Performance & Evaluation Branch
Operations Division
NWS Office of Chief Operating Officer
Silver Spring, Maryland

This Issue

⇒ Aviation Forecast Verification Tool
Page 1

⇒ NWS 2015 Customer Satisfaction Survey Update
Page 3

⇒ On the Road Again
Page 6

⇒ PoP Forecasts Used to Teach Probability
Page 9

⇒ Fly…. With Ointment
Page 12

⇒ Status of Service Assessment Action Items
Page 15

⇒ Service Assessment Best Practices
Page 16

⇒ Update on Recent Data Ingest Issues
Page 17

⇒ Contact Information
Page 19

Aviation Forecast Verification Tool

Jamie Vavra, NWS Headquarters

Are you a verification enthusiast? We are seeking volunteers to help evaluate a new verification tool with capabilities for verification of the NWS human generated gridded forecasts. This web-based tool currently under development with initial prototype capabilities is now open for user evaluation and feedback.

The NOAA Next Generation Air Transportation (NextGen) Program and the Aviation and Space Weather Services Branch (ASWSB) have funded the development of capabilities for the verification of gridded aviation weather forecasts made available in the National Digital Forecast Database (NDFD). This tool is designed to support needs of the NWS forecasters and managers as well as for Quality Management of Digital Aviation Services products provided to the Federal Aviation Administration (FAA).

The Aviation Forecast Verification Tool (AFVT) currently provides near-real time point-based verification using METAR and SPECI observations and grid-based verification using the Real-Time Mesoscale Analysis (RTMA) as the verifying analysis. In the initial tool prototype, verification is computed using a three year historical archive of the forecast and observational data for the following parameters: visibility, temperature, dew point temperature, wind speed and direction, and wind gust forecasts. The domain of the initial prototype AFVT is the Contiguous U.S. (CONUS).

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Aviation Forecast Verification Tool – Continued from Page 1

The graphic below **(Figure 1)** depicts the main page of the prototype AFVT with the Graphical User Interface. Users may select queries that provide verification results for a Region, Weather Forecast Office, Airport, or station location. The results for point-based verification are depicted in contingency tables or bar graphs, and the grid -based verification results may be displayed in contingency tables, bar graphs, or as map-based graphics.

Funding for the AFVT development has been provided to the development organization for the past three years, and the tool capabilities are nearing a state of maturity for the initial requirements. The tool development is managed by the Meteorological Development Laboratory (MDL) located at the NWS Headquarters in Silver Spring, MD. An Integrated Work Team of Aviation and verification experts contributed to prepare the requirement documentation for the AFVT capabilities under development. We are seeking your input prior to finishing the first release of the tool operationally.

Future plans for 2016 and beyond include extension of the domain to the Outside of the CONUS (OCONUS), adding capabilities for individual skill scores, additional capabilities for verification of ceiling height forecasts, and verification of other gridded forecasts of interest to Aviation users.

We are seeking volunteers from NWS offices to help evaluate the AFVT capabilities and provide feedback on the tool's functionality and performance. All interested volunteers should contact the AFVT NextGen Project Manager, Jamie Vavra at Jamie.Vavra@noaa.gov to obtain specific information about the AFVT evaluation objectives and procedures.

This evaluation of the prototype AFVT is an opportunity to provide feedback prior to the initial version of the tool being implemented into NWS operations in the fall of 2016. Your input will be very valuable in ensuring the AFVT provides the key features and capabilities needed by the NWS forecasters, managers and the FAA.

Thank you in advance for your interest in the AFVT evaluation!

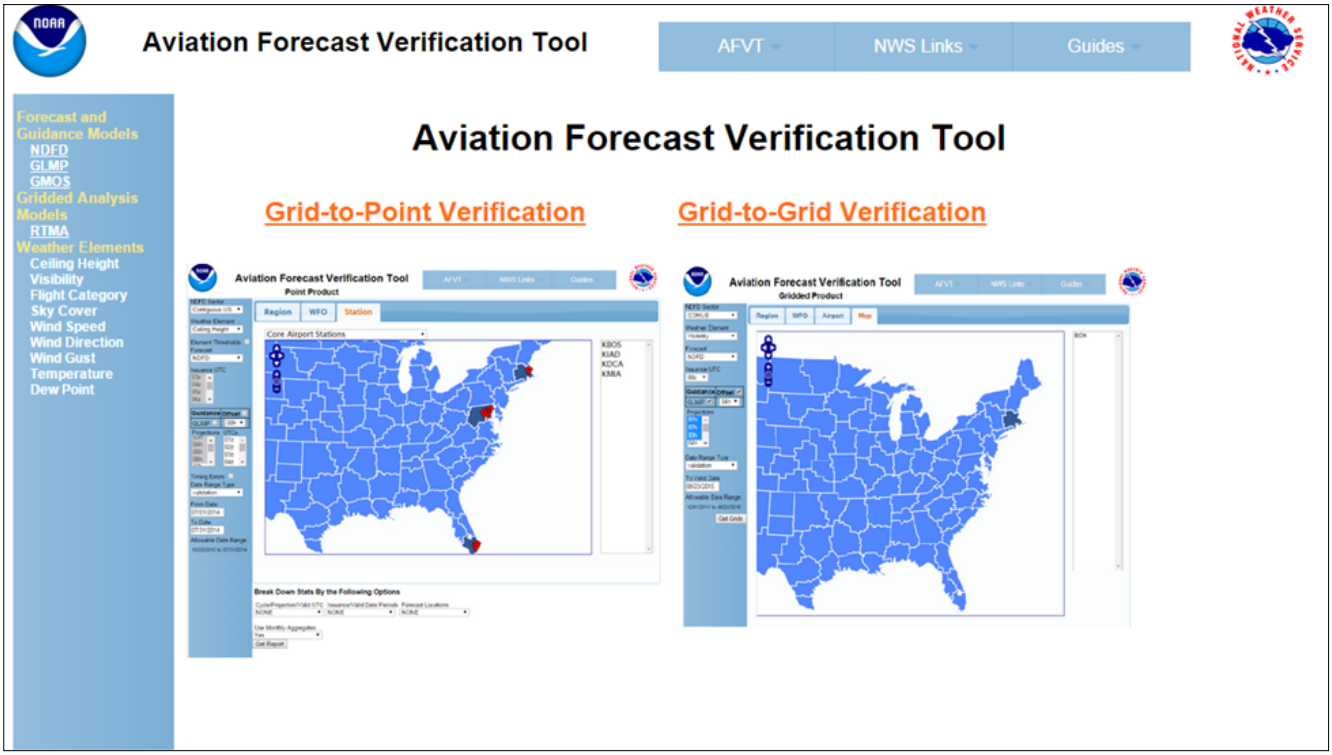

Figure 1. Graphic depicts the main page of the prototype AFVT with the Graphical User Interface.

