

# Aware

Aware is published by NOAA's National Weather Service  
to enhance communications within the Agency  
and with the emergency management community.

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## Climate, Water, Weather

### Emergency Managers Give NWS Input

By Ken Graham, OCWWS Integrated Services Director  
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NWS hosted a 2 hour meeting on November 11 at the International Association of Emergency Managers (IAEM) Annual Conference. NWS held the meeting to strengthen relations with key stakeholders, specifically the emergency management community. NWS used this time to gather input from emergency managers (EMs) and affirm priorities to improve services not only today, but well into the future. The meeting successfully focused on several key questions:

- ◆ What are some of the core values shared by IAEM and NWS?
- ◆ What do you consider untouchable and would not want NWS to change?
- ◆ How can NWS improve products or services that we provide directly to you or on the Web, like a warning, watch or forecast?
- ◆ How can we improve the way NWS delivers services to you?
- ◆ What are some of the best practices from experiences with local NWS offices?

Both IAEM and NWS leadership agree this relationship must grow to remain viable. EMs, specifically, were asked about shared core values. Here are the NWS programs and services they said were untouchable and should never change:



NWS Director Jack Hayes, (right) talking to David Paulison, Administrator of FEMA, at IAEM Conference in Reno, NV. Photo by Beth Armstrong.

### Inside Aware

- 3 Aviation Safety
- 3 Digital Services
- 5 Dissemination
- 9 Climate/Drought
- 10 Flood Awareness
- 10 Heat Workshop
- 11 Outreach Innovations
- 14 Severe Weather
- 16 StormReady/TsunamiReady
- 16 Winter Weather
- 19 Climate, Water and Weather Links



- ◆ Local offices are critical; NWS needs to maintain its local presence and services.
- ◆ Ensure at least two personnel are on shift at local NWS offices.
- ◆ Renew and expand science and technology, radars, buoys and satellites critical to products and services.
- ◆ Preserve the NWS name.
- ◆ Remove barriers to direct communications between EMs and Weather Forecast Offices (WFO), but don't drown users in information. Need to maintain close relationship and trust.
- ◆ Support innovative efforts of local WFOs to tailor products for EMs. Continue involving EMs early in development and getting EM feedback on experimental products.
- ◆ Maintain integrity and respect for one another.

#### EM Requirements for NWS: How Can we Improve?

- ◆ EMs want longer lead times for warnings, but watches are getting too long and large to be effective. Shelters are increasingly becoming unavailable because of longer lead times for watches; events are being canceled under watches. General public and emergency managers are receiving the same information/products; not best service. Need input from EMs on wording for some warnings such as manufactured homes vs. stick homes.
- ◆ Products are not confusing but could be better consolidated or integrated.
- ◆ EMs need easily understood probabilistic and certainty information.
- ◆ Integrate more water data with weather information for one-stop shopping. Flood reports are not meeting needs. Users don't live where gauges are. Need to improve river forecasts and coordinate with FEMA on changes with flood plain. Need more hydrologic information in graphical form.
- ◆ StormReady program is great. It is time to move to the next level.
- ◆ NWS needs to partner with FEMA to add "Change batteries in your NWR" to their public information campaign, which coincides with daylight savings time. Recommend sending message out on NWR stating, "Change the batteries in your NWR."
- ◆ Polygon warnings are great improvement for reducing amount of county warned; however, NWR still broadcasts at the county level as opposed to specific polygons.
- ◆ NWS needs to work with EM community earlier in development process; would like more lead time to invest in infrastructure. It is expensive to adapt (i.e., adapting polygon warnings with county sirens). EMs would like a test bed they can interact with early in development and prepare for potential operational impacts.
- ◆ Nowcast information is recorded and not really a "now" cast. How can information be more "now" on NWR?
- ◆ EMs need training and education to improve communication.

#### What Best Practices Should NWS Continue?

- ◆ Move forward with industry formats such as Geographic Information Systems and Instant Messaging. EMs will adapt.
- ◆ Continue forward movement with Common Alerting Protocol (CAP).
- ◆ Continue 800 MHz radio transmission. EMs very pleased.
- ◆ EMWIN is beneficial because it pushes data, however, program needs more technical support.
- ◆ Hurricane Liaison Team is very effective.
- ◆ Decision Support Tools are an OK experiment.
- ◆ NWS Severe Storms Workshop in Norman, OK, is worthwhile.
- ◆ Expand NWS support for man-made or natural disasters. Support is needed during response and recovery phase.

