Shareholders' Report

National Weather Service

Louisville

A Few Words from the Meteorologist-in-Charge

Welcome to the seventh edition of the National Weather Service Louisville (LMK) Shareholders' Report. Taxpaying citizens of this country invested $3.19 per person in the NWS in 2011, and thus are our shareholders. This report details activities of the Louisville Weather Forecast Office (WFO) and events in its county warning area (CWA) during 2011. Since you are both a shareholder and a customer, I hope you find our activities have demonstrated the sort of stewardship you expect from your public servants. As always I welcome your comments and suggestions as to how the NWS can be an even better investment for you.

John Gordon
Meteorologist-in-Charge

Serving the Community Since 1871

The NWS office in Louisville, KY is responsible for weather warnings and forecasts for much more than just the Louisville metro. We are charged with providing critical weather information to 49 counties in central Kentucky and 10 counties across southern Indiana. This area includes the cities of Lexington and Bowling Green in Kentucky, and Jasper and Madison in Indiana.

Stormy 2011

Tom Reaugh, Senior Forecaster

January 20 near Hardy Lake, IN. Photo: Jeanne Newton

February 7 in Elizabethtown. Photo: Robert O'Bryant

February 28 in Henry County.

2011 will remain in our memories as a year of incredibly active weather, both in the Ohio Valley as well as much of the country. Here in central Kentucky and southern Indiana we experienced more than *twice* as many tornadoes in 2011 (61) than in the pervious record year (30 in 2008), including one outbreak that produced more (albeit much weaker) tornadoes than the legendary Super Outbreak of April 3, 1974.

With the many storm systems came drenching rains, resulting in the wettest calendar year on record at Louisville, Lexington, and Frankfort. It was so wet in Frankfort that the calendar year record there was broken in November!

Though we did have a couple of 3-5 inch snowfalls in January and early February, severe weather dominated 2011 and started early when the first tornado of the year touched down on February 24 in Barren County. More tornadoes followed just four days later including the year's strongest twister: an EF-3 with140 mph winds that flattened two homes in Henry County.

Heavy springtime rains fell from late February into March, resulting in significant flooding. The Ohio River at Louisville crested at 31.1 feet, it's highest level in six years.

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March 12 in Louisville.

March 23 in Tompkinsville.

April 4 in Clinton County.

Providing Decision Support Services for Local Events

Joe Sullivan, Warning Coordination Meteorologist

NWS Louisville forecasters continued to expand Decision Support Services to the emergency management community in 2011. For the fourth straight year, several members of our staff who are hazardous materials (HAZMAT) certified provided on-site weather monitoring and forecast assistance to Louisville's Joint Emergency Services Unit. LMK was present at large public events such as the Kentucky Derby, Thunder Over Louisville, and the Breeders' Cup.

NWS Louisville provides both remote and on-site decision support services at large public events as well as dangerous HAZMAT incidents (pictured here).

On a smaller though more intense scale, Warning Coordination Meteorologist (WCM) Joe Sullivan deployed to a HAZMAT clean-up site in Louisville during a Severe Thunderstorm Watch in March to ensure emergency responders had the most reliable and up-to-date short term forecast information possible. A violent industrial explosion had exposed water-sensitive chemicals, and a line of storms was developing just west of the incident site. The chemicals would react explosively with rain so the clean-up team was trying to contain it quickly, and would need to evacuate if the storms moved in. LMK was at the scene and provided crucial weather information.

During 2011 forecasters also provided assistance for HAZMAT and fire weather responses via phone coordination and Internet-based spot forecast requests to emergency management and fire officials throughout central Kentucky and southern Indiana.

Notifying the Public About Air Quality

Brian Schoettmer, Forecaster

NWS Louisville met with the Louisville Metro Air Pollution Control District and the Lexington Area Metropolitan Planning Organization in 2011 to decide how Air Quality Alerts could be better disseminated through the resources of the NWS. Using NOAA Weather Radio and our webpage, the dissemination of Air Quality Alerts will be drastically improved. In 2012, when the Air Quality Index for ozone and/or particulate matter (pollution) rise into the Unhealthy for Sensitive Groups range or higher, LMK will issue Air Quality Alerts for counties included in the Louisville and Lexington metro areas.

Aerial Storm Damage Surveys

Brian Schoettmer, Forecaster

Our method of conducting storm damage surveys took on new life in 2011 with the implementation of aerial damage survey support from private pilots. As part of a new vision to conduct more comprehensive and complete storm damage surveys, private pilots flew over three April tornado damage paths and provided aerial photos of May flooding. The tornado path aerial photos were very helpful in confirming and rating tornadoes, as well as, in some cases, determining an area where a tornado did *not* touch down.

Private pilots Roy Cantrall and Glenn Norman from Elizabethtown, KY were the first volunteer private pilots to complete an aerial damage survey for us. They were presented with a plaque from NWS Louisville in appreciation of their efforts. Also, this innovative new concept was presented at the National Weather Association (NWA) Conference in Birmingham, AL in October to help spread the idea to other NWS offices. About twenty pilots were recruited in 2011 with more expected to volunteer in 2012.