National Weather Service 2015 Customer Satisfaction Survey Update

By Sal Romano, NWS Headquarters

The Performance and Evaluation Branch in the Operations Division of the Office of Chief Operating Officer continues to contract with the Claes Fornell International (CFI) Group to assist in the development and implementation of this year's survey. The CFI Group staff are experts in the science of customer satisfaction and use the American Customer Satisfaction Index (ACSI) methodology. The ACSI was created by CFI Group's founder, Claes Fornell, under the auspices of the University of Michigan. It is the only uniform measure of customer satisfaction in the U.S. economy and is used by more than 200 companies and government agencies.

This is a short, continuous, web-based, pop-up survey on NWS websites (e.g., weather.gov, forecast.gov, WFOs' web pages) that went "live," on Saturday, May 9, 2015. This provides a continuous data collection and reporting, via a web portal, throughout the year. The survey has been exceeding its goal to obtain 2,000 responses monthly (~67 nationwide each day). In the May 9, 2015 to September 9, 2015 period (i.e., a 4- month or 124 day period), there have been an average of 4041 responses per month (130 responses per day), for a sum of 16,164 responses.

Respondents had an Overall Satisfaction score of 80, as is shown below **(Figure 1)** from a screen capture of a graphic in the results portal.

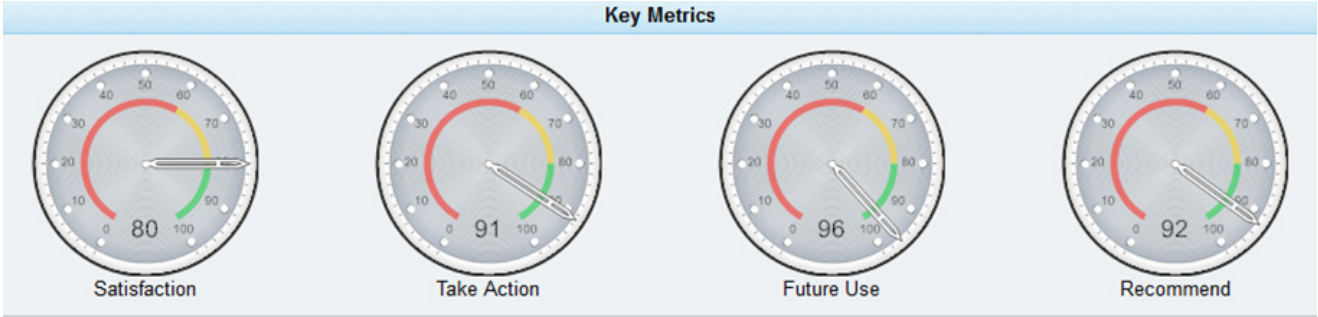

Figure 1. Screen capture from a graphic in the results portal showing an overall satisfaction score of 80.

The other three measures shown in the above graphics are scores resulting from these questions:

1. Using a 10-point scale on which 1 means "Not at all Likely" and 10 means "Very Likely," how likely would you be to **take action based on the information you receive from the NWS?**
2. Using a 10-point scale, on which 1 means "Not at all Likely" and 10 means "Very Likely," how likely are you to **use the NWS as a source of weather information in the future?**
3. Using a 10-point scale on which 1 means "Not at all Likely" and 10 means "Very Likely," how likely are you to **recommend the NWS to a colleague or friend**?

These scores have been very consistent since the start of the continuous, web-based, pop-up survey.

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National Weather Service 2015 Customer Satisfaction Survey Update – Continued from Page 3

Each of these quarterly surveys contains approximately 25 questions. The usual customer satisfaction index questions to determine the satisfaction score, desired outcomes questions, and demographics questions make up about 15 questions. In addition, there are about 10 seasonal/topical questions. For example, the spring survey included questions on Winter Weather, Weather-Ready Nation, and Outreach. Those seasonal questions were swapped out in July and replaced with Flooding and Hazardous Weather-related questions. The fall version of the survey went "live" in early October and contains questions on Extreme Heat and Wildland Fire Weather.

For your information, another continuous pop-up survey is being led for the NWS by the Office of the CFO. That survey is mainly concerned with the NWS's Weather.Gov site and the pop-ups only occur on that website and not on the WFOs' web pages. A different survey company, ForeSee, is administrating that survey.

In addition to these pop-up surveys, CFI selects a panel consisting of approximately 250 individuals each quarter and compensates them to take a very similar survey on the Internet. These Internet panelists/respondents more closely represent the demographics of the United States according to the 2010 U.S. Census. The first group of Internet panelists, consisting of 293 respondents, took the winter weather-related survey in May 2015. The second group of Internet panelists, consisting of 246 respondents, took the flooding and hazardous weather-related survey in July 2015.

Respondents had an overall satisfaction score of 75, as is shown below **(Figure 2)** and a Take Action score of 84 for both the May 2015 and July 2015 surveys. Also, in the July 2015 survey, the Future Use score increased by 2 points, to 84, and the Recommend Score increased by 1 point, to 80. The May 2015 Internet Panel scores are shown below **(Figure 3)** from a screen capture of a graphic in the results portal.

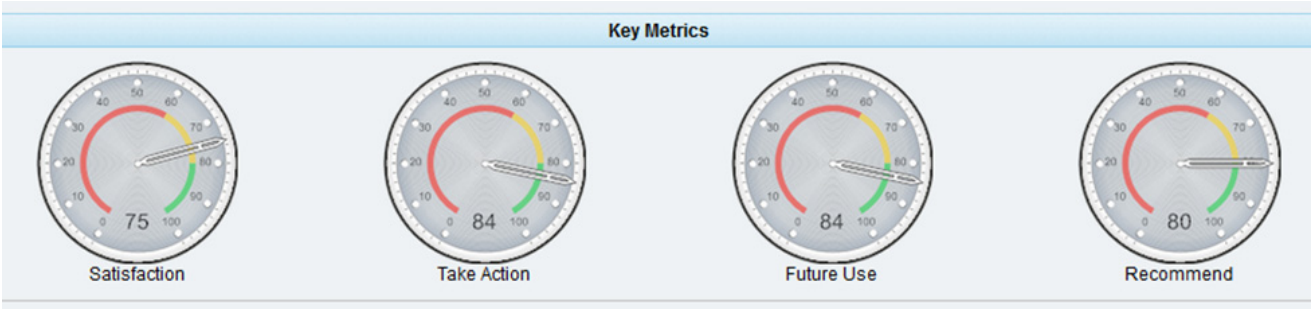

Figure 2. July 2015 Internet Panel scores from a screen capture of a graphic in the results portal.

