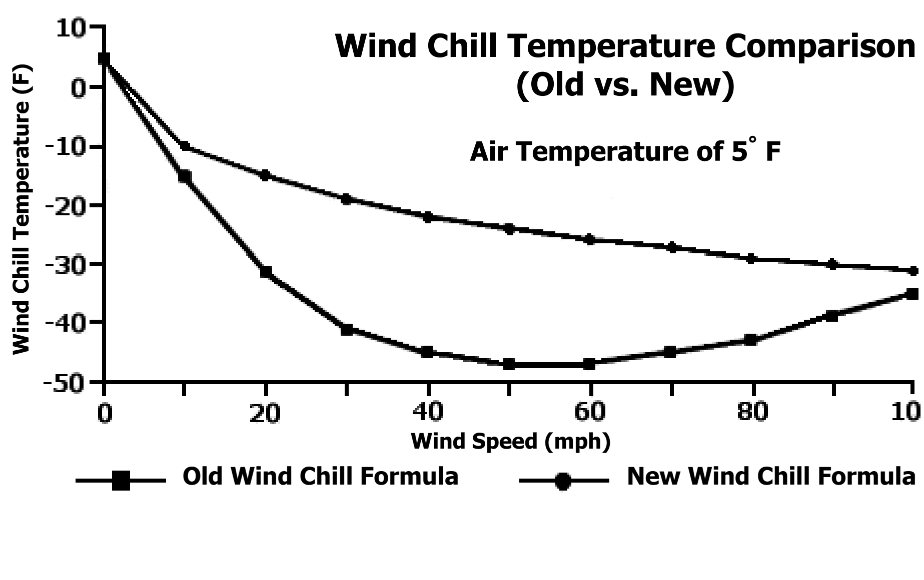
-will result in more accurate wind chills

The Wind Chill Temperature Index (WCTI) documents the combined effect of actual air temperature and wind speed on body heat loss through exposed flesh, i.e., how cold it feels to a human being. The existing index has been used for half of a century. However, this winter a new WCTI will be implemented within the National Weather Service and the Meteorological Services of Canada. Thus, despite the warm weather now, we are providing you with advance notice of this significant change before cold weather arrives.

Advances in science, technology, and computer modeling have resulted in the development of a more accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures. In addition, clinical trials were conducted that verified and improved the accuracy of the new formula. Improvements and standardization of the WCTI are important for an accurate, consistent measurement and to ensure public safety.

The new index will produce noticeably warmer values of wind chill than its predecessor. For example, using the new criteria, an air temperature of +5 degrees Fahrenheit (F) combined with a 20 mph wind will yield a new, more accurate wind chill value of -15 F compared to the old value of -31 F. Although this number is significantly warmer, such a value still is potentially dangerous leading to frostbite given prolonged exposure.

The diagram below compares wind chill values for the new (top line) versus old (bottom line) index for various wind speeds at an air temperature of +5 F. A chart specifying new wind chill values at all ranges of temperatures and wind speeds will be included in our Winter 2001/2002 issue of *Eye on the Sky*.



NOAA Weather Radio Network Expanding in Central Kentucky

by Norm Reitmeyer, Warning Coordination Meteorologist

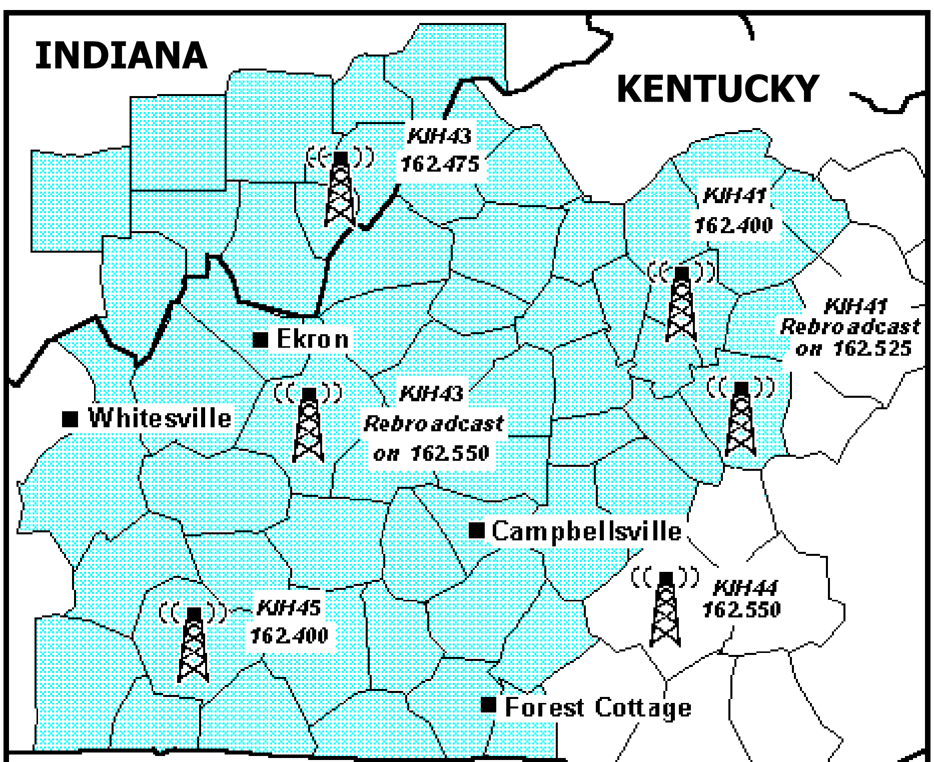
Several years ago, a tornado ripped through the town of Piedmont, Alabama killing a number of people. A tornado warning had been in effect for about 20 minutes prior to the tornado hitting the town. Nevertheless, some of the citizens did not hear the warning. Since then, there has been a strong emphasis to provide increased warning service to the public through nationwide expansion of the NOAA Weather Radio (NWR) network.