This photo was taken during an aerial damage survey flown by Roy Cantrall on April 29, 2011over Grayson County. The damage (lower right) is plainly visible from the air, but would have been very difficult for a ground crew to find since it was so far from the road (upper left).

Tornado Warning Verification

John Denman, Forecaster

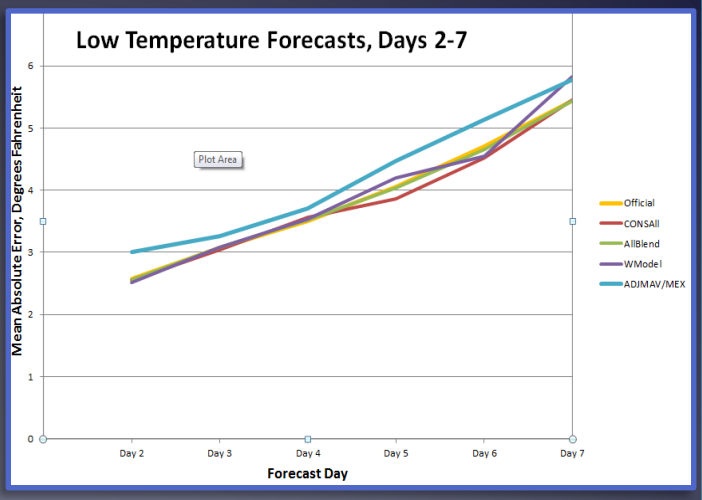
Over the last decade the NWS has increasingly emphasized warning verification. For severe weather we use two main statistics: probability of detection (POD) and false alarm ratio (FAR). POD is the number of severe weather occurrences that we successfully warned for divided by the total number of severe events reported. A high POD is good. FAR is the number of warnings during which no severe weather occurred divided by the total number of warnings that we issued during a severe weather episode. A low FAR is best.

As an example, let's look at a large tornado outbreak that struck the LMK CWA on April 19-20, 2011. Of the 13 tornado warnings we issued, four did not verify (there was no tornado in the warned area). Out of the 27 tornadoes that touched down during the outbreak, we successfully warned for 25 of them. So, our FAR was 31% (4/13) and our POD was 93% (25/27).

Forecast Verification

John Denman, Forecaster

Our accuracy in forecasting temperatures, especially daily highs and lows for days 3 through 7, has shown improvement over the past several years. In 2011 we began using an important new technique to evaluate our forecasting skill. Studies have shown that forecasting from a blend of weather computer models provides better accuracy than the use of any single model, even if that specific model has been quite accurate in the past. Different blends are available, and it is the forecaster's decision which blend to use, and how much to modify its output.



Forecast performance by NWS Louisville compared to weather forecasting computer models.

The graph shown here, from October through December 2011, charts the accuracy of our forecasts of low temperatures 2 to 7 days in advance. The NWS Louisville forecast is labeled ***official***, and is shown by the yellow line. Mean absolute error, measured in degrees Fahrenheit, is on the Y axis. Our official error in forecasting low temperatures fell in the middle of the pack compared with several of the other computer model blends. Note, however, that our forecasts were consistently superior to the **blue line**, which shows the temperature forecast from single models.

We evaluate our forecast performance every day and pay close attention to the quality of the product we deliver to our customers. These analyses assist us in determining the areas in need of improvement, and how to achieve better results in our forecasts.

Flash Flood Verification

Mike Callahan, Hydrologist

Lexington, KY on July 22.

Flash flooding is a serious threat, and since 1971 has taken an average of 92 lives per year nationally. As a result, accurate and timely Flash Flood Warnings are a priority in the NWS. The Louisville office issued 72 Flash Flood Warnings in 2011with an average lead time of nearly an hour. Eighty percent of flash flood incidents were warned for before the flooding began.

Torrential Rains Led to Widespread Flooding in 2011

Mike Callahan, Hydrologist

US 231 in Dubois County in April. Photo: Dubois County Flight Services

2011 was a very busy year, hydrologically speaking. We started the year in a mild drought, but by February rainfall resulted in minor flooding along some of the usual troublesome spots. The flooding expanded into March, including on the Ohio River, but we got a break during the second half of the month which allowed streams to fall back to within their banks.

The worst month was April, when over a foot of rain deluged the area. Some spots in Ohio County, KY were estimated to have collected 20 inches of rain. It was the wettest April on record in Louisville, Lexington, and Frankfort, and the second wettest in Bowling Green.

The heavy rain continued into the first few days of May. Flooding was widespread in most river basins with the exception of the Kentucky. Many locations recorded moderate flooding, and a few spots saw major levels. Evacuations of homes and a few businesses were required. Some major highways were briefly closed due to flood waters. Spring 2011 was the wettest season, of any season, recorded at Louisville and Frankfort. Fortunately there were no fatalities with the spring flooding, though there was one death due to flash flooding in November.

