*2012 Shareholders' Report

National Weather Service

Louisville, Kentucky

*Leadership

Meteorologist-In-Charge (MIC)	John Gordon
Warning Coordination Meteorologist (WCM)	Joe Sullivan
Science and Operations Officer (SOO)	Ted Funk
Electronic Systems Analyst (ESA)	Bill Whitlock

A Message from the Meteorologist-In-Charge

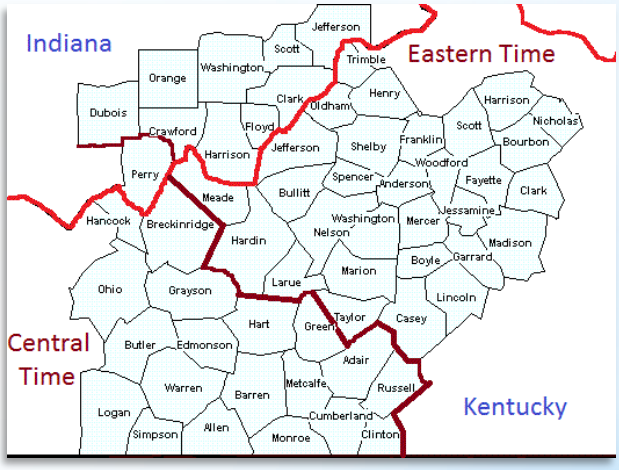
Welcome to the eighth edition of the Louisville Shareholders' Report. You are a shareholder in the National Weather Service (NWS)! As a taxpaying citizen of this country, you have invested in the NWS (part of the federal government). The NWS was appropriated $988 million for fiscal year 2012. That equates to an investment of $3.13 per American. As the Chief Meteorologist of your investment, I feel it is my duty to report to you how your "holdings" have fared.

John Gordon speaks to the press after a tornado outbreak.

This report details activities of the Louisville Weather Forecast Office (WFO) and events in its county warning area (CWA) during 2012. 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.

Who We Are

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, Frankfort, and Bowling Green in Kentucky, and Jasper and Madison in Indiana.

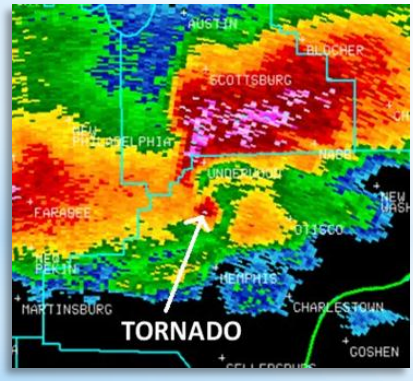


*In Like A Lion

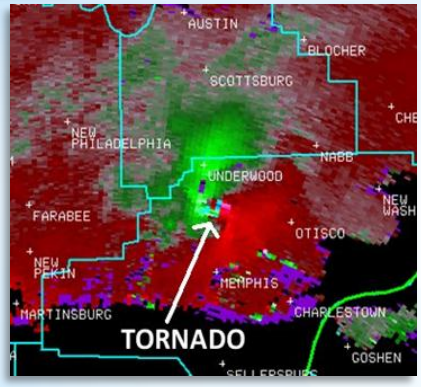
Ted Funk, Science and Operations Officer

The worst severe weather event in 2012, by far, occurred on March 2 when a historic tornado outbreak struck parts of southern Indiana and central Kentucky. By late morning, a strong low pressure system moved into central Illinois with a trailing cold front south into Texas. Ahead of the front unusually warm, moist air surged northward into the Ohio Valley. Temperatures over southern Indiana and central Kentucky soared into the 70s by midday, with south-central Kentucky setting record highs in the lower 80s. At the same time, a powerful jet stream aloft approached from the west. These factors created a very unstable atmosphere with extremely strong vertical wind shear (a rapid change in wind speed and/or direction with height).

NWS Louisville meteorologists recognized the chance for storms on March 2 as early as February 25, a full week before the severe weather hit, while also having to pay attention to the forecasted severe weather coming on February 29. The day before the March 2 outbreak, meteorologists at NWS Louisville conducted a conference call with county emergency managers, media, and school superintendents to explain the situation. On the morning of the outbreak as the seriousness and volatility of the situation became even more apparent, NWS Louisville conducted a second conference call with about 250 attendees, detailing the extreme nature of what could happen that afternoon.

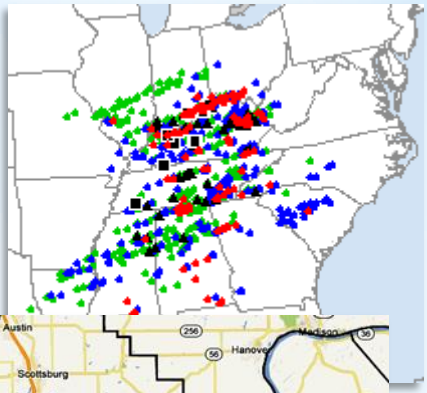


Left: NWS Doppler radar showing a large supercell thunderstorm over southern Indiana on March 2. The storm was producing an EF4 tornado and hitting Henryville at the time this picture was taken.

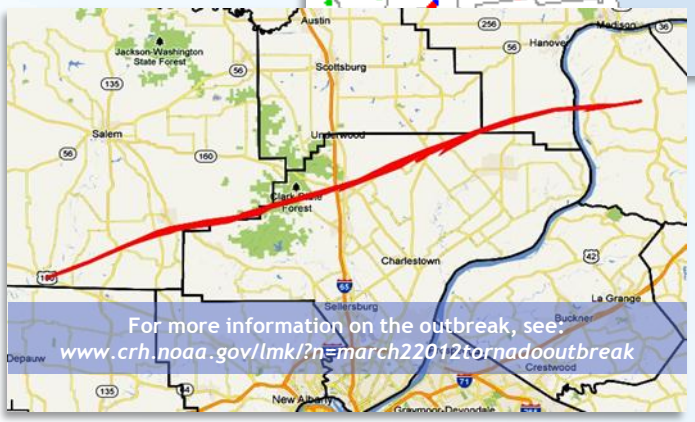


Right: NWS Doppler radar velocity data showing strong rotation (red-green couplets) over Henryville at the same time as the picture above.

Right: Reports of tornadoes, damaging winds, and hail on March 2, 2012.



Below: The path of the EF4 tornado from Fredericksburg, IN to Bedford, KY.



Thunderstorms fired up over southern Illinois and western Kentucky ahead of the front, with explosive intensification as they progressed east into southern Indiana around 1:30pm EST, and later into central Kentucky. Given the high instability and shear, numerous thunderstorms developed significant rotation. The result was eight tornadoes and many reports of large hail. Over central Kentucky hail up to the size of baseballs was reported.