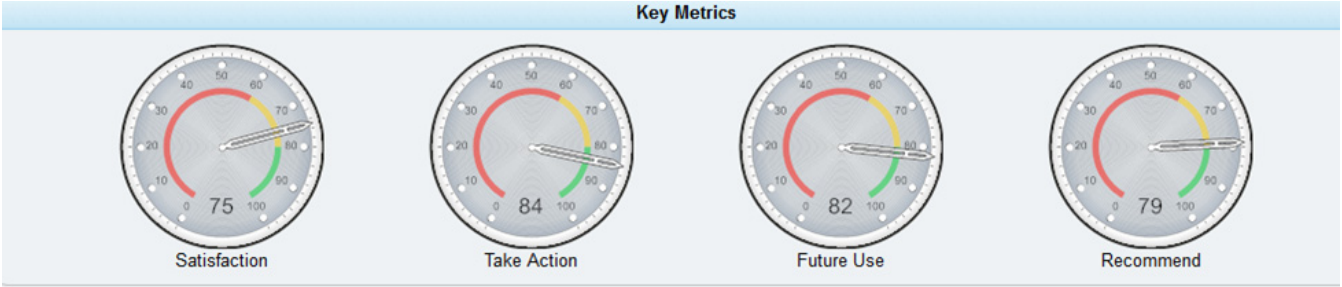

Figure 3. May 2015 Internet Panel scores from a screen capture of a graphic in the results portal.

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National Weather Service 2015 Customer Satisfaction Survey Update – Continued from Page 4

The pop-up and Internet panel survey results are available through a Web portal provided by CFI. You may access the survey results' Web portal at:
https://portal.cfigroup.com/Portal

The generic username and password are:
Username: NWSwm@noaa.gov
Password: NWS2015!!

Once you have gained access to the portal, please go to the upper right-hand corner and click on "Exit to Portal List," in order to select the survey results that you would like to view.

In addition to results from this year's Internet Panels (i.e., named "National Weather Service – Internet Panel) and the continuous, web-based, pop-up survey (i.e., named "National Weather Service Web Monitor"), there are results from the 2012, 2013, and 2014 annual surveys. These data can be parsed to the NWS Regional and/or State levels. Also, a new feature is the parsing of results from each WFO's area of responsibility (i.e., named "National Weather Service WFO, 2015 – Present"). WFOs will be able to learn quite a bit about how the public perceives their services by providing each WFO with responses from respondents within their area of responsibility.

Please take a few moments to complete the survey if you receive our CFI Customer Satisfaction Survey pop-up.☼

Quotes From the 2015 Quarterly Website Survey

"Thoughts on Improvements to the NWS"

⇒ "I would like to see NWS have a local weather reporting system for weather enthusiasts like myself to report my weather conditions. Using the airport readings from a large city is seldom representative of what other parts of the city are reporting. I keep my own records and my numbers, especially daily rainfall totals are significantly different from the airport, which is 7 or 8 miles away. The airport may get a thunderstorm and I get nothing, which frequently happens. If the NWS had a computer program that allowed people to sign up to report conditions at their location, it would give a more representative picture of what is happening city or area wide."

⇒ "NWS is probably doing as well as it can since I live in a mountainous region and weather activity varies widely within a few miles. Storms predicted often do not happen, and an occasional storm happens without any prediction."

(Survey period 7/23/15 to 8/24/15)

" Overall, it felt good to get back on the road and meet with some great people, both inside and outside the National Weather Service".

By Brent MacAloney, Performance and Evaluation Branch, NWS Headquarters

When the NWS Headquarters' reorganization was implemented on April 1, 2015, it became apparent that I would once again be taking to the road to gather performance management requirements and conduct training. Over the last few months, I ended up with three trips to four cities and the following is a recap of what I was doing.

Salt Lake City, Utah

The first trip I took was to Boise with a stopover in Salt Lake City for two nights. The main purpose of this visit was to go to the University of Utah to discuss a way to transfer the Joint Fire Science Program (JFSP) Spot Forecast Verification Project to operations in the NWS. Performance and Evaluation Branch (PEB) Chief, Doug Young, accompanied me to Salt Lake City to meet with John Horel, professor in the Atmospheric Sciences Department at University of Utah.

John hosted me and Doug for the better part of the day to discuss the Spot Forecast Verification Project that he and his students developed. (location: http://meso1.chpc.utah.edu/jfsp/). The program was developed as a result of a 2012 JFSP funded proposal to verify fire weather forecasts. The goal of the project was to transfer whatever was created into operations at the NWS. The program looked very interesting and useful. It does a decent job at objectively verifying the NWS's fire weather spot forecasts and displaying the performance results. As part of our meeting with John, we discussed areas in which we could expand the program to make it even more useful to forecasters. The transfer of this program to operations is part of the NWS's Performance and Evaluation Revitalization Plan (PERP) and the development of a transition plan is an FY2016 milestone.

After our meeting with John, Doug and I visited the forecast office in Salt Lake City to discuss our verification plans, answer any questions, and spend some time with the forecasters, trying to better understand how fire weather spot forecasts are issued. We were able to meet with SLC Meteorologist in Charge, Randy Graham, and members of his staff. Randy and his staff did a great job showing us exactly how spot forecasts are issued and some of the challenges they have in the process. This is good information to have as we will embark on transferring the spot forecast verification project to operations and improving programs functionality as we go into the next Fiscal Year. View **Figure 1** on the next page.

Before heading out of SLC on a noon flight, Doug and I were able to stop by Western Region Headquarters, attend the morning weather briefing. We then conducted a quick presentation on PERP and discussed ways in which the tools on the Performance Management website could be improved. We wished we had more time to spend with the Western Region staff, but we were on a tight schedule and will have to plan a future visit.

Continued on next page...

On the Road Again – Continued from Page 6

Figure 1. Salt Lake City WFO Meteorologist-in-Charge, Randy Graham (L), shows Performance and Evaluation Branch Chief, Doug Young (R), how fire weather spot forecasts are created. Photo taken by: Brent MacAloney

Figure 2. Brent MacAloney in front of the National Interagency Fire Center (NIFC) in Boise, Idaho. Photo by: Doug Young

Boise, Idaho

As Doug and I arrived in Boise, there was an active 73-acre wild fire taking place in the Boise Foothills that made national news (http://goo.gl/PIqaD5). Nothing like an active wildfire to get us into the swing of brainstorming ways in which we could develop tools to assist with tracking the NWS's performance with regard to fire weather forecasting and Incident Meteorologist (IMET) deployments.