Elizabethtown in April. Photo: Tom Williams

Corps of Engineers reservoirs captured the massive volume of rainwater and alleviated downstream flooding as they were designed to do. However, levels at three reservoirs, Rough River Lake, Taylorsville Lake, and Patoka Lake, overfilled which caused flows through their emergency spillways, a first in this area. However, the flows were small compared to the water already rushing downstream and impact was minimal.

The Ohio River in Louisville rose to its highest level since 1997 (31.1 feet), right during the Kentucky Derby Festival. Thus, the impact was much greater than normal, with many events that were planned to take place along the riverfront forced to move.

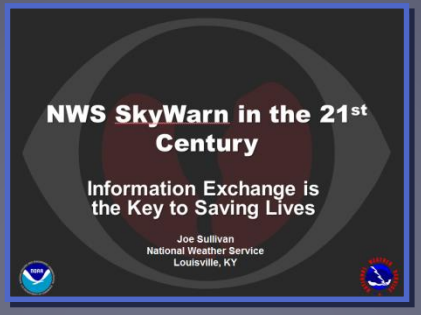
Patoka Lake spilling over in April. Photo: Dubois County Flight Services

Fortunately, the remainder of May was dry. Minor floods were observed in June, July, November, and December. In all, LMK issued 91 flood warnings, 25 flood advisories, and 414 flood statements. Our warning POD for the year was 90% and our FAR was 20% (see page 5 for definitions of POD and FAR).

Spotter Training Methods Continue to Evolve

Joe Sullivan, Warning Coordination Meteorologist

One need only watch the evening news, read the local newspaper, or listen to any talk radio show to know that the federal budget is currently of great concern in the United States. As a federal agency tasked with protecting lives and property by the issuance of timely weather forecasts and warnings, the NWS remains fiercely dedicated to fulfilling its mission, regardless of budgetary concerns. Like every business or individual attempting to survive in these challenging times, this involves searching for ways to work more efficiently with ever-dwindling resources. We're striving to fulfill our mission by working smarter, not harder, so that we can continue to serve you, the American taxpayer.



With this in mind, one of the changes that will be taking place in 2012 is in SKYWARN Spotter Training. Since the program began in the 1960s, the effort to train volunteers in reporting severe weather to the NWS has changed relatively little. A representative from the NWS works with local emergency management (EM) officials to schedule a class in that EM's county. The NWS employee then travels there to present training to individuals volunteering to provide the NWS with ground-truth information on potential severe storms in their area. While advancing technology has allowed for an upgrade from 35 mm slides in the first spotter talks to PowerPoint, video, and live Internet feeds in recent years, the general concept of a NWS staff member traveling throughout the office's county warning area to visit spotters near their home has remain unchanged - until now.

"Distance learning," in which training is given from a remote site often through materials or meetings provided via the Internet, has become a vital method by which the NWS receives and delivers training within the organization. In addition to reducing travel time and expense, online courses can be completed at any hour of the day at any location with Internet access. The time has come for this cost-effective way of training to be incorporated into the LMK SKYWARN program. Online spotter training is being developed for introduction during Spring 2012, and will be announced on the office's website (weather.gov/louisville) when it is available.

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Spotter Training continued from page 8

While on-site training classes will not be eliminated, there will be fewer of them and their scope will change. In-person training will include presentations by local TV meteorologists and emergency management officials to better exemplify the partnership that is in place for the severe weather program. This will emphasize the role of the public in the partnership: providing ground-truth information on storms in near-real time to ALL partners in the warning process.

Rarely has our modern storm spotter network been tested as much as it was in 2011. NWS Louisville's area of responsibility suffered 61 tornadoes, which was more than *twice* the previous annual record. Although less impactful, the two dozen tornadoes that formed on April 19-20 set a new mark for number of tornadoes in a single event, beating the infamous Super Outbreak of April 3, 1974. Densely populated urban areas were not immune from the twisters. On June 22 four tornadoes touched down within the Louisville city limits, including an EF2 that damaged Churchill Downs's horse barns and jockey facilities. Spotters were instrumental in getting accurate, real-time information straight to the NWS enabling radar analysts to issue detailed warnings about the dangerous storms. The storm spotter program must, and will, remain a top priority for the NWS.

Fire Weather Program Growing

Brian Schoettmer, Forecaster

After a record setting 2010 fire weather season in terms of the number of Red Flag Warnings issued by NWS Louisville, 2011 turned out to be much less active. One of the big reasons for the quieter year was the record setting spring rainfall that kept vegetation much more moist than normal. NWS Louisville still played an integral role in providing daily forecasts to local, state, and federal agencies including the Hoosier National Forest, Mammoth Cave National Park, and the Indiana and Kentucky Divisions of Forestry. Every year these agencies are in charge of completing prescribed burns to help control the amount of small fuels and to mitigate future wildfires. NWS Louisville completed 54 site specific forecasts in 2011 supporting prescribed burns and HAZMAT incidents. Also, two forecasters were able to attend a prescribed burn in Hoosier National Forest, gaining knowledge of how complex terrain and local fuels interact with local weather phenomena to influence fire behavior. With this awareness, forecasters can provide more detailed and accurate site specific forecasts. More forecasters are planning to attend prescribed burns in 2012.