Two forceful supercells tracked across south-central Indiana. These storms prompted the issuance of tornado warnings from our office before the tornadoes developed. Once it was known that a significant tornado was on the ground, combined with intense radar signatures, NWS Louisville upgraded the warning to a ***Tornado Emergency*** for the lead supercell over southeastern Washington and Clark Counties in Indiana.

Subsequent damage surveys indicated that the violent tornado was on the ground for 49 miles and was rated EF4 at its peak with maximum estimated winds of 175 mph. It was the region's strongest tornado since May 28, 1996 and the deadliest since the Brandenburg, Kentucky tornado of April 3, 1974.

In the weeks after the storms, several NWS Louisville staff members helped residents in southern Indiana program their weather radios so they would be ready when severe weather threatens in the future.

Angel Babcock, 14 months

Jaydon Babcock, 2

Joseph Babcock, 21

Kendall Babcock, 8 weeks

Moriah Brough, 20

Christianus Govers, 72

William Wayne Hunter, 62

Carol Jackson, 70

Daylynn Jackson, 4

Tony Jackson, 70

John Poyner, 30

*In Like A Lion

Joe Sullivan, Warning Coordination Meteorologist

There can be no mistake that the tornadoes which claimed the lives of 40 people, injured scores more, and devastated whole communities in the eastern U.S. on March 2, 2012 were a disaster. The mission of the NWS is to protect lives and property, and whenever a life is lost to the fury of nature there are questions as to what could have been done differently to reduce the number of lives lost. However, in the case of the Henryville tornado - an EF4 which claimed 11 lives - the real question to ask is, "How many lives *would have* been lost had the warning process not worked so well?" While no one can say with certainty what that number might have been, there is no doubt that, without the combined efforts of the National Weather Service, Louisville television meteorologists, county emergency managers, and school officials, the number would have been *much* higher.

"The NWS staff saved hundreds of kids' lives with their precise tornado warnings, forecasts, and customer service on the phone for Clark County and Henryville.

-- Dr. John McLean Reed, Assistant Superintendent for West Clark Community Schools.

Nowhere is that more evident than in Henryville where, based on information gleaned from NWS Louisville's conference call held to discuss the tornado threat that day, school officials made the decision to send students home before the storms reached the Clark County, Indiana community. Because of that decision, when the tornado struck the Henryville Junior-Senior High School only two dozen students and faculty were in the facility instead of the nearly 500 that would have been there had the school not released early. Given the degree of damage the facility suffered in the EF4 tornado, there is little doubt there would have been dozens of injuries and likely several fatalities had the building been occupied with its full enrollment.

One county west, administrators in the schools in New Pekin elected to keep their students in school because by the time the storms had developed and started heading toward them, there was insufficient time for the district buses to safely transfer all students home. This turned out to be the best possible action by school officials there as the powerful tornado passed two miles to the south and east of the elementary school, destroying numerous homes and killing five people. New Pekin school officials actively monitored the location of the storm online, via television, and with a teacher monitoring outside the building as the storm moved in from the west. They wisely chose to shelter their enrollment in place rather than risk them being caught in buses on their way home.

In both cases it was the collective efforts of <u>all</u> parties involved in the warning process - from NWS meteorologists issuing Emergency Tornado Warnings, to television meteorologists providing details to those in the path, to school officials making the most appropriate decisions for their students and faculty based on the shared information at hand -- that helped reduce the number of lives lost in southern Indiana that day.

Left: Henryville Junior/Senior High School. Photo courtesy Dr. John Reed.

A statement issued by NWS Louisville with very rare "Tornado Emergency" wording:

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE LOUISVILLE KY
317 PM EST FRI MAR 2 2012

TORNADO EMERGENCY CONTINUES FOR NORTHERN CLARK COUNTY INDIANA.
A TORNADO WARNING REMAINS IN EFFECT UNTIL 345 PM EST FOR NORTHERN TRIMBLE, NORTHERN CLARK, JEFFERSON, EASTERN WASHINGTON, AND SOUTHEASTERN SCOTT COUNTIES.
AT 314 PM EST MULTIPLE REPORTS OF A TORNADO CONTINUE TO BE RECEIVED BY THE NATIONAL WEATHER SERVICE IN LOUISVILLE. THIS TORNADO JUST CROSSED I-65 AND IS HEADING NORTHEAST AT 60 TO 65 MPH. IF YOU ARE IN AREAS SUCH AS HENRYVILLE...MARYSVILLE AND LEXINGTON INDIANA TAKE COVER NOW!

*Early Severe Weather

Ted Funk, Science and Operations Officer

When we talk about severe weather season, we normally mean the months of April, May, and June when low pressure systems, strong vertical wind shear, and atmospheric instability combine to bring severe thunderstorms to our area. However, in 2012, severe weather season came unusually early – during January, February, and March, a time when we should normally receive snow, not damaging thunderstorms. In Winter 2012, significant snow was rare, but severe weather was not.

While the amount and coverage of severe weather last winter was quite unusual, the actual occurrence of severe storms during late fall and winter is not all that uncommon. It is what meteorologists call "cool season severe," defined as November through March. During this time, strong low pressure systems can bring heavy snow and ice to the Plains and Great Lakes, but they also can bring thunderstorms farther south and east along their cold fronts. In these systems, strong southerly winds off the Gulf of Mexico stream moisture northward into the Ohio Valley and contribute the ingredients necessary for organized severe weather. In 2012, significant cool season severe events occurred on January 17, February 29, and March 2. Thunderstorms on those days brought a combination of damaging winds, large hail, and numerous tornadoes.

January 17, 2012

Left: A powerful squall line prepares to cross the Ohio River into Kentucky.

Right: EF2 damage in Simpson County

On January 17 low pressure moved into the Great Lakes with strong wind shear along the trailing cold front in the Ohio Valley. This spawned a powerful line of thunderstorms called a "quasi-linear convective system" (QLCS) that swept through southern Indiana and central Kentucky in the morning.

Small areas of rotation developed, resulting in 9 tornadoes, a January record. Eight of the tornadoes were short-lived and EF0 or EF1 in intensity. The Louisville metropolitan area experienced 4 tornadoes within or just outside the city. Farther south, a stronger EF2 tornado ripped through parts of Simpson and Allen counties near the Tennessee border.

In addition, there were many reports of damaging wind along the line with trees uprooted, roofs torn off, and a couple tractor trailer trucks blown over on interstates. More information on this event is on our website at *weather.gov/lmk/?n=jan17_2012*.

February 29, 2012

Severe storms returned with a vengeance on Leap Day, February 29, before the historic tornado outbreak two days later on March 2.

On the 29th a strong cold front roared into the Ohio Valley. Ahead of the front, surface temperatures rose into the 60s with moist air flowing northward from the Gulf of Mexico. With a strong jet stream approaching the area, the atmosphere over central Kentucky became quite unstable setting the stage for an eruption of severe storms.