#### Successful Local Programs to Expand

- ◆ Boulder, CO: Great weather spotter training, further benefits the WFO.
- ◆ Greenville, SC: Weather spotter course is great; outstanding support for CERT.
- ◆ Huntsville, AL: Conducts storm surveys with EMs.
- ◆ Des Moines, IA: Kudos for the all hazards and specifically plume modeling support, i.e., explosions due to a chemical fire at Barton Solvent. \*

## Aware

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## Aviation Safety

### Free Aviation Safety Tips Available in *The Front*

By Melody Magnus, Editor, *The Front*  
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In December, the NWS Aviation Branch released the latest copy of its aviation safety newsletter, *The Front*. This free resource offers aviation weather tips to pilots of private and commercial planes, balloons and other aircraft. Articles in the latest edition include:

- ◆ Mobile/Cellular Aviation Website Available at Oakland CWSU
- ◆ The Importance of Climatology in Aviation
- ◆ The Practically Perfect TAF: A Customer Oriented Philosophy to Writing TAFs

If you would like an email when *The Front* is released, write [Melody.Magnus@noaa.gov](mailto:Melody.Magnus@noaa.gov). If you have article suggestions or comments, contact [Michael.Graf@noaa.gov](mailto:Michael.Graf@noaa.gov). To download the December edition or see past editions, go to [www.weather.gov/os/aviation/front.shtml](http://www.weather.gov/os/aviation/front.shtml). \*



## Digital Services

### NDFD SOAP Service Supports Multiple Point, Grid Point Location Requests

By John Schattel, NWS Meteorological Development Laboratory  
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The National Digital Forecast Database (NDFD) Simple Object Access Protocol (SOAP) service supports requests for data at multiple grid point locations and at the location of the grid points. As a result, you can obtain all of the temperature data in **Figure 1** in two calls to the NDFD SOAP service. Reducing the number of requests a user needs to send also makes the SOAP server faster and more efficient, improving your response time.

To take advantage of the new multiple point support, Web developers may use two new service functions: NDFDgenLatLonList and NDFDgenByDayLatLonList. Both functions allow the user to provide a list of space separated WGS84 (Datum used by the NDFD. See [www.weather.gov/forecasts/graphical/docs/ndfdSRS.htm](http://www.weather.gov/forecasts/graphical/docs/ndfdSRS.htm)) latitude and longitude (lat/lon) pairs as the location input. Each lat/lon pair is composed of a comma separated lat/lon value. A sample lat/lon list follows:

38.9, -77.0 41.2, -96.0 39.7, -104.8 34.0, -118.4

In addition to the lat/lon pairs, the new functions also require the same non-location inputs as their single point counterparts: NDFDgen and NDFDgenByDay. You can experiment with the new multiple point functions by visiting the service demonstration pages (See "More Information" link at end of article). To exercise the NDFDgenLatLonList and NDFDgenByDayLatLonList functions, select the "NDFD

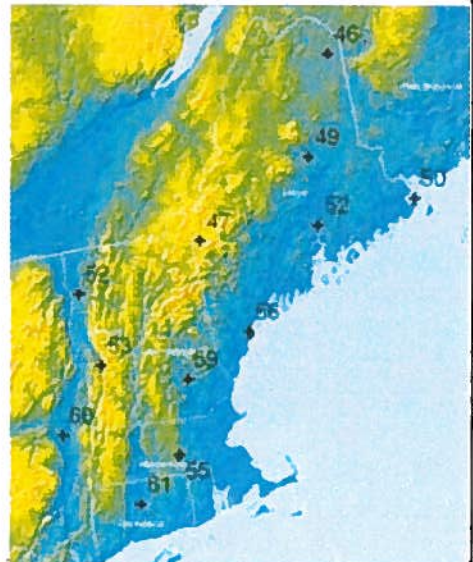


Figure 1: NDFD Temperatures (map background courtesy of ESRI)

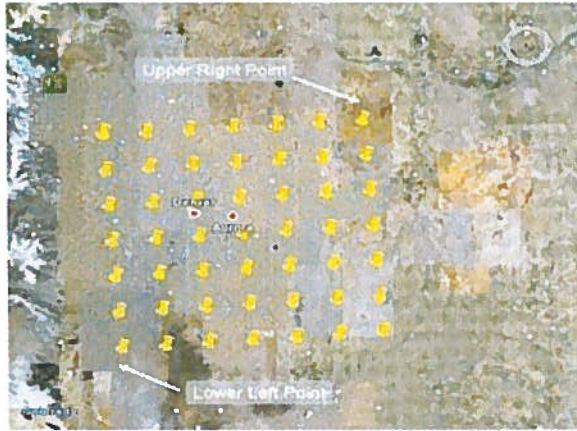


Figure 2: Points for a subgrid (image background courtesy of Google Earth).