We spent a good part of two and a half days with the National Fire Weather Operations Coordinator, Larry Van Bussum, and Fire Weather Science and Dissemination Meteorologist, Robyn Heffernan discussing their challenges in tracking performance in their program areas. In total, we discussed ways in which the PEB can assist with tracking IMET deployments, how the NWS can transition and upgrade the fire weather spot forecast verification program developed by the University of Utah, ways the National Fire Danger Rating System (NFDRS) verification can be resurrected and expanded to be more meaningful, and if there are any viable options on the table to automate the verification of Red Flag Warnings (RFW). In addition to discussing the work related topics, Robyn treated us to a tour of the Nation Interagency Fire Center (NIFC) campus and operations center **(Figure 2)**. Although there were no wildfires going on at the time, we were able to tour a very impressive room, which brings all agencies together to work in actively suppressing large wildfires.

After Doug and I completed our fire weather meetings with Robyn and Larry, we stopped over at the Boise forecast office to meet with the Warning Coordination Meteorologist (WCM), Jay Breidenbach, and Science and Operations Officer (SOO), Tim Barker. The visit was nothing formal, rather just an opportunity to say hi and discuss any issues or needs their office currently has with regard to verification.

Doug and I were fortunate to have a late afternoon flight back to the Washington DC metro area. This gave us the opportunity to get some hiking, disc golf, and sightseeing done in the Boise area. In addition, we were able to take in a Boise Hawks baseball game and a free live concert in the downtown area while in town. The city of Boise is absolutely beautiful, the food is great, and the people are very friendly. I cannot wait to go back!

Kansas City, Missouri

The NWS Training Center (NWSTC) threw me a

Continued on next page...

On the Road Again – Continued from Page 7

welcomed curveball and held their annual WCM Training Course in late August/ early September this year. Traditionally, this class is held in early December. So it was nice to actually go to Kansas City when it was not so windy and cold.

This year I tackled my training responsibilities at the WCM Training Course like a boot camp. I had several topics to discuss, but was only limited to two and a half hours. So I gave very quick, high-level snippets of everything that a WCM might need to know about performance management and storm data in a rapid fire format. My section of the class went fast, but I feel like everyone was able to walk away with some ideas of what responsibilities they have in the performance management world.

When in Kansas City to conduct a training session, I usually try and hold several other meetings with staff members at Central Region Headquarters. This year was no different. Doug Young and I were able to brief the staff on the PERP, storm data modernization plan, and customer satisfaction surveys. We also met with the CRH IT staff to discuss the ongoing care and feeding of the PEB data servers (located at CRH) and the staff in the Central Region Operations Center (ROC) to discuss ways in which they collect information on high impact weather events, which are reported to headquarters.

Personally, one of the more interesting aspects of this trip was being introduced to the staff at the Aviation Weather Center (AWC), which is co-located with CRH and the NWSTC. Doug and I were greeted by AWC Deputy Director, Clinton Wallace who had his staff on hand to discuss ways in which verification is conducted at the AWC. As I suspected, verification of AWC products is difficult to conduct, mainly due to the lack of observations. When the purpose of your products is to tell pilots not to fly aircraft into an area due to bad weather, you will rarely end up with any observations of that bad weather. However, it was very interesting to see the operations areas there at the AWC, as well as discuss the aviation impacts catalog. We look forward to working with them in the future on developing some performance metrics.

McKinney, Texas

My final trip was to McKinney, Texas for the American Society of Civil Engineers (ASCE) Wind Speed Standard Committee Meeting at Simpson Strong Tie. For those who are not aware, there is an effort under way to set a standard for the way in which tornado wind data is collected, used and archived. This effort is being led by Jim LaDue from the Warning Decision Training Division (WDTD) and Marc Levitan from National Institute of Standards and Technology (NIST). I am the chair of the Data and Archival sub-committee. The purpose of this meeting was to get all the voting and associate members of the committee together to begin drafting a scope and framework for the standard.

When this process is complete and the standard has been accepted, should the NWS choose to accept this standard (which it will likely do since its employees took part in the process), this will impact how tornadoes and their associated winds are rated and archived in storm data. There are several sub-committees associated with this team that will explore various aspects of tornado wind estimations. They are: EF-scale (i.e., damage), radar, forensics, remote sensing, in-situ, and tree fall pattern.

Having the meeting hosted by Simpson Strong Tie was a great opportunity to step out of the forecast and warning meteorology world and into the manufacturing world to see some practical applications of meteorology. Simpson Strong Tie creates connectors, fasteners, and anchoring systems. These are the types of materials used when constructing homes and buildings. The group meeting at the facility had the opportunity to see how these materials are manufactured, as well as

Continued on next page... Page 8

On the Road Again – Continued from Page 8

some of the strength testing that takes place to ensure the products can withstand various environmental elements, including wind **(Figure 3)**. The whole experience was very interesting.

Figure 3. The ASCE Wind Speed Standards Committee receives a demonstration on connector strength at Simpson Strong Tie in McKinney, Texas. Photo by: Brent MacAloney

Overall, it felt good to get back on the road and meet with some great people, both inside and outside the NWS. However, having all of this travel took its toll on me.

I had the best remedy for exhaustion and that was in the form of a trip to one of my favorite places, Vermont, for two weeks of rest and relaxation during foliage season.

I hope you all have a great Fall and as always, I hope your travels, whether they are personal or business related, will be safe and fun. Until next time, cheers!

PoP Forecasts Used to Teach Probability

By Chuck Kluepfel, NWS Headquarters

A couple months ago, I was invited to a meeting in Annapolis, Maryland to brainstorm some ideas for curriculum development in the Maryland public schools. Upon arriving, I met some fellow NOAA scientists, some teachers, and people responsible for leading curriculum development. We had been asked to come up with some scientific examples of how math is used in the real world so more scientific examples can be incorporated into the teaching of math in grades 4 thru 12. We had about fifteen people around a long table, and I was the sole representative from the National Weather Service.

My challenge that morning was formidable because I wanted to provide two examples to the group, and the amount of time allotted for me to present both topics was only ten minutes! After we each gave our presentation, the larger group voted upon four ideas to begin building into a future curriculum. I had two ideas that I thought were appropriate so I had five minutes to present each idea. First, I presented the use of probability of precipitation (PoP) forecasts to illustrate the concept of probability to students. Next, I showed how the basic laws of motion and physics are used in numerical weather prediction.