By the time the event ended, five EF2 tornadoes (with winds estimated up to 135 mph) and one EF1 tornado (90 mph estimated winds) touched down in central Kentucky. The EF2 twisters hit eastern Grayson County, Hardin County south of Elizabethtown, Hodgenville in LaRue County (two tornadoes), and northern Russell County. The EF1 touched down in northern Metcalfe County.

Golf ball sized hail occurred in the strongest storms, with many reports of structural damage and trees down due to severe winds. See our web site at *crh.noaa.gov/lmage/lmk/feb292012tornadoes.htm* for more information.

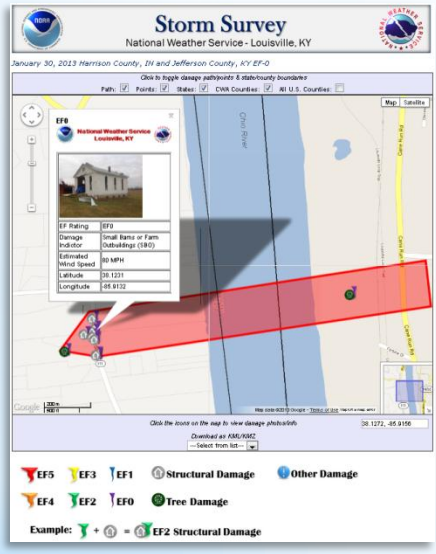
Left: Tornado damage two miles south of Elizabethtown. Photo courtesy Paul Osborne of Kentucky Volunteer Aviators.

*Surveying the Damage

Andrea Schoettmer, Lead Forecaster

NWS Louisville is now using a new method of surveying and displaying storm damage information from tornadoes, intense straight line winds, and unusually large, damaging hail. In the past, damage survey teams have collected damage photos in the field, written a narrative describing the damage, and produced a static graphic of the approximate damage path. In order to make the damage survey process more efficient and the resulting information more accurate and timely, a new procedure for collecting damage details and photos and displaying that information on our web site has been developed.

To aid surveyors in finding and classifying storm damage in the field, a radar program by Gibson Ridge called "GR2Analyst" is used on laptops in combination with Global Positioning System (GPS). Surveyors can then match radar images of a storm to the damage observed at their location. Having found damage, the surveyors then geotag storm damage photos by attaching the latitude and longitude of the damage to the photo and submitting those photos to a central server via a new internal Geographical Information System (GIS)-based program called Damage Survey Merged (DSM). The type of damage, wind speed, EF rating, and other information can also be sent with each photo. The geotagged photos may be taken by a variety of electronics including geotagging cameras, iPads, iPhones, Android tablets, and Android or Blackberry phones. In the office forecasters retrieve the geotagged damage photos and information from the server using the DSM software. Python scripts are then used to process the information quickly and efficiently to create detailed, dynamic storm damage track maps for our web site.



Storm survey maps are now much more detailed and interactive. Because they use a Google map background, the user can zoom in and out from the default map view. Also, we now indicate the type and severity of damage at each location where damage was found. Clicking on a damage indicator icon produces a pop-up box with information about that point. Clicking on the photograph thumbnail opens a larger version of the photo in a new browser window or tab.

StormReady

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. Crawford and Jefferson counties in Indiana and Madison County in Kentucky became new StormReady counties in 2012 while Anderson, Fayette, and Barren counties in Kentucky as well as Fort Knox, the University of Kentucky, and Floyd County in Indiana completed their StormReady renewal (every 3 years). This brings LMK's StormReady program to a total of 15 counties, 8 supporters, 1 military base, 1 community, 2 universities, and 2 state parks. Several more counties and public entities are working on their StormReady certification and will likely be added to the list in 2013.

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 you're "storm proof," it does mean that you are as prepared as possible for a storm and will know how to react and communicate effectively before, during, and after the storm. LMK's local StormReady program is part of NOAA's Weather-Ready Nation initiative which is designed to make every U.S. citizen better prepared for hazardous weather. For more information on StormReady and Weather-Ready Nation, check out the following links: *www.stormready.noaa.gov* and *www.nws.noaa.gov.com/weatherreadynation.*

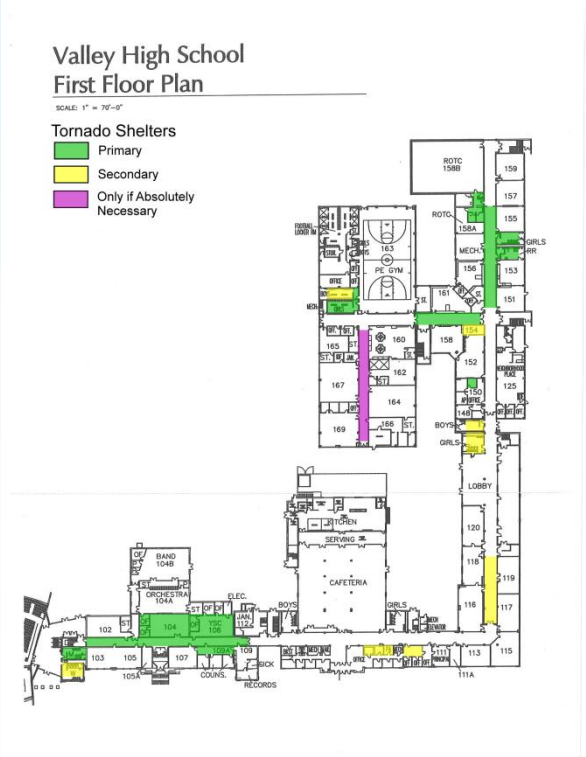
Madison County StormReady Ceremony in November 2012

*School Safety

Joe Sullivan, Warning Coordination Meteorologist

In recent years a number of videos have surfaced on the Internet showing the destruction of schools by violent tornadoes, including those in Joplin, MO and Henryville, IN. These security videos have caused many school administrators to question whether their current shelter locations are the best that are available in their buildings. Working with Jefferson County Public Schools (JCPS) facilities personnel, WCM Joe Sullivan visited several schools in Louisville in 2012 to ensure that students are sheltering in the best possible locations. Shelter locations are identified using the governing principle of placing as many walls and floors as possible between the tornado's winds and the shelter location. Other determining factors include the size of the space, its proximity to any glass, and the absence or presence of any potentially harmful debris.

Upon completing a facility walk-through, Joe Sullivan provides JCPS officials with color-coded diagrams of the building's primary and secondary locations for sheltering during Tornado Warnings, such as in the example seen here on the right.