Forecaster Andrea Schoettmer attended a prescribed burn in Hoosier National Forest in October 2011.

StormReady Grows in Southern Indiana and Central Kentucky

Andrea Schoettmer, Forecaster

In an effort to become better prepared for hazardous weather, counties and public entities across southern Indiana and central Kentucky continue to become StormReady or renew their StormReady certification. StormReady certification comes from meeting a specific set of guidelines that ensure that a location has a plan in place for hazardous weather, possesses multiple communication methods with which to send and receive information before and during hazardous weather, and conducts weather safety training on a regular basis. An additional requirement was added to local guidelines in 2011 for participating counties: each StormReady county must have at least 5 Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) observers. This requirement was put in place to increase the number of precipitation reports in the area. New StormReady counties must meet this guideline before certification, while already active StormReady counties are required to recruit 5 CoCoRaHS observers before their next 3 year renewal.

Perry County, IN became a new StormReady county in 2011 while Warren, Scott, and Woodford counties in Kentucky completed their StormReady renewal (which is required every 3 years). This brings LMK's StormReady program to a total of 18 counties, 8 supporters, 2 communities, 2 universities, 2 state parks, and 1 military base. Several more counties and public entities are working on their StormReady certification and will likely be added to the list in 2012.

By gaining StormReady certification, emergency managers are taking a big step to better protect local citizens from hazardous weather and mitigate its effects. While becoming StormReady doesn't mean that a place is "storm proof," it does mean that the community is as prepared as possible for a storm, and will know how to react and communicate effectively during and after the storm.

For more information on StormReady, Weather-Ready Nation, and CoCoRaHS, check out the following links:
www.stormready.noaa.gov
www.nws.noaa.gov/com/weatherreadynation
www.cocorahs.org

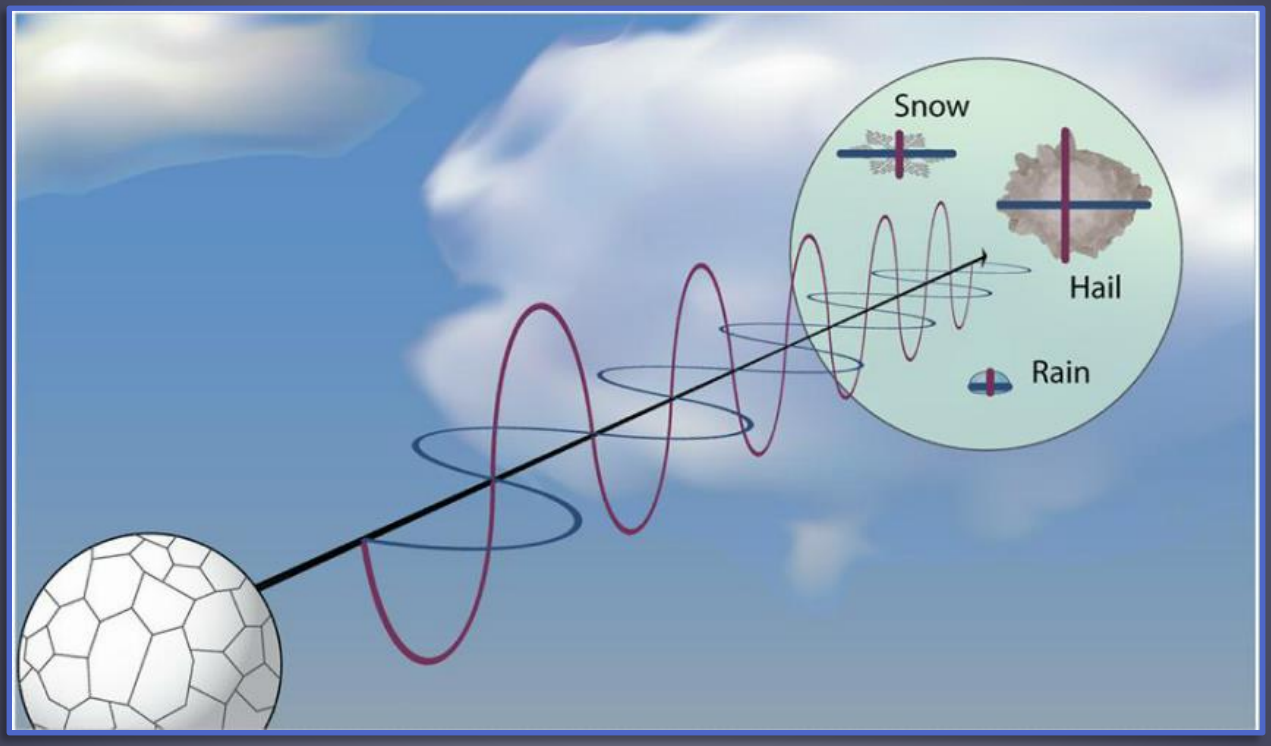
Woodford County, KY.