Known as the "*Voice of the National Weather Service*," NOAA Weather Radio is provided as a public service by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). As part of the nationwide expansion (made possible through government and private funding), central Kentucky will receive four additional NWR transmitters. The new 300-watt transmitters, expected to be operational around October 1, will significantly expand the reception area of National Weather Service forecasts and warnings. This will promote heightened protection for many citizens in central Kentucky.

The new NWR sites will be located near the towns of Ekron, Campbellsville, Forest Cottage, and Whitesville. Ekron, in central Meade County, should provide improved reception to people in Meade and Breckinridge Counties. Campbellsville, in Taylor County, will cover Taylor and Green Counties, plus parts of Larue and Marion Counties. Forest Cottage, 8 miles east of Burkesville in east-central Cumberland County, should be heard in Cumberland, Clinton, and southern portions of Russell and Adair Counties. Whitesville, in eastern Daviess County, will provide audio in Daviess and Hancock Counties. In addition, the transmitter in Elizabethtown will be strengthened to 300 watts, thereby giving Hardin County and the western portions of Nelson and Larue Counties improved reception.

Field strength surveys will be conducted after the transmitters are operational to determine their effective coverage areas. If gaps in the system remain, efforts to alleviate these gaps will be considered.

Additional information on NOAA Weather Radio can be found on our Web site at *www.crh.noaa.gov/lmk/nwr.htm*. Radios can be purchased at local electronic stores.



Map of NWS Louisville's county warning and forecast area (hatched) across central Kentucky and south-central Indiana showing the locations of existing and expected NOAA Weather Radio transmitters. Existing sites are denoted by a tower graphic with the radio identification and frequency indicated. Black squares denote the locations of new transmitter sites near Ekron, Campbellsville, Forest Cottage, and Whitesville.

The Autumnal Equinox: 12 Hours of Day and Night?

By Rob Cox, Forecaster

The arrival of September means that fall is just around the corner. This year the autumnal equinox officially takes place on September 22 at 7:04 pm edt (6:04 pm cdt). It might be assumed that on this date, day (sunrise to sunset) and night (sunset to sunrise) are exactly the same length of time. However, this is not the case. In fact, according to the U.S. Naval Observatory, the dates on which day and night are exactly 12 hours across the United States occur a few days before and after the vernal (spring) and autumnal equinoxes. The specific dates vary depending on latitude.

The official day of the equinox coincides with the center of the sun's disk crossing the equator, and this point is above the horizon for 12 hours everywhere on earth. However, refraction in the earth's atmosphere and our definition of sunrise and sunset alters our perception of what the equinox really is. Refraction is a turning or bending of light waves as they pass through an atmosphere of different densities, which can cause the sun to appear slightly higher in the sky than it actually is.

Sunrise occurs when the upper edge of the sun's disk first becomes visible. Sunset is when the upper edge of the disk disappears. As you can see, these parameters do not factor in the center point of the sun. So, to find out when we actually will have 12 hours of light and darkness in central Kentucky, look at sunrise and sunset times in the almanac. This year, the date this will occur is on September 26.

Frost and Freeze Advisories: A Review

By Rob Cox, Forecaster

As the warm days of summer turn into cooler days this fall, it won't be long before you should start thinking about how to protect your plants and flowers. The official end of the growing season is designated as the day we move our clocks back one hour to Standard Time. This year, that day is Sunday, October 28.