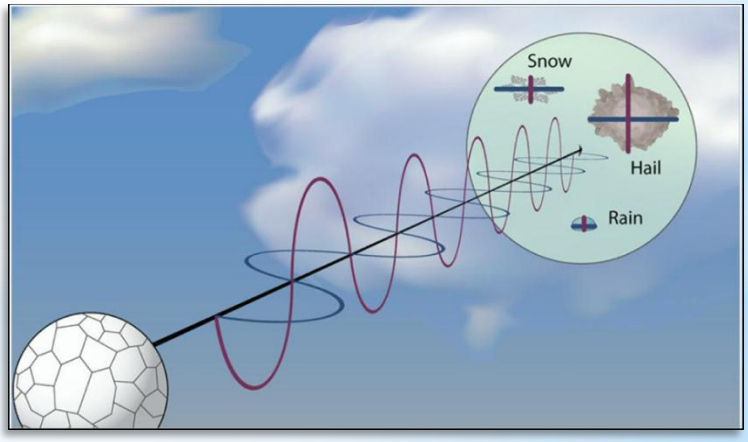
*Dual-Pol Radar

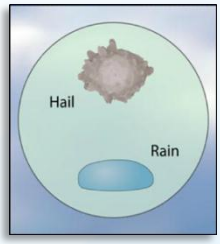
John Denman, Forecaster

In November central Kentucky's NWS Doppler radar, located at Fort Knox, received a long-awaited and significant upgrade. The upgrade to "dual polarization" heralded the most fundamental change to our ability to track storms since the Doppler radar became widespread in the mid-1990s.

Before the new technology was installed, the radar's electromagnetic signal had only a horizontal polarization (shown on the right in blue). Now, with dual polarization (dual-pol) we have added 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 with a horizontal pulse. For example, a large raindrop, which is shaped like a hamburger bun, shows up differently with a horizontal pulse than with 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 are able to obtain information on the size, shape, and ice density of cloud and precipitation particles.

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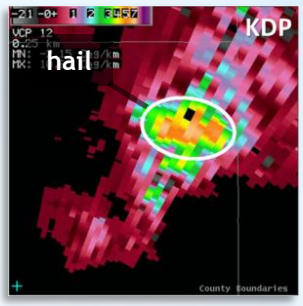
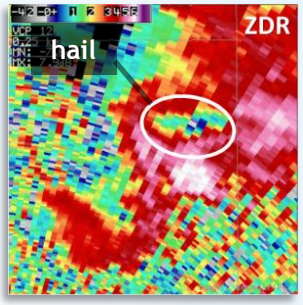
* Dual-Pol Radar, continued…

With the dual-pol upgrade, three new base products are now available: specific differential phase (KDP), differential reflectivity (ZDR), and correlation coefficient (CC).

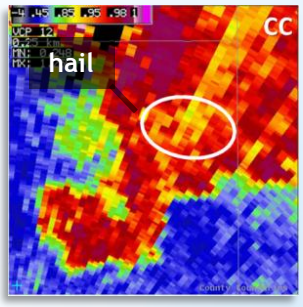
KDP is a comparison of the returned phase difference between the horizontal and vertical pulses. This phase difference is caused by the difference in the number of wave cycles (or wavelengths) along the propagation path for horizontal and vertically polarized waves. It should not be confused with the Doppler frequency shift, which is caused by the motion of the cloud and precipitation particles. Unlike ZDR and CC, which are dependent on reflected power, the specific differential phase is a "propagation effect." It is a very good estimator of rainfall rates.

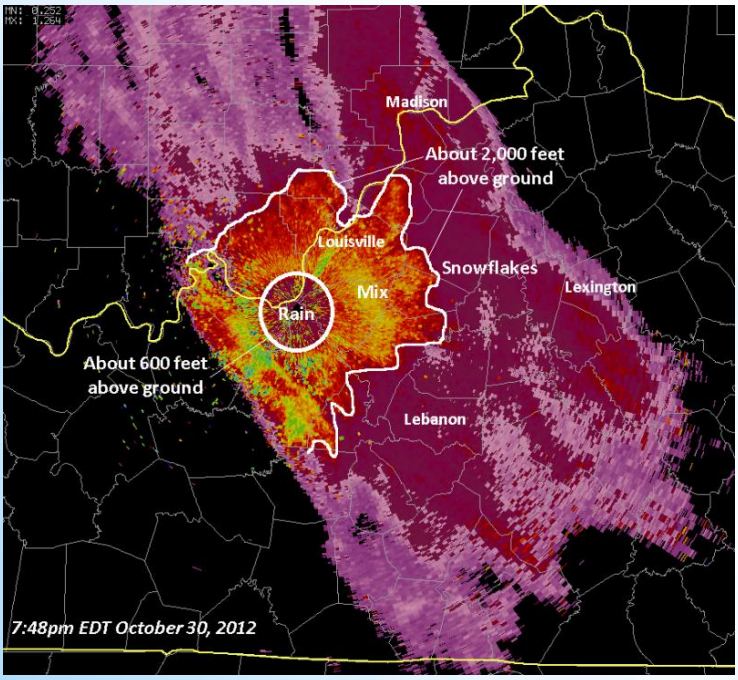


ZDR is the ratio of the reflected horizontal and vertical power returns. Among other things, this ratio is a good indicator of drop shape. In turn, drop shape is a good estimate of drop size. A very large drop might have a horizontal power return 5 times stronger than its vertical power return. Hail, which tumbles, looks spherical to the radar and would have a ratio near 1. Snow and drizzle also have a ZDR of near 1, but can be differentiated from hail with knowledge of cloud types and the temperature in the lower levels of the atmosphere.



CC is a statistical correlation between the reflected horizontal and vertical power returns. It is a good indicator of regions where there is a mixture of precipitation types, such as rain, sleet, and snow. Pure rain or snow, where all of the particles are either liquid or frozen, would have a CC of almost 1. A mixture of precipitation types will have a reduced CC, perhaps as low as 0.8. Caution should be used in areas of very light precipitation, though, since CC is usually quite low in those areas. CC is also used during times of severe weather, since a very low CC (<0.8) is indicative of very large hail.





Since the radar is able to differentiate different sizes and shapes of precipitation particles, it can tell us where it is seeing snow, rain, ice pellets, or a mix. From that information we can see and track the freezing level located aloft, as seen in the CC image on the left, which helps us to predict what sort of precipitation can be expected at the surface.

A melting layer (ML) product, a hydrometeor classification algorithm (HCA) that attempts to determine what type of precipitation the radar is sensing, and eight new precipitation accumulation products have been made available to forecasters and the public. We strongly encourage users of our radar information to become familiar with these new products through a series of online training modules provided by the NWS's Warning Decision Training Branch (WDTB). Modules are available for non-NWS meteorologists and non-meteorologists at *wdtb.noaa.gov/courses/dualpol/Outreach/index.html*.

*Decision Support

Toby TenHarmsel, Information Technology Officer

Ground zero of the derailment

Shortly after 6am on October 29, 2012, 13 cars of an eastbound 39-car Paducah & Louisville train derailed just north of the Salt River Bridge in far southwest Jefferson County, Kentucky. Residents reported a strong chemical odor in the air, and reported it to local Emergency Management. Emergency crews arrived on the scene and confirmed that one of the derailed cars was leaking butadiene after having landed upside-down. Though no other cars were compromised, nearby cars contained additional chemicals such as hydrochloride, sodium hydroxide, calcium carbide, and methyl isobutyl ketone.