Cutting Edge Radar Technology Coming in 2012

John Denman, Forecaster

In November 2012 our local WSR-88D Doppler radar at Fort Knox will receive a significant upgrade. This upgrade, called dual-polarization or "dual pol" for short, will herald the most fundamental change in our ability to track storms since the 88D radar became widespread in the mid-1990s.

Currently the electromagnetic signal issued from the radar has only a horizontal polarization (shown below in blue). The dual pol upgrade will add a pulse with a vertical polarization (shown in red).



The key to dual pol's effectiveness lies in the fact that various forms of precipitation do not look the same with a vertical pulse compared to a horizontal pulse. For example, a large raindrop, which actually has the shape of a hamburger bun, shows up much stronger with a horizontal pulse compared to a vertical pulse. On the other hand, hail, which is essentially spherical, has a similar reflectivity with both horizontal and vertical pulses. By comparing these reflected power returns in different ways (ratios, correlations, etc.), we will be able to better obtain information on the size, shape, and ice density of cloud and precipitation particles.

Dual pol radar will prove very effective in identifying large hail, determining if precipitation is rain or snow, and enhancing precipitation amount estimations.

Bringing Real-World Experience to College Students

Ted Funk, Science and Operations Officer, and Angie Lese, Senior Forecaster

NWS Louisville greatly respects its professional partnerships with the atmospheric science programs at Western Kentucky University (WKU) and the University of Louisville (U of L). Such partnerships leverage the talents within each organization, which ultimately can enrich the services we provide you, our customers, while also helping students in the academic learning environment.

Ted Funk and Angie Lese talk to students at U of L.

In 2011 U of L invited LMK Science and Operations Officer Ted Funk and Senior Meteorologist Angie Lese to their School of Physics to deliver "real-world" presentations to students involved in the school's meteorology program. Ted and Angie gave a presentation on the challenges of forecasting winter-type precipitation and cool-season severe weather here in the lower Ohio Valley. All meteorology programs are weighted heavily in physics and advanced mathematics. However, it can be difficult to translate that into real-life forecasting. Part of LMK's collaboration with U of L is to show students that their difficult classes will pay off, and can be applied to operational use when they enter the workforce. LMK has developed a "seminar-a-semester" plan in which NWS meteorologists will give seasonal forecast and severe weather presentations to students at U of L and WKU.

At WKU we interact frequently with professors on climate issues and the Kentucky Mesonet (www.kymesonet.org). In addition, we have initiated a joint research effort, led by WKU student and NWS intern Evan Webb, on fog forecasting in Bowling Green, which will enhance our aviation forecast for the Bowling Green/Warren County Regional Airport.

In addition to visiting nearby schools, LMK also joins forces with surrounding NWS offices to take our act on the road. For the seventh consecutive year, we traveled throughout Indiana to visit with students and faculty at Purdue University, Valparaiso University, and Ball State University. We, along with the NWS offices in Indianapolis, Northern Indiana, and Chicago showed students a mixture of science, NWS operations, and a fun *Jeopardy!* style weather trivia game.

College Students Gain Invaluable Experience at LMK

Evan Webb, Student

Evan Webb

Four college students from U of L, WKU, and Valparaiso University worked at LMK during the summer in 2011, completing a large amount of work and becoming fully immersed in the experience of being a NWS meteorologist.

Jenna Mackin

Geoffrey Sego

Two students from U of L, Geoffrey Sego and Jenna Mackin, researched and created a historical weather poster on the August 2009 flash flood in Louisville, KY that had a tremendous impact on their own campus. Geoff and Jenna also had the great opportunity of presenting their poster at the 2011 NWA Annual Meeting in Birmingham, AL. In addition, the students worked on LMK's Internet presence, including edits to the student information webpage and a webpage on the history of the Ohio River freezing over.

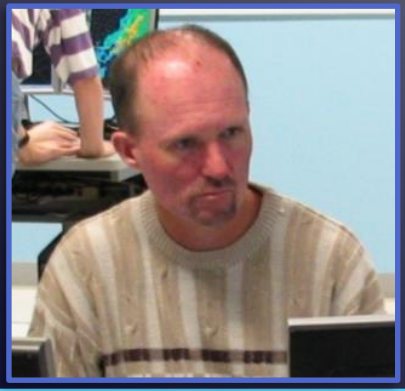
Kristin Smedley

Kristen Smedley from Valparaiso did a significant amount of work on the office's storm spotter database. The database is an immense help to forecasters during severe weather. Evan Webb from WKU was trained extensively on day-to-day operations of the NWS. Evan also took the lead with WCM Joe Sullivan in planning LMK's open house in September held to commemorate the office's 140th anniversary.