The National Weather Service in Louisville once again will issue frost and freeze advisories, as needed, prior to the end of the growing season to advise you when plants and flowers need protection.

A *Frost Advisory* is issued when the temperature of objects such as cars, trees, roofs, the ground, etc., is expected to fall below 32 F. These objects tend to lose heat much faster than the air. Thus, the temperature of the air at 5 feet above the ground can be as much as 5 to 10 degrees warmer than these objects. If the frost period is severe enough, it is called a "killing frost," which sometimes can end the growing season.

A *Freeze Advisory* is issued when the air temperature at 5 feet above the ground is expected to be 32 F or below over a wide-spread area for a significant amount of time. A freeze may or may not be accompanied by frost depending on wind speed. If the freeze period is cold enough, it is labeled a "killing freeze," which can kill all but the hardiest crops. The average time for the first occurrence of temperatures 32 F or lower in Kentucky is late October.

Tips to protect your plants

Frost advisory:

-Water the garden thoroughly before nightfall.

-Use an electric fan to keep the air moving so that frost will not form on your plants.

-Create a tent by placing stakes around your plants and draping newspapers, cardboard, plastic tarps, bed sheeting, or other lightweight material over the stakes. Otherwise, just lay a lightweight material over the plants. Remove the covering after the frost melts the next morning.

Freeze advisory:

-Bring any tender vegetation indoors, if possible.

-Cover your plants by creating a tent and draping cloth material over the stakes. Make sure that the cloth does not touch the leaves.

-Spread mulch around the roots of your plants and make sure that the soil remains moist.

PUBLIC RESPONSE TO SEVERE WEATHER WARNINGS

by Van DeWald, Forecaster

The National Weather Service's mission is to provide weather, hydrologic, and climate forecasts and warnings for the United States, its territories, and adjacent waters for the protection of life and property and enhancement of the national economy. This mission is accomplished through forecasts and warnings for hazardous weather, including thunderstorms, tornadoes, flooding, hurricanes, snow, ice, fog, extreme heat and cold, high winds, and climate events. However, there is a delicate balance between issuing the appropriate number of warnings and statements to maximize public response, versus over-warning which could desensitize the public to the alerts we provide.

There is a delicate balance between issuing the appropriate number of warnings and statements to maximize public response, versus over-warning which could desensitize the public to the alerts we provide.

An effective warning must be one that communicates the message well and produces a desirable result before the event occurs.

An effective warning cannot guarantee total safety, but it certainly can cut down on potential injury and even death.

There are six components of public response to weather warnings. First, a person must have the means and desire to hear the warning. The NWS has no direct control over this component. However, the NWS can have a large impact on the remaining five steps, which ultimately lead to a much more effective product. Beyond simply hearing the warning, a person must 1) understand the warning, 2) believe the warning, 3) personalize the warning to his or her own situation, 4) confirm the warning with another source, and 5) choose to make a response.

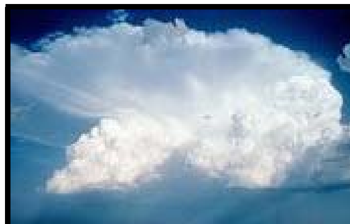
As a result, an effective warning must be one that communicates the message well and produces a desirable result before the event occurs. Wording within such a warning should describe the hazard in a specific, consistent, understandable, and clear manner. For example, by highlighting the expected threat, using specific arrival times and locations affected, being consistent within the warning and from product to product, and offering an appropriate response to the threat through a call-to-action statement, we can make a difference and provide a warning that indeed communicates our message and produces a desirable result.

Nevertheless, an effective warning cannot guarantee total safety, but it certainly can cut down on potential injury and even death. For instance, what if a tornado killed 2 people, but due to an effective warning, 20 people who could have died did not since they heard, understood, and reacted to the warning. Would this still be an effective warning?

Although technological and conceptual advances continue, there still is more to learn about severe storms, tornadoes, flash floods, and winter storms. Through ongoing training and research efforts, we hope to continue increasing our lead times and accuracy for severe weather and winter weather warnings, and to increase our verification statistics. This will help us to protect life and property and to enhance the economy across central Kentucky and south-central Indiana.

OBTAINING SEVERE WEATHER REPORTS

by Norm Reitmeyer, Warning Coordination Meteorologist



Cumulonimbus (Cb) clouds, occasionally referred to as thunderheads, often extend high into the atmosphere and can produce severe weather.