Data for Multiple Points” radio button on your demonstration page, then click the “Submit” button. The demonstration pages return a Digital Weather Markup Language (DWML) document with data for three points.

To help you use the new multiple point functions, the SOAP service also supports requests for NDFD grid point locations. The service offers Web developers six interfaces to request NDFD grid point locations. These functions generate a DWML document containing a list of lat/lon value pairs. Figure 2 shows an example of some NDFD grid point locations returned by the service and then displayed in Google Earth. The service creates the list of lat/lon value pairs in a format suitable for input to the SOAP service’s multiple grid point interfaces NDFDgenLatLonList and NDFDgenByDayLatLonList.

The grid point generating functions differ by the method used to determine the subset of NDFD grid points. For example, the LatLonListSubgrid function creates its

list of lat/lon values by finding all the grid points within a rectangular box. Each of the new functions is listed below along with an explanation of how it determines the list of grid points.

- ◆ **LatLonListSubgrid:** Returns lat/lon value pairs of all the grid points within a rectangular subgrid as defined by the point at the lower left and upper right corners of the rectangle (See Figure 2).
- ◆ **LatLonListLine:** Returns lat/lon value pairs for all grid points on a line defined by its two end points (See Figure 3).
- ◆ **LatLonListZipCode:** Returns a lat/lon value pair corresponding to each zip code in a list of space separated zip codes.
- ◆ **LatLonListCityNames:** Returns lat/lon value pairs for the cities found on NDFD Graphical Forecast sector images.
- ◆ **LatLonListSquare:** Returns lat/lon value pairs for all grid points contained in a rectangle defined by a center point and distances in latitudinal and longitudinal directions (See Figure 4).
- ◆ **CornerPoints:** Returns lat/lon value pairs for grid points at the corners of an NDFD grid.

For more information on each of these functions, go to the SOAP service home page linked below. To experiment with the new grid point generating functions, visit



Figure 3: Points for a line (image background courtesy of Google Maps).

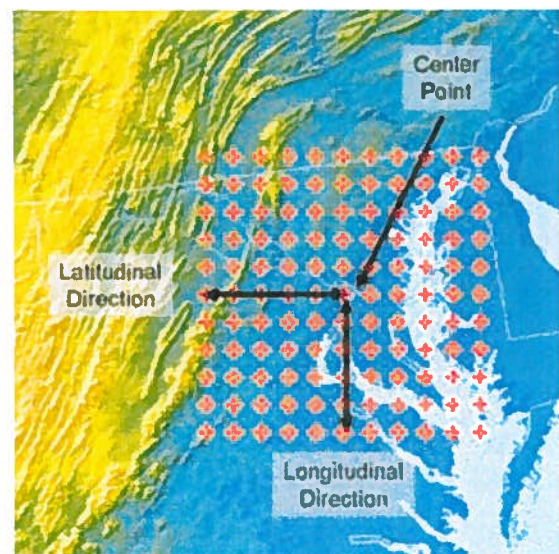


Figure 4: Points for a square (image background courtesy of ESRI).

the demonstration pages listed below. Once on those pages, test the functions by selecting one of five radio buttons beginning with "Grid Points For" then click **Submit**.

#### More Information

- ◆ SOAP Service Home Page:  
[www.weather.gov/forecasts/xml/](http://www.weather.gov/forecasts/xml/)
- ◆ NDFDgenLatLonList Demonstration Page:  
[www.weather.gov/forecasts/xml/SOAP\\_server/ndfdXML.htm](http://www.weather.gov/forecasts/xml/SOAP_server/ndfdXML.htm)
- ◆ NDFDgenByDayLatLonList Demonstration Page:  
[www.weather.gov/forecasts/xml/SOAP\\_server/ndfdSOAPByDay.htm](http://www.weather.gov/forecasts/xml/SOAP_server/ndfdSOAPByDay.htm) \*