Getting back to probability, when we introduced ourselves at the beginning of the day, I asked everyone in the group to think about the answer to the following question prior to my speaking time: *If you predict a 40 percent probability of rain today, and the rain occurs, were you right or wrong?*

As a student, I had very little formal exposure to

Continued on next page... Page 9

PoP Forecasts Used to Teach Probability – Continued from Page 9

probability prior to the basic statistics for a research course I took as an undergraduate at Rutgers. I remember some teachers touching upon some very basic probability themes once or twice in grammar school, but we didn't spend much time on them. They were primarily used as illustrations. Meanwhile, I grew up hearing the chance of rain in the weather forecast every day. Without realizing it, as a very young, budding meteorologist I was beginning to think in probabilistic terms. After all, the forecast wasn't always correct, and deep down, I knew I probably wasn't that much better of a forecaster than the meteorologists I would watch on the evening news. The concept of uncertainty had become a certainty for me very early in life!

In my presentation, I alluded briefly to the Brier score, which is nothing more than a mean square error formula for your forecasts, setting each forecast value in the time series to whatever probability value was forecasted for that occasion (10, 20, 30, etc.). Each forecast is matched to its corresponding observation in space and time at the appropriate forecast projection. The observation value for each dry event is set to zero, and the observation value for each wet event is set to 100. Recall, Brier points are like golf—the lowest scores are the best scores so you don't want to rack up too many Brier points. By this point, I had already used at least one of my allotted five minutes for this topic so I used the image of the PoP reliability diagram to pull everything together. Each PoP forecast is rounded to the nearest ten percent (zero, 10, 20, 30, … , 80, 90, 100), and each of these rounded values is plotted against the percentage of time that measurable precipitation actually occurred (the observed relative frequency) when that rounded value was forecast. In other words, if you forecasted a 40% PoP thirty times during a period of two months, and measurable precipitation occurred on fifteen of those thirty occasions, the observed relative frequency for those 40% PoP forecasts was 50% (15 out of 30). This means the 40% PoP value was slightly under-forecasted. If, on the other hand, it had only rained on six of those thirty occasions, then the observed relative frequency would have been only 20% (6 out of 30), making the 40% PoP value substantially over-forecasted. When this analysis is performed for each rounded PoP value forecasted during a given period, you see the full spectrum of forecast reliability scores for that period. **Figure 1** gives the reliability plot for all NWS PoP forecasts during 2011.

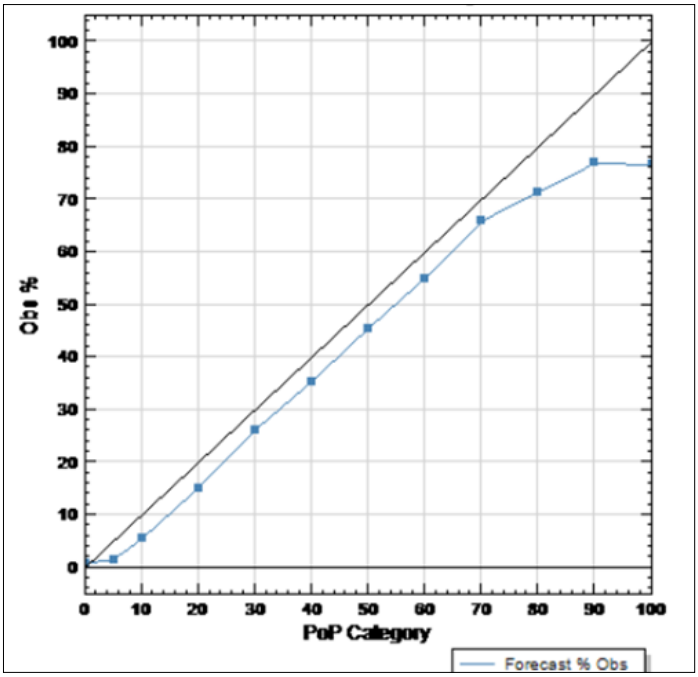


Figure 1. NWS-wide Day 3 PoP reliability scores (FY11). All rounded PoP values were over-forecast.

Returning to my introductory question, you can't tell how good your probability forecast was after just one forecast event. You need to look at a lot of forecasts over a period of time so you can apply probability theory to assess the skillfulness of your forecasts over time.

During the next five minutes, I talked about how basic physical laws, such as Newton's second law of motion, the continuity equation, the ideal gas law, and the thermodynamic energy equation provide everything you need to solve the six primitive equations used every day in numerical weather prediction. You start with six equations and six unknowns that are initialized twice or

Continued on next page… Page 10

PoP Forecasts Used to Teach Probability – Continued from Page 10

four times a day with observed data (temperatures, pressures, winds, etc.). To some degree, every high school physics or chemistry student is already familiar with Newton's laws of motion, the conservation of mass (with the continuity equation), the conservation of energy (with the thermodynamic energy equation), and the ideal gas law.

In addition to the familiar physics class example of a block sliding down an inclined plane within a moving elevator, Newton's second law of motion can be illustrated with a parcel of air that is always in motion. This is the wind. Mathematically, we are applying $\boldsymbol{F} = m\boldsymbol{a}$ to the atmosphere. You know the rest: $\boldsymbol{F}$ is the sum of the largest forces upon the air parcel, $\boldsymbol{a}$ is the acceleration of the parcel, $\boldsymbol{v}$ is the velocity of the parcel (the wind), and t is time. Since $\boldsymbol{a} = d\boldsymbol{v}/dt$, time derivatives appear in many of these equations so they can be integrated forward in time to produce future forecasts of the state of the atmosphere.

After lunch, the group chose the first of my two ideas to go forward for use. In an afternoon break out session, three of us began constructing some ideas for how each student would begin forecasting the chance of rain, recording that forecast, and recording the verifying observation. This is very similar to how the Meteorological Development Lab (MDL) verifies our PoP forecasts. Once you have a few weeks of data, you can use probability theory to assess your forecast performance. If all goes as planned, Maryland public school teachers will have a new tool to teach probability.☼

If you would like to use any of my handouts for outreach to the schools in your area, they are located at the following links on our Performance Management website:

https://goo.gl/fNcn3Q – Equations of Motion and Thermodynamics

https://goo.gl/v7mfmf – Probability of Precipitation Forecast

https://goo.gl/wOAAHT – Early Attempts at Numerical Weather Prediction

https://goo.gl/EbKLbh – Explanation of Sigma Notation

Fly...with Ointment

By Beth McNulty, Performance and Evaluation Branch, NWS Headquarters

Introduction to Forensics — NWS Style

There is a mystique or even apprehension about forensics and its relationship to the field. This article will give you an overview of the NWS Forensics program. The NWS Forensics program relies on event reports from the field for situation awareness, and prompt data collection to assist investigators. While there are aspects that are similar to the NWS service assessment program, the two programs are not the same. Service assessment is internal, related to weather events and the actions or service provided by weather personnel forecasting those events, and does not support litigation. Forensics is driven by external investigations and events that may be related to weather, but frequently weather conditions and forecasts are simply pieces to the puzzle of what occurred and why.