Although autumn statistically is a quiet season for severe weather, it still is important to consider how we can most effectively gather severe storm reports, and any other kind of adverse weather information. As sophisticated as Doppler radar, weather satellites, and computer model and forecast systems are, they cannot provide the "ground truth" that human observations can. Your reports from the counties we serve are crucial in verifying our data sources and to answer the question, "What really is happening out there?"

(Continued on page 7)

The Science Corner

by Ted Funk, Science Officer

In This Issue:

COLD FRONTS ALOFT

In forecasting the weather, meteorologists consider many parameters, including characteristics of high and low pressure systems, warm and cold fronts, and troughs at the surface. These features are shown routinely in television weather presentations to the public to highlight the basic weather features that will influence cloud cover, temperature, and precipitation.

However, precipitation locations and intensities do not necessarily relate directly to the position of surface features, especially during the cool half of the year. In other words, precipitation typically is not restricted to along surface boundaries, especially in the late fall and winter. Instead, it can occur well away from these boundaries depending on crucial atmospheric processes occurring above the surface. These processes ultimately dictate the location, intensity, and movement of precipitation areas. Important processes include cold fronts aloft, isentropic lift, jet streaks, frontogenesis, and the release of mesoscale instabilities. In this issue, we examine the effect of cold fronts aloft. Subsequent issues will focus on some of these other processes.

The classic Norwegian Cyclone Model (NCM; Figure 1), developed many years ago, describes the development of an incipient weather disturbance along a surface frontal zone into a mature low pressure storm system (extratropical cyclone) and associated cold and warm fronts. In this model, steady precipitation usually occurs along and ahead of a warm front, with a band of showers along the cold front.

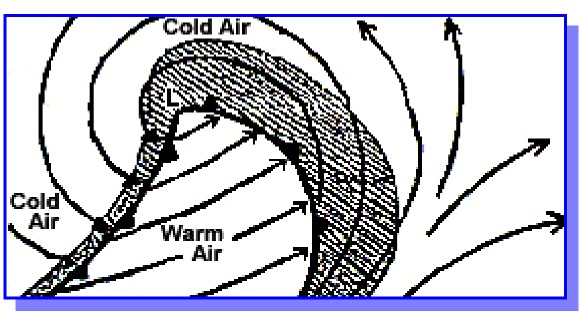


Figure 1: Typical frontal structure (open wave cyclone) and precipitation pattern associated with the Norwegian Cyclone Model. Precipitation occurs along and ahead of the warm front with a band of showers on the cold front.

However, the NCM possesses several problems, including the fact that it fails to explain detailed mesoscale frontal and precipitation structures associated with typical extratropical cyclones. Thus, alternative models have been devised to allow for a more scientific and correct analysis and evolution of low pressure development, fronts, airflow, and precipitation patterns within storm systems.

Cold fronts are not all homogeneous, i.e., they vary in associated temperature contrast, wind shift, and precipitation regimes. Two basic groups of cold fronts exist. The first type is associated with a relatively deep trough at 500 mb (about 18,000 ft), i.e., the upper flow is roughly parallel to the surface front (Figure 2). In this case, the surface front often possesses a sharp temperature change and wind shift, and significant vertical motion. System-relative airflow (i.e., air motion relative to the moving front) exhibits a sloping rearward ascent of warm, moist air which can result in a line of showers or even thunderstorms along the front and extensive post-frontal precipitation (Figure 3). If the air is cold enough and precipitation extends far enough behind the front, then precipitation can change to snow in the cool season.

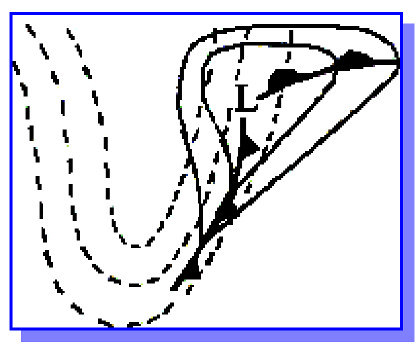


Figure 2: Typical 500 mb (dashed height lines) and surface low and frontal patterns associated with a Type 1 cold front.

The second type of cold front is not as well-defined as Type 1, and usually possesses a weak-to-moderate temperature gradient and scattered showery precipitation along the front. A Type 2 front occurs within a less amplified 500 mb flow pattern (i.e., more westerly momentum aloft; Figure 4), which results in system-relative forward sloping ascent and a band or area of significant precipitation ahead of the surface front (Figure 5).