Veteran Forecaster Retires

Ted Funk, Science and Operations Officer

Don Kirkpatrick retired from LMK on July 30, 2011 after a storied 31-year career with the NWS, all served in Louisville. Don was a diligent, conscientious forecaster whose experience and insight were second to none. Don's leadership, work ethic, knowledge, and calm demeanor even in challenging weather situations resulted in years of phenomenal service for the citizens of southern Indiana and central Kentucky.

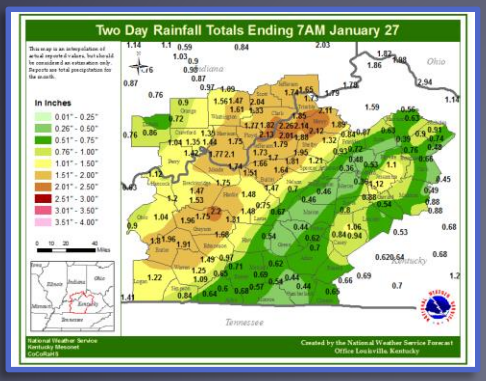


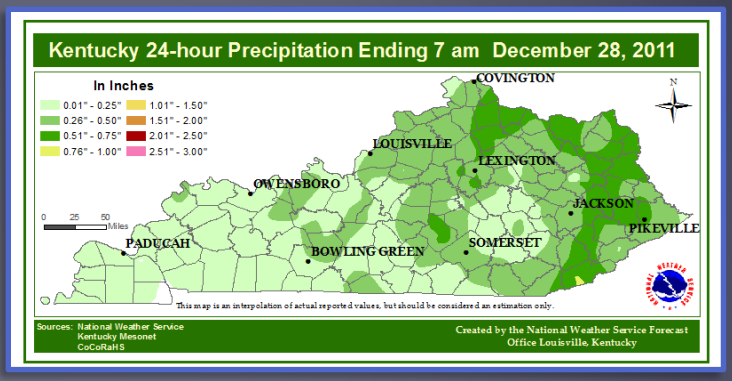
Don began his career in 1978 as a communications specialist with the NOAA Weather Radio program. In July 1980 Don became a forecaster aide, and then was promoted to meteorological technician, journeyman forecaster, and finally to senior forecaster. In addition to co-authoring several scientific papers, Don spent years cataloguing flash flood "hot spots" for use in warnings and GIS maps.

GIS Activities Continue to Expand and Improve

Erin Rau, Forecaster

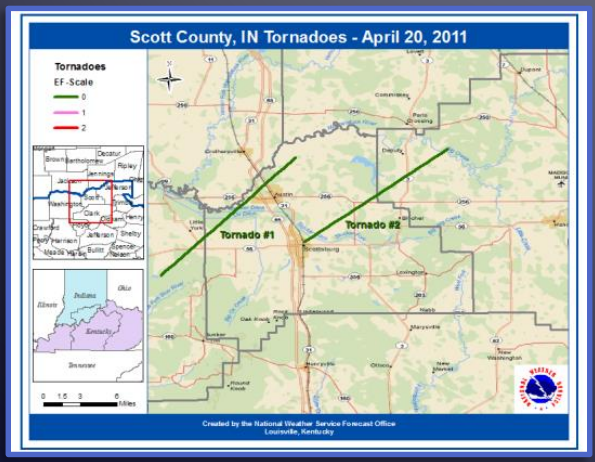
NWS Louisville continues to make strides in the use of Geographic Information System (GIS)-based programs. Over the past year we have worked toward streamlining the process of creating daily precipitation maps for the office's forecast area. Additionally, in coordination with the other NWS offices that serve Kentucky, we have begun producing statewide 24-hour precipitation maps when a significant amount of rain falls anyplace in the Commonwealth. The automation of the maps has been expanded to incorporate multi-day accumulated precipitation, snow depth, and peak wind gusts.





Spotters have been incorporated into KML files to be displayed in Google Earth, enabling us to more easily see where spotters are located and if they were in the path of storms. This helps in the verification process for severe weather. Additionally, flash flood hot spots are now automatically incorporated into flood warnings, thanks to shapefiles created using GIS technology.

GIS applications have been put to good use in a variety of ways for severe weather and flooding as well. With a very active tornado season in 2011, we were able to produce very detailed tornado track maps at the conclusion of damage surveys.



Over the next year, we will continue to expand the use of GIS-based programs. A new survey program is in development that will allow faster plotting of damage survey points, as well as incorporating geotagged photos. Additionally, some members of the LMK staff are on national teams whose purpose is exploring options for unifying the use of GIS-based programs across the NWS.

NWS Louisville "Likes" Facebook

Linda Gilbert, Intern Forecaster

This past spring marked an unprecedented turning point for NWS Louisville: we entered the world of social media. In May 2011we launched our own Facebook page, gaining 557 "likes," or fans of the page by the end of the first week. Since then our popularity has increased dramatically, with our number of fans increasing to over 2200 in 10 months.

Our hope for the Facebook page is to allow us to reach a broader spectrum of those with interests in the latest weather happenings in central Kentucky and south-central Indiana. Not only are posts made on a daily basis about what we are forecasting, but other noteworthy stories about past, present, and future weather events are posted as well. In addition, we publish information regarding outreach events such as SKYWARN activities.