Definition

The best place to start is with a working definition of forensics. According to the dictionary, forensics means "*belonging to, used in or suitable to courts of judicature…".* The concept of forensics is fairly simple: reconstruct the weather that was occurring at the time of a significant event such as an airplane accident, or capsizing tourist boat in a historic area of a bay. The reconstruction includes the procedures applied by the forecaster (did he/she follow the directives applicable to the forecast being made?), equipment status, and data available at the forecast issuance time. The reports based on that reconstruction can be introduced in a court as part of the justification for a suit, or as evidence of whatever the plaintiff is charging.

Forensic Meteorology in the private sector typically recreates the weather conditions for the event, and provides expert testimony in civil court cases. In the NWS, forensic meteorology provides data (recent and archived) to government investigators from the various law enforcement agencies, or National Transportation Safety Board (NTSB), arranges for subject matter experts to confer with investigators on the data, or works with government attorneys as they prepare for litigation pending against the government. The Department of Justice contracts for subject matter experts from the private sector to avoid conflict of interest petitions from the plaintiff attorneys. Occasionally, I will coach members of the public as they navigate NOAA's National Centers for Environmental Information (NCEI) and use their online ordering tool.

Focus/Scope of NWS Forensics

NWS Forensics is concerned with transportation accidents and incidents. While the majority of accidents involve aviation, all the others: rail, highway, and water (marine) are included. These accidents may have a weather component that created or exacerbated the event. The use of weather data and forecaster statements (when requested by investigators) aids in the determination of the

Continued on next page...

Fly...with Ointment - Continued from Page 12

probable cause of the accident. This is different from the more familiar service assessment after a significant weather event such as flood or tornado that involves an internal team investigating forecast services and coordination with emergency management, and where weather is the star player in the event.

I receive forensic requests for data and occasionally for a subject matter expert. The data requested most often are Automated Surface Observing System (ASOS) 1 and 5-minute data, followed by radar or satellite imagery or locally produced graphics used to create forecasts. Usually the NTSB is the only investigating agency that requests subject matter experts. Other agencies, such as Federal Aviation Administration (FAA), Occupational Safety and Health Administration (OSHA), and US Forest Service rely on my help and explanation of the data they receive. Occasionally I assist highway patrol investigators with weather data and interpretation for large accidents such as one a few years ago that was caused by dense smoke blowing across a highway in Florida. I have helped an OSHA investigator determine whether a freighter had a reasonable likelihood of having the latest marine forecast and hazard outlook for an accident involving a large container ship drifting into a pier along the Gulf Coast.

Notification Phase

The notification phase is the beginning of a forensics action. The first the forensics meteorologist knows of an incident is by the receipt of an ASOS printout from the ASOS Operations and Monitoring Center (AOMC), (which has been requested by a field office) or through a For the Record (FTR) forwarded in the significant events channels from the Regional Operations Centers (ROCs) to the National Operations Center (NOC). Sometimes the external investigators will request information before the event reporting system has completed its cycle. In that case the notification will flow in reverse to the ROC from the forensic meteorologist, seeking more information or data. For aviation incidents the forensic meteorologist will frequently work through the Region Aviation Meteorologists.

Investigation Phase

During the investigation phase NWS forensics provides data to investigators. The data can range from meteorological data (observations, forecasts, radar, or satellite), to forecaster statements and tools or graphics developed locally. NWS Forecasters have considerable discretion, and that is considered as part of the investigation. Again, in these cases the weather is a supporting player but not the main character in the accident investigation. In those cases where weather appears to be a prime player it usually becomes apparent that the forecast was present, but the user did not apply the information or request greater detail if the forecast appeared to have less intensity than the observed occurrence. For example, in-flight icing forecast at moderate, with occasional severe conditions, and the aircraft encounters severe icing with unpleasant results.

Litigation Phase

The potential litigant has two years from the date of the accident to file suit, if they are going to do so. If a suit is filed against the government the case is argued by Department of Justice (DOJ) attorneys, assisted by Department of Commerce (DOC) attorneys. As the forensic meteorologist, I work closely with the DOC attorney assigned to a case as the case file is developed; providing data for discovery, or arranging for necessary depositions if requested by the plaintiff. The DOJ attorneys will hire a private sector meteorologist for in court testimony. This eliminates any appearance of conflict of interest created by using a government meteorologist. The exception is if the judge decides to have the deposed personnel actually testify, though normally a deposition (which is

Continued on next page...

Fly…with Ointment – Continued from Page 13
done under oath) is in lieu of testimony in court.

Relevant Directives

The NWS Forensic program is governed by four directives. Each one covers an element of the program as discussed above. I am in the process of revising and updating the directives to reflect the modern NWS forensic program. The directives are listed below.

- NWSI 10-2003, *Records Retention* (Revised January 2015)
- NWSI 10-2004, *Accident Notification and Response* (Needs a complete re-write and update to reflect the role of ROCs and the NOC, and the modern significant event notification process, as related to transportation incidents/accidents). This revision results from the failed attempt to incorporate the directive content into a revised NWSI 10-1603, *Significant Event Report*. **Suggestions are welcome.** (Expected completion Spring 2016)
- NWSI 10-2005, *Handling and Releasing Accident Related Information* (Under revision, due out November/December 2015)
- NWSI 10-2006, *The Accident Investigation/ Litigation Process* (Revised April 2015)

Summary

The NWS forensic program serves as a conduit for moving weather data and products to accident investigators for transportation accidents. I describe this as connecting investigators to the data, and, if needed, subject matter experts. While the majority of cases are aviation related, all other forms of transportation are covered by the program. NWS Forensics, unlike the private sector does not actively recreate the weather occurring at the time of the event, but serves as support to those investigators that are analyzing the event and determining what happened, and why. Similarly, NWS Forensics assists government attorneys while a case is developed, but does not actively participate in the litigation process in court. Private sector forensic meteorologists may serve as expert witnesses during litigation.

Note – This is the final Fly…with Ointment episode. Next: a new series of articles, topic to be decided.☼

Fall 2015 Peak Performance Quote

Teamwork

"The ability of a group of people to do remarkable things hinges on how well those people pull together as a team."

— Simon Sinek

Simon Sinek is a leadership guru, professor at Columbia University and author.