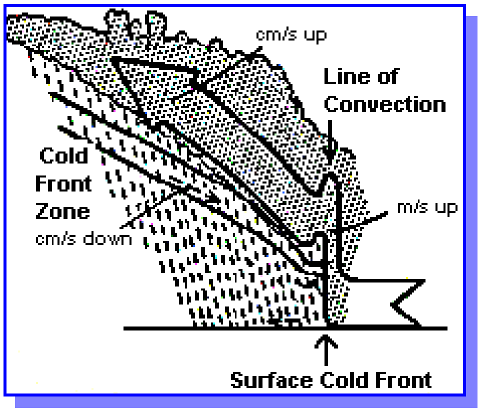


Figure 3: Common precipitation pattern associated with a Type 1 cold front. A line of convection may be located along the front where strong vertical motion occurs, with ample post-frontal precipitation due to "system-relative" front-to-rear sloped ascent behind the front.

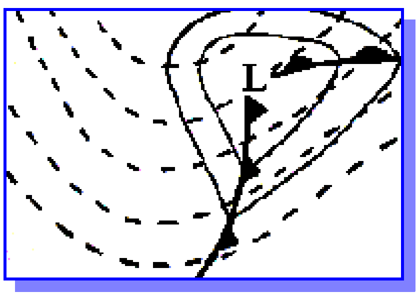


Figure 4: Typical 500 mb (dashed height lines) and surface low and frontal patterns associated with a Type 2 cold front.

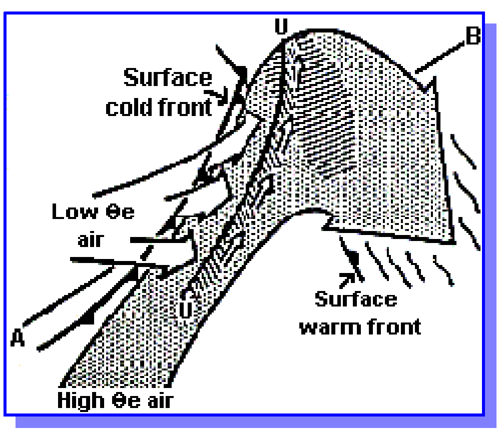


Figure 5: Common frontal, precipitation, and airflow (large hatched arrow) regimes associated with a Type 2 cold front. Precipitation occurs along a cold front aloft (CFA; line U-U) located ahead of the surface front with drier air aloft (low theta-e air) behind the CFA. Precipitation also occurs along/ahead of the surface warm front. Scattered showers are possible along the surface cold front given low-level moisture and any lift.

Precipitation patterns associated with Type 2 fronts have been explained via a "split cold front" or "cold front aloft" (CFA) model. The cold front aloft (Figures 5, 6, and 7) is associated with the leading edge of cold advection (often evident at 700 mb and on satellite imagery), and with frontogenesis (axis of increasing thermal gradient) and convergence between warm, moist air ahead of the CFA and cooler, drier air behind it. This typically produces significant lift and a band or area of stratiform rain (or snow in the winter) and/or convection along and ahead of the CFA within the surface warm sector (ahead of the surface front). This is one explanation for the existence of "pre-frontal" squall lines.

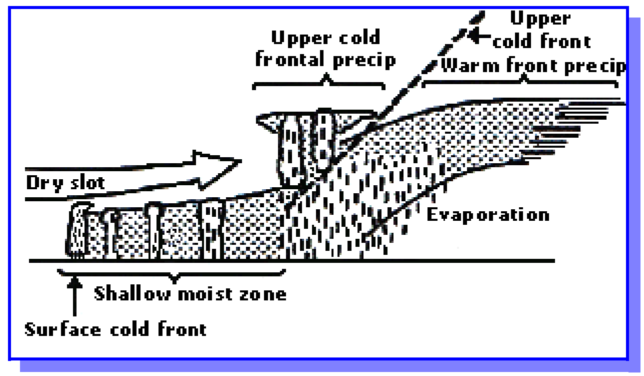


Figure 6: Vertical cross-section of clouds/moisture (hatched area) and precipitation patterns associated with a CFA (dashed line). Rain and possible convection occurs along and ahead of the CFA, with scattered showers and possible thunderstorms behind the CFA and along the surface cold front.