When severe or other impactful weather events are anticipated, we utilize Facebook to get the word out to as many people as possible. It has also been a helpful way to receive information from individuals regarding not only storm reports and photos, but also to gain valuable feedback to help us improve our services.

www.facebook.com/US.NationalWeatherService.Louisville.gov

NWS Louisville Hosts Open House

Joe Sullivan, Warning Coordination Meteorologist

On September 10, 2011, NWS Louisville held an open house for members of the media, elected officials, and emergency management community. It was our first open house since leaving Louisville International Airport to move in to our current building on Smyrna Road. A steady flow of about 70 visitors toured the office over a four-hour period, viewing presentations on forecast and warning functions, seeing a demonstration of how various land uses affect flash flooding, and visiting with staff members. Subsequent comments from the staff and guests were overwhelmingly positive. Special thanks go out to AMVETS Post 61 for use of their parking area during the event, and to Jefferson County Public Schools for the use of a bus to shuttle visitors to the overflow parking area at the AMVETS Post.

Extolling the Virtues of Leadership

Angie Lese, Senior Forecaster

Leadership qualities are important in employers for obvious reasons, but leadership does not have to work from the top down. Each individual employee has the opportunity to lead. This concept holds true within the NWS as we all strive to enhance our work relationships for a better overall working environment and, thus, end product for our users. Also, we strive to develop our own personal qualities in order to improve ourselves. A great example of this is serving others while developing one's self, known as servant leadership. Every few months at NWS Louisville, we participate in a servant leadership activity.

During the winter and spring of 2010/2011 our office participated in two Habitat for Humanity events when we helped paint walls and put up siding on two separate houses for needy families. Ted Funk, NWS Louisville SOO, commented, "We had the pleasure to meet the future homeowner, which really personalized the experience and made us realize how a little time and effort can make a huge difference in the life of another person."

In Fall 2011 we participated in a local clean-up project with Louisville's Brightside organization. Several NWS Louisville members and their families picked up litter at a local city park.

These types of projects enhanced our leadership skills (humility, hard work, helping others), and reminded us of what's really important in life. The personal development and skill sets acquired during servant leadership activities will lead to great teamwork within our office and a better end product for our customers.

NWS Louisville Loses a Member of the Family

Bill Whitlock, Electronic Systems Analyst

Mark Schweitzer, Electronics Technician at NWS Louisville, passed away at his home on the evening of April 21 at the age of 48. Mark began his career with the NWS as an electronics intern at Indianapolis in 1983. He accepted a position at NWS Cheyenne, WY after his internship. From there Mark moved to Louisville, then to Paducah, on to Grand Junction, and then to Boulder. After a brief stint outside the NWS as a computer analyst for a private company, Mark was re-hired at NWS Louisville in 1999. During his career Mark received numerous awards for his dedication to the NWS mission. On the day of his death, Mark spent the day doing a tornado damage survey aiding a thinly staffed storm survey crew. Mark was a great person and friend, and is greatly missed here at NWS Louisville.

New Normals

Tom Reaugh, Senior Forecaster

In the most basic sense, a "normal" is a 30-year average of a particular meteorological variable, such as temperature or precipitation. Normals can be computed on time scales from an hour (the normal temperature at 2pm on the 6th of July, for instance) to a year (the annual normal precipitation for Lexington, perhaps).

The National Climatic Data Center (NCDC) in Asheville, NC has a responsibility to fulfill the mandate of Congress "... to establish and record the climatic conditions of the United States." As part of that responsibility, NCDC computes normals for 9800 sites in the United States and her territories. Computation of normals is in accordance with the recommendation of the World Meteorological Organization (WMO), of which the United States is a member. While the WMO mandates each member nation to compute normals at least every 30 years (1931-1960, 1961-1990, 1991-2020, etc.), the WMO recommends decadal updates. As a result, new normals were issued in July 2011 based on data collected during the 1981-2010 time period.

Meteorologists and climatologists use normals for placing recent climate conditions into a historical context. Normals are commonly seen on local weather news segments for comparisons with the day's weather conditions. In addition to weather and climate comparisons, normals are utilized in seemingly countless applications across a variety of sectors including regulation of power companies, energy load forecasting, crop selection and planting times, construction planning, building design, and many others.

Though normals were not designed to be metrics of climate change, differences from one installment of normals to the next can, nonetheless, provide some evidence of climate change impacts. However, care must be taken when interpreting changes between one normals period and another. Differences may be due to station moves, changes in normals computation methodologies, changes in instrumentation, and other external factors that are not reflective of real changes in the underlying climate signal.