Status of Service Assessment Action Items

Status of Service Assessments at a Glance

- There are **264** total actions from open events.
- **219** actions are closed; **45** remain open.
- **2** actions closed since last report (July 2015).
- Recent Service Assessments: 1) *Texas/Oklahoma May 2015 Flooding - A regional* service assessment team completed an evaluation of products and services related to this flood event; a draft report is being reviewed. 2) *South Carolina Historic Flooding of October 2–5, 2015* - A national service assessment team was activated to evaluate products and services related to this flood event.

Open Service Assessments

⇒ **Colorado Flooding of September 11-17, 2013**
Released June 24, 2014
26 Total Actions, 18 (69%) Closed Actions
8 (31%) Open Actions

⇒ **May 2013 Oklahoma Tornadoes and Flash Flooding**
Released March 21, 2014
29 Total Actions, 21 (72%) Closed Actions
8 (28%) Open Actions

⇒ **Hurricane and Post-Tropical Cyclone Sandy, October 22-29, 2012**
Released May 05, 2013
25 Total Actions, 21 (84%) Closed Actions
4 (16%) Open Actions

⇒ **Historic Derecho of June 29, 2012**
Released February 05, 2013
14 Total Actions, 7 (50%) Closed Actions
7 (50%) Open Actions

⇒ **Hurricane Irene in August 2011**
Released October 05, 2012
94 Total Actions, 84 (89%) Closed Actions
10 (11%) Open Actions

⇒ **The Missouri/Souris River Floods of May – August 2011 (Regional Service Assessment)**
Released June 05, 2012
29 Total Actions, 26 (90%) Closed Actions
3 (10%) Open Actions

⇒ **May 22, 2011 Joplin Tornado (Regional Service Assessment)**
Released September 20, 2011
16 Total Actions, 14 (88%) Closed Actions
2 (12%) Open Actions

⇒ **Spring 2011 Mississippi River Floods**
Released April 11, 2012
31 Total Actions, 28 (90%) Closed Actions
3 (10%) Open Actions

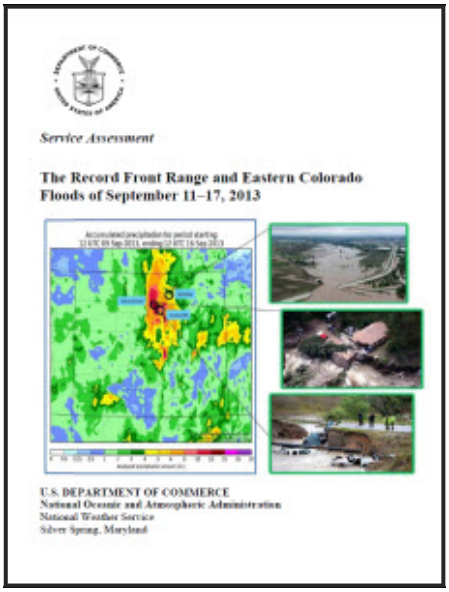
Closed Events (all actions completed)

- **Remnants of Tropical Storm Lee and the Susquehanna River Basin Flooding of September 6-10, 2011 (Regional Service Assessment)**
Released July 26, 2012
11 Total Actions - Closed
- **The Historic Tornado Outbreaks of April 2011**
Released December 19, 2011
32 Total Actions - Closed
- **Washington, D.C. High-Impact, Convective Winter Weather Event of January 26, 2011**
Released April 01, 2011
6 Total Actions - Closed
- **Record Floods of Greater Nashville: Including Flooding in Middle Tennessee and Western Kentucky, May 1-4, 2010**
Released January 12, 2011
17 Total Actions - Closed
- **Southeast US Flooding of September 18-23, 2009**
Released May 28, 2010
29 Total Actions - Closed
- **South Pacific Basin Tsunami of September 29-30, 2009**
Released June 04, 2010
131 Total Actions - Closed
- **Mount Redoubt Eruptions of March - April 2009**
Released March 23, 2010
17 Total Actions - Closed
- **Central US Flooding of June 2008**
Released February 03, 2010
34 Total Actions - Closed
- **Mother's Day Weekend Tornadoes of May 10, 2008**
Released November 06, 2009
17 Total Actions - Closed
- **Super Tuesday Tornado Outbreak of February 5-6, 2008**
Released March 02, 2009
17 Total Actions - Closed

Updated October 2015 by Freda Walters

Service Assessment "Best Practices"

Best Practice – An activity or procedure that has produced outstanding results during a particular situation that could be used to improve effectiveness and/or efficiency throughout the organization in similar situations. No action is required.



The Record Front Range and Eastern Colorado Floods of September 11–17, 2013

1. Extensive interagency outreach and preparedness activities regarding the flash flood potential on burn scars greatly enhanced the level of threat awareness and resulted in communities having an emergency plan they could implement quickly.

2. Group email blasts, notifications, and webinars are an effective way to reach many stakeholders and partners during an event without overly taxing the resources at WFOs.

3. WFO Boulder successfully incorporated the flash flood emergency language to raise the level of urgency for action. (View message below).

The following is an excerpt of Boulder's Flash Flood Statement product citing a Flash Flood Emergency for Jefferson and Boulder counties during the height of flash flooding on the evening of September 11:

...THE FLASH FLOOD WARNING REMAINS IN EFFECT UNTIL 415 AM MDT FOR NORTHERN JEFFERSON AND BOULDER COUNTIES...

...THIS IS A FLASH FLOOD EMERGENCY FOR NORTHERN JEFFERSON AND BOULDER COUNTIES…

AT 1153 PM MDT...LOCAL LAW ENFORCEMENT AND EMERGENCY MANAGEMENT REPORTED FLASH FLOODING IN SEVERAL LOCATIONS. 4 TO 6 INCHES OF RAIN HAS FALLEN IN SOME PLACES THIS EVENING. FLASH FLOODING IS ALREADY OCCURRING IN MANY LOCATIONS AND THIS IS AN EXTREMELY DANGEROUS AND LIFE THREATENING SITUATION.

You may access the full service assessment report here on the Performance Management Website.☼

Update on Recent Data Ingest Issues

By Brent MacAloney, NWS Headquarters

The Issue and Resolution

As some of you may be aware, the Performance and Evaluation Branch (COO11) began having data ingest issues beginning early in 2015. At first, this issue appeared to be a random warning or two missing every few weeks. When dealing with the import of several thousand products a year, this is to be expected and did not raise any concerns. However, as 2015 went on, products were being dropped more and more frequently. It got to the point where it was clear, something was wrong with the system.

As the issue became worse, we started to notice some unusual errors occurring on the COO11's data import server. Due to the nature of the issues and the age of the server, a decision was made in late July to take the server offline and transfer the data import capabilities to a new server. The process of transferring the data import software began on July 30th and the new server was made operational on August 11th.