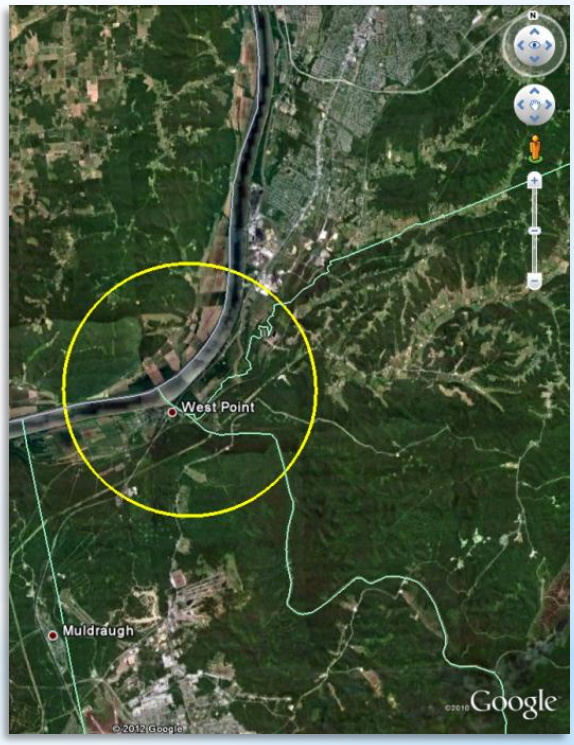
Local fire officials quickly declared a Level III HAZMAT situation, which is the highest possible alert level for a hazardous materials incident. A two-mile stretch of Dixie Highway was closed and 34 homes were evacuated, while the entire city of West Point was instructed to shelter-in-place.

Originally it was felt that the spill would be quickly contained, and for the first two hours after the accident NWS Louisville provided weather support to HAZMAT teams via telephone. Northwest winds were gusting to 25 mph at the time, putting residents of Hardin and Bullitt counties in the path of any leaking fumes.

It eventually became clear, however, that the spill would remain a threat to the region for an extended period of time. NWS Louisville ended up providing on-site support for much of a two and a half week period. Representatives of the NWS office, including Joe Sullivan, Toby TenHarmsel, Forecaster Mike Paddock, and Forecaster Brian Schoettmer, spent their days compiling and delivering weather briefings at the post command center to high-level local, state, and federal officials to assist them in determining the best course of action to secure the tankers and protect area residents. Officials from the Environmental Protection Agency and Federal Railroad Administration were among those involved in receiving our weather support.

Toby TenHarmsel and Joe Sullivan install a temporary weather station.

NWS Louisville employees sometimes spent more than 12 hours a day at the command center about a quarter mile from the spill site giving real-time wind, temperature, and atmospheric pressure data. Forecast information we provided was also very important to the emergency responders.



Shelter-in-place zone

Toby TenHarmsel and Joe Sullivan installed a temporary weather station at the site, which was connected to a computer that delivered constant weather information and current plume forecasts.

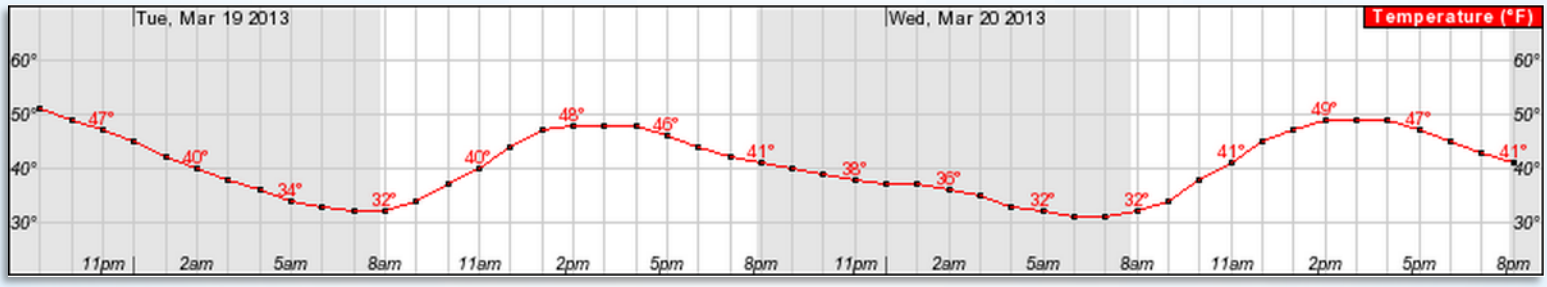
The event demonstrated just how vital weather support is during HAZMAT events for the safety of the clean-up crew and for residents living in the area.

*Enhanced Forecasts

Ted Funk, Science and Operations Officer

In 2012 the Central Region (CR) of the NWS, which includes Indiana and most of Kentucky, embarked on an initiative to create enhanced forecasts in the first 36 hours of the forecast (e.g., today, tonight, and tomorrow). The Enhanced Short-Term Forecast (ESTF) philosophy is predicated on local offices producing more detailed and definitive customer-centric forecasts and services along with frequent updates as weather conditions change. The enhanced data are meant to provide all users with the information they need to make informed decisions, including those which maximize safety, reduce hazardous weather-related damage, and spur economic productivity.

From February through May 2012, CR conducted an 11-office testbed to assess ESTF procedures and the best methods to achieve the goals of the project. NWS Louisville participated in the test by updating the short-term forecast at least once every three hours, and more frequently during rapidly changing conditions. We concentrated on the timing and movement of precipitation; trends in temperature, wind, and sky cover; and proactive issuance and cancellation of watches, warnings, and advisories. Updated forecast discussions were usually issued whenever the forecast was altered so that customers would know the logic behind the changes.



Hourly forecast data, like the temperatures shown here, are available via NWS web sites including NWS Louisville's at *weather.gov/louisville*.

During the test, the 11 NWS offices provided valuable feedback to a regional ESTF Team. This team carefully evaluated all input to come up with a set of recommendations to define the best possible process for enhanced short-term forecast and decision support in CR. The recommendations were formalized into an agreement in late December. As a result, most of the 38 NWS offices in CR will implement ESTF around April 1, 2013.

*Social Media

Linda Gilbert, Meteorologist

NWS Louisville's social media program experienced tremendous growth in 2012 as our Facebook fan base continued to increase and we began using Twitter and HootSuite.