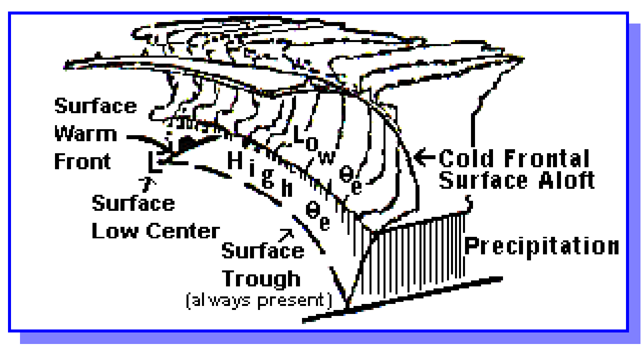


Figure 7: A 3-dimensional view of a CFA and surface cold front/trough and warm front. Widespread rain or snow (and possible thunderstorms in the warm season) occurs along and ahead of the CFA with drier air aloft overtop low-level moisture behind the CFA. Scattered precipitation can occur along the surface cold front (including convection if instability and lift are present).

At the same time, in general a less active surface boundary/cold front exists behind the CFA, especially in the cool season when only limited instability may be

(Continued on page 8)

OBTAINING SEVERE WEATHER REPORTS *(Continued from page 4)*

During severe weather episodes, we initiate calls to dispatch centers, weather spotters, the media, and others to obtain an accurate assessment of the ongoing weather. Occasionally, people at dispatch centers are dealing with higher priority business, and cannot talk at length about the effects of weather on their local area. For example, downed trees or power lines that cross roadways and endanger public safety, reported structural damage, and the occurrence of human injury take precedence, perhaps reducing the importance or time available to convey this information in detail to our office.

The challenge is to optimize methods that provide critical weather services to your counties without interruption and convey critical weather information back to the National Weather Service as soon as possible. Maximum effectiveness in providing timely and accurate damage reports to our office will significantly enhance forecasters' ability to warn accurately for potentially life threatening storms.

If you have innovative ideas on how more complete reports can be communicated to us at the National Weather Service, please contact Norm Reitmeyer at 502-969-8842.

REVIEW OF SEVERE WEATHER SEASON 2001

by Norm Reitmeyer, Warning Coordination Meteorologist

The heart of severe weather season in central Kentucky and south-central Indiana is considered to be April through June, with less frequent occurrence in July and August. Nevertheless, no month is immune from severe weather, and tornadoes have occurred in every month of the year.

In terms of tornadoes, 2001 to date has been a quiet season in central Kentucky. The only tornado was near Adairville in southern Logan County on May 31. The twister blew roofs off some houses and damaged some garages leaving evidence of a path in a wheat field. There have been no reports of tornadoes in south-central Indiana this year. However, significant tornadoes have struck near our area, including in London and just north of Somerset in southeast Kentucky this past spring.

Despite the lack of tornadoes, there were a few rounds of severe thunderstorms that knocked down numerous trees and power lines around parts of the area. Noteworthy were two convective systems that rolled southeastward across central and east-central Kentucky on July 8. NWS Louisville issued severe thunderstorm warnings for a total of 53 counties, 51 of which verified with wind damage. No tornado warnings were issued and no tornadoes were reported. Overall, as far as is known, only two people have been injured in severe storms this year.

A question that sometimes arises is whether extreme weather conditions in one season will be followed by extreme weather in the following season. It can be confidently stated that this was not the case this past year, as the record breaking cold in December 2000 was not followed by extremes in severe weather in Spring 2001 or heat in Summer 2001.

Eye on the Sky is a quarterly newsletter published by the National Weather Service in Louisville, Kentucky. Comments and suggestions are welcome. Your feedback is very important to us!

Please contact us by phone, e-mail, or mail at

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www.crh.noaa.gov/lmk/newsletter

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Ted Funk and Van DeWald

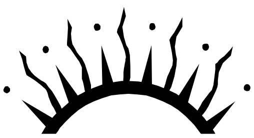
PLEASE NOTE: November 13-16, 2001 will mark Winter Awareness Week for central Kentucky and south-central Indiana. Listen for public information statements over NOAA Weather Radio concerning winter weather safety. This week will be a good time to begin your own preparation for the winter season.

COLD FRONTS ALOFT *(Continued from page 6)*

present. However, in the warm season, some sunshine could occur between the CFA and surface boundary (as drier air moves in aloft overtop low-level moisture). The convective instability may then be released through surface/low-level convergence along the surface boundary leading to the development of a secondary line of strong convection, especially if additional upper-level dynamics are present.

Precipitation in the cool season also does not always line up along surface warm fronts. Instead, precipitation usually falls ahead (north and/or east) of the boundary as warm air advection results in isentropic lift above the front. How far ahead of the front precipitation occurs depends on the amount of moisture, lift, and instability present in the air.

It is very important to monitor fronts aloft via satellite imagery, the leading edge of 700/500 mb cold advection zones, and shortwaves. Sometimes, model data suggest fronts aloft in their relative humidity pattern, although many times they indicate too high or widespread relative humidity and precipitation forecasts versus that observed. Thus, astute forecasters can improve upon the timing and location of model forecasted precipitation in these cases.