When the servers were brought back online, it looked as if the refresh in hardware resolved the issue of products being dropped. However, on a trip to Central Region Headquarters (CRH) in late August, Brent MacAloney and Doug Young found out that the issue was likely not related to the decommissioned COO11 Branch hardware. Rather, the data collection servers COO11 has in Kansas City were found to be having AWIPS Satellite Broadcast Network (SBN) issues.

We were able to find out that the SBN issues at CRH were recognized and addressed in late July. There was also some redundancy built into the system so that if the SBN had issues in the future, the data would continue to flow, but just from a different source.

Actions for Field Offices

To ensure no warnings are missing from the database, each office should go through an exercise of reviewing the products issued in 2015. This is not only a good exercise because of the data transmission issues, but this is also something every office should do from time to time to ensure the database reflects what was actually issued.

The easiest and quickest way to do this would be through running a report on the Interactive Products Database at: https://verification.nws.noaa.gov/idb/request.aspx). By running a report for your CWA and looking at the Event Tracking Numbers (ETN) in the report output, it should become pretty apparent if any products were skipped.

Be sure to use the following settings:

Start Date: 1/1/2015
End Date: Select the current date
Area: WFO>>Select your WFO
Products: You may select all, but it may be easier to check one product at a time and run separate reports, especially for TOR, SVR, FFW, FLW, FLS, SMW, WSW, NPW, and CFW.

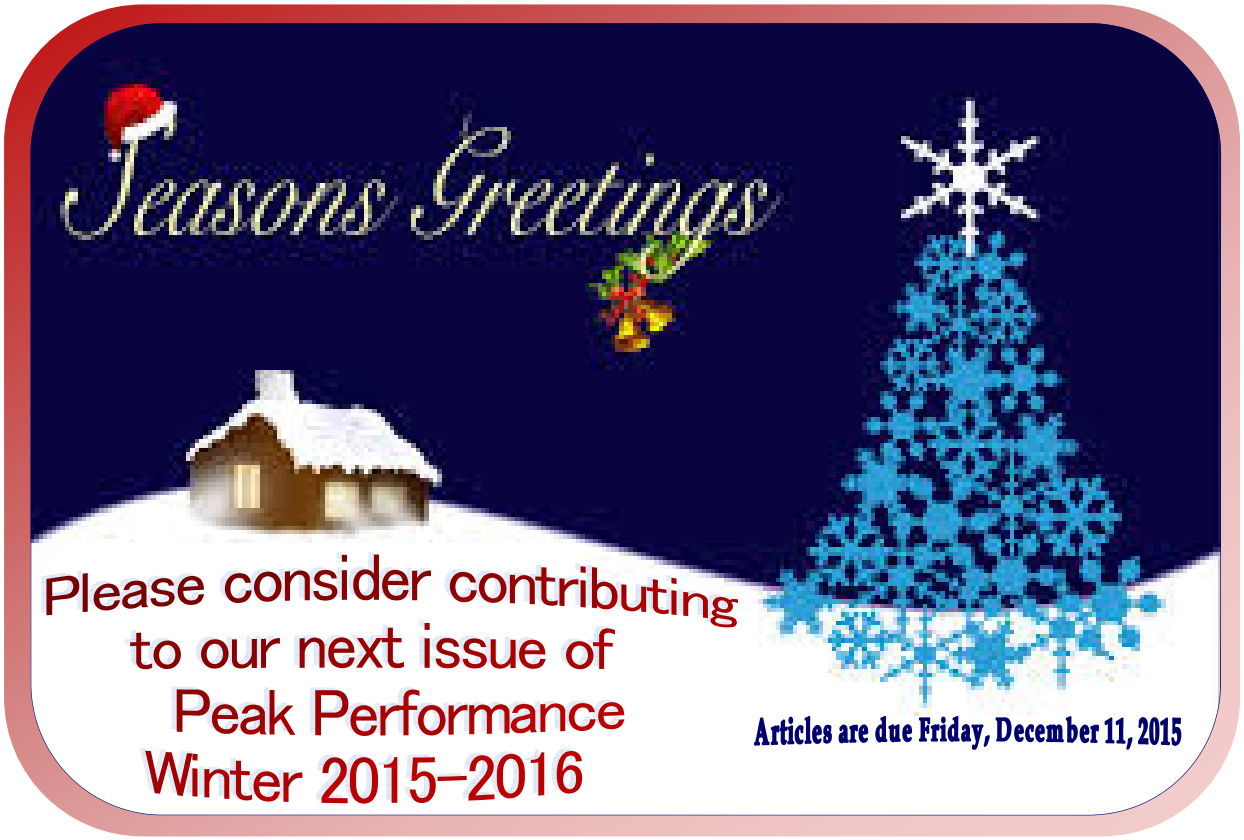
Continued on next page...

Update on Recent Data Ingest Issues – Continued from Page 17

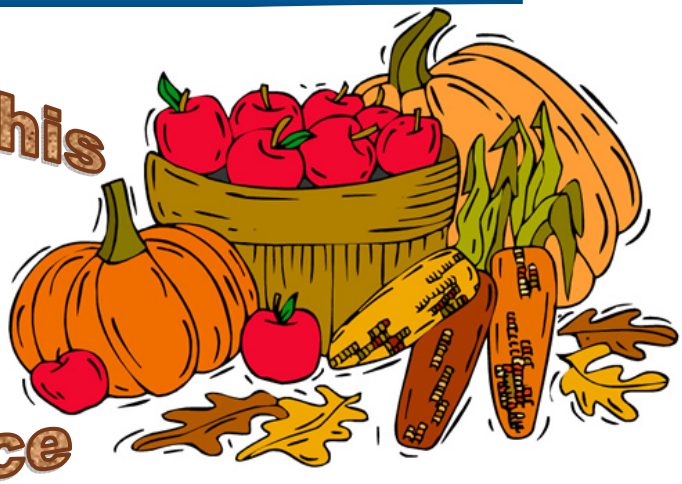
Product Significance: Select all
Action Code: Select all
Listing Type: Aggregate by Product
Group Type: "Product" works best for looking at SVRs, TORs, FFWs, FLWs, FLSs, and SMWs. "Phenomena" works best for WSWs, NPWs, and CFWs.
Report Type: Detailed

When the data is output from the system, you can either download the data in a spreadsheet or view it in HTML to analyze it for missing products. Again, it is easiest to look for skipped ETNs.

If you do find any products are missing, you may contact us at Brent.MacAloney@noaa.gov with the date, product type, and ETN and we will be sure to get the missing product(s) added to the database.☼



Contributors to this Fall 2015 Edition of Peak Performance include . . .



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