Twitter is a fast-paced networking arena that limits its users to converse in messages of 140 characters or less, called tweets. There are a number of ways that tweets can be tracked; the most widely used way is by searching for keywords that have a # symbol in front of them. The combination of the word and symbol is known as a hashtag. Hashtags can be created by adding the symbol to any well-known word, such as #tornado, or can be any alphabetic or alphanumeric combination of characters. For NWS Louisville we've designated #lmkwx as a way for people to talk about general local weather, and #LMKSpotter for weather reports to or from anyone in central Kentucky and south-central Indiana. A nationally advertised NWS hashtag for folks to report significant weather is #wxreport. However, unless your report is geocoded (see *www.crh.noaa.gov/images/lmk/Introducing%20Twitter.pdf*), it will be difficult for us to receive it since people from across the country also are using that hashtag to send in reports. Therefore, to ensure your report makes it to us, we highly encourage you to use #LMKSpotter or mention our handle, @NWSLouisville.

continued on next page…

* Social Media, continued…

HootSuite is a multitasking tool that we are using internally for our social media needs. It allows us to not only keep track of what is happening on our Twitter and Facebook pages, but also to easily converse with all of you and send out information quickly across both platforms simultaneously. HootSuite also allows an easy way to search for specific hashtags, keywords, and other weather information, especially during hazardous weather.

twitter.com/NWSLouisville

Originally obtained from NWS Nashville, we also employ the Social Media Spotter Liaison Program. The program consists of a group of volunteers who peruse various social media sites for legitimate weather reports to relay back to us at NWS Louisville. These trained storm spotters are turning their expertise to the social media world, building relationships with us and others. They are analogous to HAM radio operators, but instead of conversing across airwaves, they converse across Facebook, Twitter, Google+, and other social media outlets. Both the spotter liaisons and the HAM Radio operators are crucial to our operations and we greatly appreciate all that they do.

From the end of 2011 through 2012 our local Facebook page saw an increase of "likes" of approximately 180%. By the end of 2012 our page had 4,796 fans. Compared to other offices in our region, these values place us among the top in popularity and growth rate.

facebook.com/US.NationalWeatherService.Louisville.gov

Facebook and Twitter provide excellent opportunities for us to convey important weather messages across a broad spectrum of people and organizations. However, we do not use these sites to issue short-fused warnings such as severe thunderstorm or tornado warnings. We primarily use the sites for purposes such as sharing precipitation and weather maps, Weather Stories, our Top News articles, and spotter reports.

If you have something weather related to say, whether it is a report, picture, or other tidbit of information, please share it with us and our followers. We look forward to hearing from you!

*Frost/Freeze Program

Rick Shanklin, Warning Coordination Meteorologist at NWS Paducah

Each fall and spring the NWS Weather Forecast Offices (WFOs) expend a great deal of energy toward the important task of determining when to end freeze warnings in the fall and when to start frost advisories and freeze warnings in the spring. This task has many considerations due to differences in customer requirements driven by geographical variations in plants grown and local variations in climate. The progress of crops and other plant life is monitored closely by experts in horticulture and agriculture. However, this information can be very challenging for WFOs to gather, analyze, and coordinate. As a result, in the fall of 2012 the NWS forged a partnership with the Midwestern Regional Climate Center (MRCC) to address this need. The MRCC covers a nine-state Midwest region including Kentucky and Indiana and is charged with developing climate information for climate-sensitive issues such as agriculture.

The partnership has since resulted in a suite of graphical products developed by MRCC based on input from meteorologists, academia, and other experts. While these products are still in testing, they have already provided a very helpful geographical representation of where the growing season is considered to have ended or started. The suite of graphics also includes critical temperature threshold maps. The end result is a much more coherent progression and representation of frost/freeze conditions, and most importantly frost and freeze products that best meet customer needs! You can visit the MRCC's web site at *mrcc.isws.illinois.edu*.

*Heat Headlines

Joe Sullivan, Warning Coordination Meteorologist

Unlike severe thunderstorm warnings, which are standardized across the United States, heat advisory and warning criteria vary based on a location's relative experience with heat and humidity. For example, while a heat index of 100 may be routine along the Gulf Coast, it is relatively rare in northern Michigan, and northern communities generally have more medical difficulties with high temperatures and humidity than do their counterparts in the South. The problem with varying criteria is that a line is drawn where the criteria change, and this can result in some confusion when the heat index is forecast to reach a value that necessitates the issuance of an advisory or warning in one county, but not in an adjacent county.

That was the situation for most of Kentucky prior to 2012. The criteria in eastern Kentucky were 5 degrees lower than in the central and western parts of the state for heat advisories and warnings. This was based on the fact that temperatures and humidity in the eastern mountains are generally lower than other parts of the Commonwealth. However, a survey by NWS Jackson of health officials in Kentucky's eastern counties revealed that nearly all felt that the lower criteria were too low for their residents, and resulted in the issuance of too many advisories and warnings when medical risks were not elevated. For that reason, the Jackson office changed its criteria on June 1, 2012 to match up with that of the counties in the central and western sections of the state. A Heat Advisory is issued for a forecast heat index around 105° and an Excessive Heat Warning is issued when the heat index is expected to reach 110°.

*Aviation

Brian Schoettmer, Forecaster

2012 was an exciting year for aviation at NWS Louisville. Highlights included successful flights by volunteer aerial damage survey pilots, a staff visit to the air traffic control tower at Louisville International Airport (SDF), and aviation-related outreach.

The volunteer pilot program continued to grow in 2012, and as of the end of the year there were 33 pilots across southern Indiana and central Kentucky involved in the program. These volunteer pilots successfully flew over damage paths after the February 29 and March 2 severe weather events, helping to verify tornado damage in a quick and efficient way. On March 2 one particular flight increased a tornado path length that had been previously surveyed on the ground from around 5 miles in length to 17 miles in length. Another flight found an additional tornado in Henry County. To honor the pilots who flew damage paths, we held a luncheon on September 7. Six plaques were awarded to pilots, lunch was provided, and a guest speaker (Randy Baker, Senior Meteorologist at United Parcel Service) gave a brief presentation.

Outreach to our aviation customers is a priority. Visits to local airports were conducted to recruit more pilots, and we talked to airport managers about their needs. One outreach event included a talk in late October to an aviation group at the Harrison County Airport near Cynthiana. The group was briefed on Hurricane Sandy,

John Gordon (l) awards pilot Mark Powers (r) a plaque for his flight after the March 2 tornadoes. Also pictured are co-pilot Josh Kiefer and photographer Austin Lassell.

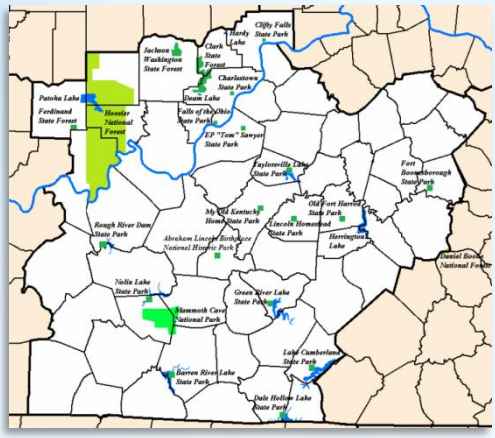
followed by a presentation about different aviation products we offer. Three additional volunteer pilots were recruited to fly over damage paths.