Location	MaxT	Min T	AvgT	Precip	Snowfall
Bowling Green	69.0°	47.0°	58.0°	49.74"	8.9"
Frankfort	66.1°	44.5°	55.3°	45.62"	
Lexington	65.3°	46.0°	55.6°	45.17"	13.0"
Louisville OFFICIAL	67.8°	48.6°	58.2°	44.91"	12.5"
Louisville Bowman	66.6°	47.9°	57.2°	45.54"	

Stormy 2011continued from page 8

April 2011 was probably one of the stormiest months ever experienced in the southeast United States, and the Ohio and Tennessee Valleys were not left out. Severe weather or flash flooding struck the LMK office's area of responsibility (CWA) on 13 days during the month, with tornadoes on seven of those days. From the 19th to the 28th 32 tornadoes tore across the region. The frequent storms brought renewed flooding to the area as well, which lasted from mid April into early May.

Though the weather settled down a bit later in the spring, on the 10th of May storms dropped huge hail, up to the size of baseballs, northeast of Lexington. Then on the 25th another five tornadoes swept through southern Indiana.

Continued on page 19

April 9 in Marengo.

April 20 in Jeffersonville.

April 22 in Lexington. Photo: WKYT

April 23 near Cynthiana.

April 25 in Clark County, IN. Photo: Chuck Branham/News and Tribune

April 25 in Clark County, IN. Photo: Chuck Branham/News and Tribune

April 26 in Logan County.

April 27 in Cumberland County.

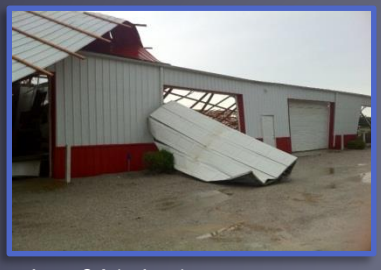
April 28 in Louisville. Photo: Michael Montgomery

May 10 near Carlisle. Photo: Delmus Murrell and Gay Hunt

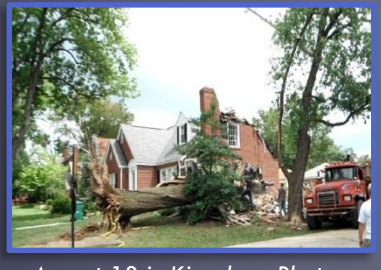
May 25 near Jasper.

Stormy 2011continued from page 18

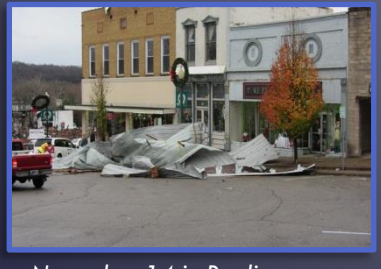
June 22 in Louisville.



June 26 in Lewisport.



August 13 in Kingsley. Photo: Mike Howard



November 14 in Paoli.

On June 22 a subtle east-west air mass boundary set up across Jefferson County, KY and served as a focus for thunderstorm development. Storms repeatedly developed over Louisville and moved through the city. In addition to heavy rain, five tornadoes touched down, four of them within the Louisville city limits! The strongest of the tornadoes, an EF2, struck Churchill Downs a few minutes after 8pm. Several horse barns and jockey apartments were severely damaged.

Just four days later, more tornadoes formed when a pair of EF1s moved through Dubois and Perry counties. The same storm system produced a downburst in Lewisport in Hancock County with estimated winds of 105 mph.

On August 13 a powerful storm developed over southeast Illinois and tracked eastward all the way into the Kentucky Blue Grass. The storm swept right through Louisville, knocking down trees and power lines with winds around 70 mph.

Fall was appreciably quieter, but one more tornado, an EF1, struck the town square and county courthouse in Paoli, IN on November 14.

Location	2011 Precipitation	Old Calendar Year Record
Louisville	68.02”	64.60”, 2004
Lexington	66.35”	65.76”, 1935
Frankfort	65.46”	60.66”, 1935

Our Goals for 2012

- Continue enhancement of radar analysts' skills
- Improve staff proficiency with Amber Alerts, backing up neighboring weather offices, office evacuation procedures, NOAA Weather Radio operation, and multimedia weather briefings
- Determining the best use for our Situational Awareness Display, including the ability to view Lexington television stations
- Training on dual polarization radar
- Updated storm damage survey procedures, including enlisting engineers and pilots to assist with surveys
- Develop on-line spotter training
- GIS maps for snow depth, wind gusts, damage surveys, and spotter locations
- Enhancement of the first 36 hours of the forecast through increased detail and frequent updates
- Increase decision support services, especially with HAZMAT operations
- Meteorologist familiarization trips to river gauges, co-op observer sites, radar site, Bowman and Louisville International towers, a prescribed burn site, and spots that are prone to particularly dangerous flash flooding
- Air Quality Alerts and information for Louisville and Lexington
- Better verification methods during and after severe weather events

National Weather Service
6201 Theiler Lane
Louisville, Kentucky 40229

Phone: 502.969.8842
Fax: 502.968.5663
E-mail: w-lmk.webmaster@noaa.gov
On-line: weather.gov/louisville

find us on facebook
www.facebook.com/US.NationalWeatherService.Louisville.gov