DROUGHT 2001 UPDATE

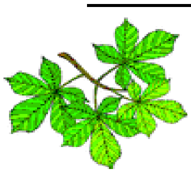
By Mike Callahan, Hydrologist

Drought? What drought? This is what many residents of central Kentucky and south-central Indiana might be saying. Summer 2001 produced an adequate amount of rainfall in many areas compared to the dry summers of recent years. Many plants, lawns, and crops are in relatively good shape and healthy across the majority of the region due to recent rains. Even streams are flowing at levels close to seasonal normal. Forest fires in the Ohio Valley are almost unheard of and most communities have adequate water supplies.

Rainfall totals and average temperatures this summer were roughly around normal, just as forecast. (The climatological data on page 9 gives exact precipitation and temperature data from May through July.) However, the summer rains did not wipe out the precipitation deficit created during last winter. Therefore, through late August 2001, Louisville's precipitation was about 7.5 inches below normal, while Bowling Green was about 6 inches behind and Lexington 5 inches behind.

The measure we use for determining long-term (water supply) drought, the Palmer Drought Severity Index, indicates that much of central Kentucky remains in a mild drought. However, the drought has ended for now across the Bluegrass region and in southern Indiana.

For this fall, the latest prediction for the Ohio Valley calls for temperatures and precipitation to be about normal. Unfortunately, autumn normally is the driest time of the year historically, so normal precipitation may not be enough to keep drought conditions from becoming worse. At least we can be thankful that the outlook does not predict a prolonged dry period.



KENTUCKY COLORFALL REPORT COMING SOON

By Larry Dattilo, Data Program Manager

Once again this fall, the National Weather Service in Louisville will broadcast the Kentucky Colorfall Report over NOAA Weather Radio (NWR). The report, furnished by the Kentucky Division of Tourism, is a summation of leaf conditions noted by hundreds of volunteers across Kentucky, including the percentage of change and colors observed. A prediction of peak color conditions also is included.

The report will air over NWR every Thursday and Friday from 10:00 am-noon edt and 5:00-7:00 pm edt from mid or late September through October or until peak leaf viewing conditions have passed. For further information, visit the Kentucky Division of Tourism's Web site at *www.kentuckytourism.com*.

CLIMATOLOGICAL CALENDAR

By Ted Funk, Science Officer

Climatological Data: Spring/Summer 2001

Location	Month	Average Temperature	Departure from Normal	Total Precipitation	Departure from Normal	Highest Temp (Date)	Lowest Temp (Date)
Louisville	May	67.2	+1.9	6.60	+1.98	87 (6th)	44 (13th)
	June	72.1	-1.1	2.56	-0.90	91 (14th/19th)	47 (3rd)
	July	76.6	-0.6	2.98	-1.53	93 (8th)	55 (2nd/6th)
Lexington	May	66.5	+2.5	6.00	+1.53	89 (6th)	44 (13th)
	June	71.1	-1.1	2.57	-1.09	91 (19th)	47 (3rd)
	July	75.3	-0.5	5.79	+0.79	91 (8th)	53 (14th)
Bowling Green	May	68.1	+2.3	5.03	+0.09	88 (16th/17th)	48 (13th/14th)
	June	73.1	-1.1	3.71	-0.46	93 (14th)	49 (3rd)
	July	78.6	+0.7	3.53	-1.21	96 (8th)	56 (14th/15th)

Normal High/Low Temperatures

Location	Sep 1	Oct 1	Nov 1	Dec 1
Louisville	84/63	75/52	63/41	50/33
Lexington	82/62	73/52	61/41	49/32
Bowling Green	85/63	76/52	64/41	52/33

Outlook for Fall 2001

The 90 day outlook for September through November 2001 calls for near normal temperatures across much of the United States, including Kentucky and southern Indiana. However, warmer than normal temperatures are expected across the southwestern United States and southern Florida. Near normal precipitation amounts are predicted across the nation, except above normal over Florida and southern Georgia.