Staff from NWS Louisville also visited the air traffic control tower at SDF for an understanding of how air traffic operates there. Knowledge of air traffic flow and airport operations is critical to our airport forecasts and our group gained an appreciation for our customer.

*New Recreation Pages

Tom Reaugh, Lead Forecaster

Now there are even more ways to get weather information tailored specifically to your needs! We've added three valuable new features to our extensive suite of web pages and they can be found at *www.crh.noaa.gov/lmk/?n=recreation*.



On our web site the above map is clickable and provides immediate access to forecasts for the region's most popular recreational sites such as Mammoth Cave National Park and Hoosier National Forest.

Click on any one of the 114 cities on this map on our web site's recreation page to instantly receive an official NWS forecast for that location.

State road conditions are just a click away with this map.

Remember the Fog Bowl? Or the Snowplow Game? These and other football games made infamous by the weather the players and fans endured are described on our new football weather web page at *www.crh.noaa.gov/lmk/?n=football_weather*.

*University Partners

Ted Funk, Science and Operations Officer

In 2011 NWS Louisville began a Seminar-a-Semester program with the atmospheric science programs at Western Kentucky University (WKU) and the University of Louisville (UofL). The program entails NWS meteorologists giving weather presentations to students on seasonal topics of interest. These interactions and partnerships leverage the talents within each organization and bring an operational and real-world perspective to the necessary atmospheric theory taught in the classroom. Students have found the seminars very interesting and an excellent complement to the learning environment brought by professors.

In March 2012 NWS Louisville continued the program as Ted Funk and Lead Forecaster Angie Lese (now a SOO at NWS Nashville) gave a severe weather presentation at UofL, focusing on severe thunderstorm structure (including the March 2 tornado outbreak) and heavy rainfall. Ted Funk and John Gordon also visited WKU for a similar severe weather seminar, including a motivating speech discussing volunteering and personal characteristics important to attaining a meteorology job after graduation.

continued on next page…

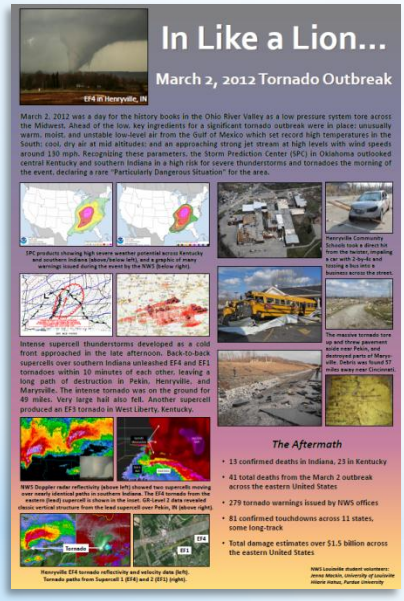
* University Partnerships, continued…

In Fall 2012 NWS Louisville continued its interaction with WKU and UofL to augment the learning environment. Forecaster John Denman provided an excellent overview of dual-polarization radar at our office, which was attended by a number of atmospheric science students and professors from UofL as well as meteorologists from the media, Ft. Knox Weather, and UPS. In addition, Ted Funk and John Gordon again traveled to WKU to give presentations on winter weather processes in the atmosphere and NWS operations during severe weather, followed by a dinner with students.

NWS Louisville greatly values its professional relationship and interaction with faculty and students at universities in Kentucky. In fact, the Seminar-a-Semester program grew into a full semester course for Ted Funk for the Spring 2013 term. Upon request by a UofL atmospheric science professor, Ted is now teaching the students about severe and hazardous weather. In addition, our relationship with UofL's GIS department has resulted in a GIS course taught by NWS Louisville Hydrologist Mike Callahan.

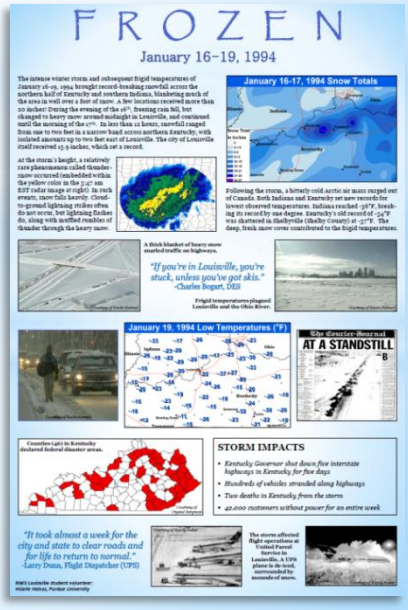
*Student Contributions

Evan Webb, Meteorologist



At NWS Louisville (LMK) in 2012, four students excelled in advancing the office and bettering their own skills. The students performed relevant, productive work to bolster LMK's efforts in keeping the service in weather. One student intern as well as three student volunteers contributed significantly to operations during severe weather, research endeavors, and several other projects to assist forecasters in accomplishing a great deal besides simply issuing a forecast.

Jenna Mackin, a University of Louisville student, added a plethora of updates to LMK's "EF-Kit," which is a valuable reference device for meteorologists conducting storm damage surveys. Jenna also did outreach work when she visited a preschool with LMK's Service Hydrologist, Mike Callahan. Mike and Jenna talked about the water cycle and revved up our tornado machine for the kids. Jenna also worked with NWS Louisville and UofL in the creation of a tornado safety video. The video won the Campus Safety Health and Environmental Management Association (CSHEMA) Award.



Hilarie Hahus, a Purdue University student, collaborated with Jenna in the research and design of a historical weather poster about the March 2, 2012 tornado outbreak. Hilarie also worked on a separate weather poster on the January 16-19, 1994 snowstorm that deposited a record-breaking 15.9 inches of snow on Louisville. In addition, Hilarie created an informational PowerPoint presentation on warning systems including CodeRED, the NWS website, and One Call Now.

Zack Leasor, a Western Kentucky University (WKU) student, created Fischer-Porter Rebuild Observer Instructions and installed a Fischer-Porter rain gauge with Mike Callahan and Hydrometeorological Technician Rick Lasher. Zack also worked on a temperature comparison study of Louisville International Airport and Bowman Field.

Evan Webb, a recent WKU graduate, collaborated with Hilarie in the creation of a "Beat the Heat, Check the Backseat" brochure to raise heat safety awareness. Evan also worked numerous observer shifts and coordinated an office trip to the Ft. Knox weather station and control tower. Evan is now the newest meteorologist at NWS Grand Rapids.

*KY Weather Workshop

Joe Sullivan, Warning Coordination Meteorologist

Three meteorologists from NWS Louisville presented at the 2012 Kentucky Weather Workshop in Bowling Green on February 24-25. Angie Lese spoke on the differences between tornadoes resulting from squall lines versus those spawned by supercells. Lead Forecaster Mark Jarvis described the effect advances in computer technology have had on computer weather modeling, and Joe Sullivan highlighted the challenges forecasters face when dealing with severe convective and winter weather in Kentucky.

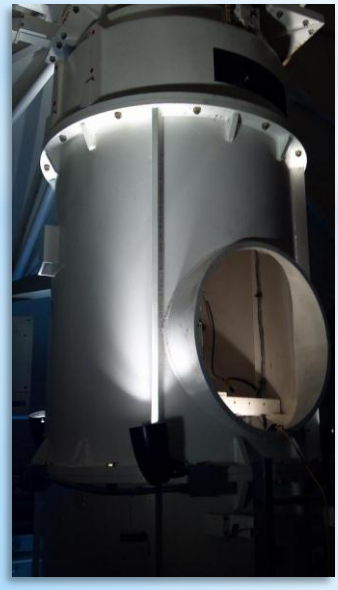
The workshop, hosted by the Kentucky Division of Emergency Management, was the third of its kind since 2010, and included speakers from the Paducah and Jackson NWS offices as well. Representatives from state and local emergency management, television, amateur radio, and other weather-minded public and private entities rounded out the presenter list, providing attendees from the Commonwealth with expertise in all areas of public weather safety.

*Fort Knox Visit

Evan Webb, Meteorologist

On August 9, 2012, eleven NWS Louisville employees and students had the privilege of taking an office trip to the military base at Ft. Knox. The NWS group met three base weather station meteorologists including Station Chief Mark Adams. Mr. Adams gave an overview of the routine responsibilities of Ft. Knox base meteorologists, particularly how they differ from the duties of a NWS forecaster. Mr. Adams provided additional insight on what specific information military pilots require versus the information in a typical public forecast.

Mr. Adams took the group up into the control tower to learn about typical flight schedules and the duties of the two individuals there. NWS employees were able to speak at length with these individuals. Mr. Adams even let the group climb around in a Boeing AH-64 Apache attack helicopter and snap some photos.



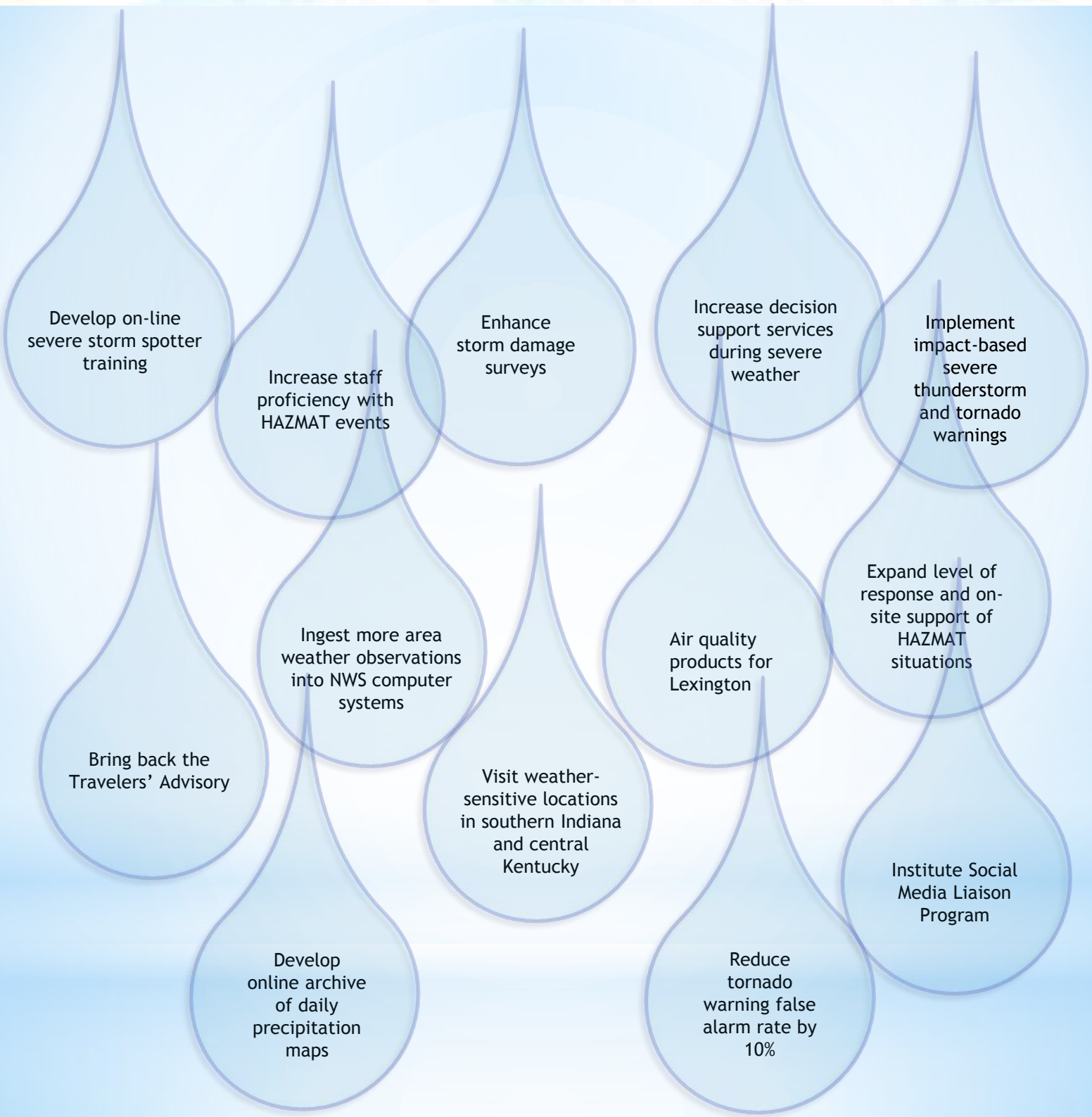
Before returning to the office, the group also visited the NWS Doppler weather radar tower located on the base. NWS employees climbed the tower to get a look inside the dome itself.

After leaving Ft. Knox the group made a stop at a cooperative observer site at Doe Valley in Meade County. The site was surveyed for improved exposure for the rain gauge. To finish the trip, the NWS crew checked up on a river gauge on Pond Creek near Fairdale in Jefferson County.

Left: Inside the radar tower

Right: Doppler weather radar at Fort Knox

*Our Goals for 2013



"What makes us so effective is our direct bonds with communities. Issuing forecasts and warnings, working shoulder-to-shoulder with emergency management, media outlets, and other partners, and directly engaging the public through a range of outreach activities are just some of the ways we're able to touch lives."

Dr. Louis W. Ucellini, Director of the National Weather Service

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