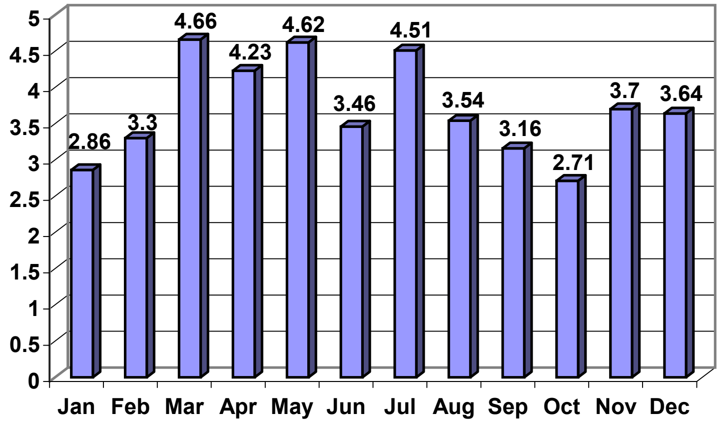
Average Monthly High and Low Temperatures and Precipitation (Liquid Equivalent)

(Note: The yearly precipitation amount is the total normal precipitation for the year, not the average monthly total.)

Lexington	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Average High	39.1	43.6	55.3	65.5	74.3	82.7	85.8	84.9	78.3	67.2	54.9	44.2	64.7
Average Low	22.4	25.3	35.3	44.2	53.5	61.5	65.7	64.4	58.0	46.0	37.0	27.6	45.1
Average Precip	2.86	3.21	4.40	3.88	4.47	3.66	5.00	3.93	3.20	2.57	3.39	3.98	44.55

Louisville	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Average High	40.3	44.8	56.3	67.3	76.0	83.5	87.0	85.7	80.3	69.2	56.8	45.1	66.0
Average Low	23.2	26.5	36.2	45.4	54.7	62.9	67.3	65.8	58.7	45.8	37.3	28.6	46.0
Average Precip	2.86	3.30	4.66	4.23	4.62	3.46	4.51	3.54	3.16	2.71	3.70	3.64	44.39

Bowling Green	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Average High	42.1	47.1	58.2	68.6	77.3	85.5	88.7	87.2	81.0	70.2	57.6	47.0	67.5
Average Low	23.6	27.1	36.6	45.4	54.3	62.8	67.1	65.3	58.4	45.4	37.3	28.4	46.0
Average Precip	3.82	4.13	5.10	4.32	4.94	4.17	4.74	3.51	3.72	3.02	4.43	5.03	50.93



The histogram (bar chart) at left displays average monthly precipitation amounts (liquid equivalent in inches) at Louisville. Chart patterns for Lexington and Bowling Green precipitation amounts are quite similar. The graph shows that spring normally is associated with the greatest precipitation amounts, due primarily to organized heavy rainfall producing convective systems. In contrast, the fall (particularly October) typically is the driest period of the year on average. Of course, precipitation amounts in any given month or year can vary significantly from long-term monthly averages.

The Advanced Hydrologic Prediction System

By Mike Callahan, Hydrologist

The National Weather Service is in the process of implementing a new program of hydrologic services that will help the flood plain and water resource managers across the country. The new program is called the Advanced Hydrologic Prediction System or AHPS. The first of these new services is a new Web page design where anybody can find a plethora of information about selected river forecast points. To view this first phase of AHPS in action, go to our Web page at *www.crh.noaa.gov/lmk/ahps*. On the display, select your location of interest to determine the current and forecast stages for that location. Other information shown will be a map, the highest and lowest stages on record, a short description of flooding impacts at different river levels, and even pictures of the location. We hope you will find this information valuable. Check our Web page regularly for more surprises as other features of AHPS develop.

Astronomical Calendar

Sunrise/Sunset							
	Louisville		Lexington		Bowling Green		
Date	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Times are given in edt (Eastern Daylight Time), est (Eastern Standard Time), cdt (Central Daylight Time), and cst (Central Standard Time), as appropriate.
Sep 1	7:13 am edt	8:12 pm edt	7:08 am edt	8:07 pm edt	6:17 am cdt	7:14 pm cdt	
Oct 1	7:39 am edt	7:26 pm edt	7:34 am edt	7:21 pm edt	6:41 am cdt	6:29 pm cdt	
Nov 1	7:09 am est	5:43 pm est	7:04 am est	5:39 pm est	6:10 am cst	4:48 pm cst	
Dec 1	7:41 am est	5:23 pm est	7:35 am est	5:19 pm est	6:41 am cst	4:29 pm cst	

Moon Phases			
New Moon	First Quarter	Full Moon	Last Quarter
Sep 17	Sep 24	Sep 2	Sep 10
Oct 16	Oct 24	Oct 2	Oct 10
Nov 15	Nov 22	Nov 1	Nov 8
Dec 14	Dec 22	Nov 30	Dec 7

Autumnal Equinox (Start of Fall):
September 22 at 7:04 pm edt (6:04 pm cdt)

Start of Standard Time:
Sunday, October 28 at 2:00 am local time (turn clocks back one hour)