## Dissemination

### NWS Starts Multi-Phase CAP Improvement Project

By Herb White, NWS Dissemination Services Manager  
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The Fall 2007 *Aware* ([www.weather.gov/os/Aware/pdfs/aware-fall07.pdf](http://www.weather.gov/os/Aware/pdfs/aware-fall07.pdf)), on Page 7, described the proposed addition of Instruction Field "markers" into NWS WMO-formatted text Watch/Warning/Advisory/Statements (W/W/A/S). The proposal is not intended to make W/W/A/S products into Common Alerting Protocol (CAP) formatted messages or even move in that direction. Rather, it is needed to improve NWS production of the separate suite of CAP messages by early 2009 to include distinct event "Description" and "Instruction" elements. Without a marker, there is no reliable way to parse the CAP Instruction element from existing WMO-formatted text products and create a separate CAP Instruction element. This proposal is the only change to existing NWS products enabling CAP message production.

NWS has an experimental Webpage that provides reformatted W/W/A/S products in eXtensible Markup Language (XML) for various feeds and displays, ([www.weather.gov/alerts/](http://www.weather.gov/alerts/)). These CAP messages have not been satisfactorily formatted. World Meteorological Organization (WMO) formatted products do not provide information needed to populate certain CAP fields. To aggressively respond to the urgent need for standardized CAP compliant message format for NWS W/W/A events, NWS has started a multi-phased project with some tasks progressing in parallel. NWS will request public review and comment on proposed improvements shortly.

NWS will improve the experimental CAP-formatted messages and continue to make them available online. At the same time, NWS will develop the Next Generation Warning Tool (NGWT) that will generate CAP messages in native format. NGWT will deliver AWIPS W/W/A applications through a more standardized approach than currently used. NGWT will modularize the applications. This will allow warning applications to be flexible enough to respond to changing technologies and user requirements. Products issued using the new NGWT will be formatted for transmission on NOAAPort, the NWS and NWS Webpage. This step will address some of the latency and reliability problems. There are 2 phases:

- ◆ Phase 1: The current systems will be modified to convert WMO messages to CAP and then transmit CAP and WMO-formatted products on NWS "push" dissemination systems like NWS, EMWIN, NOAAPort, Family of Services (FOS) and most other NWS Telecommunications Gateway (NWSTG) circuits.
- ◆ Phase 2: NWS will fully implement the NGWT to produce mixed case products and correctly populated CAP elements. NGWT will then use a formatting feature to produce customer desired formats, for example CAP and WMO, or other future formats.

When NWS completes Phase 1, CAP requirements for latency and reliability will be satisfied but at a higher operating and maintenance cost. The conversion will have to be maintained as the warning product requirements. The final step will streamline and connect processes for optimum lifecycle supportability. For example, the Weather Radio Improvement Project (OSIP 04-006) requires that NWS be modified to process and disseminate CAP-formatted products; however, this is not likely before 2012. Below is a summary of the proposed solution:

**Short term: 2007-2008**

- ◆ Continue current enhancement of Web-based CAP feeds
- ◆ Populate additional CAP elements
- ◆ Engage partners during process

**Medium term: 2008-First Quarter FY 2009**

- ◆ Add Call-to-Action (or "Instruction") markers to WMO-formatted Watch, Warning, Advisory and follow-up Statement text products generated by AWIPS (Operational Build 9)
- ◆ Centrally generate CAP messages with WMO "envelope" to be disseminated via traditional NWS "push" dissemination systems in addition to current WMO-formatted products
- ◆ Leverage off the work the Web team has done to date
- ◆ Eliminate Web production of CAP (but not Web distribution)

**Long term: 2010-2012**

- ◆ Generate native CAP using Next Generation Warning Tool (post AWIPS II era) with mixed case, expanded character set, and fully populated CAP elements
- ◆ Generate WMO-formatted product from CAP message
- ◆ Disseminate both versions

This CAP solution will provide numerous benefits such as the following:

- ◆ In addition to benefitting the public and government agencies, CAP will help companies, such as industrial plant operators who have warning responsibilities. Other groups who will benefit include developers of new sensors, threat evaluation technology and warning dissemination technology.
- ◆ NWS Watch, Warning and Advisory products will support automated interpretation via modern technologies. Free text writing style constrained to CAP fields will eliminate NWS product inconsistencies and enable automated programs to process them.

```
<?xml version="1.0" encoding="UTF-8" ?>
<event>Severe Thunderstorm Warning</event>
<agency>Intermediate</agency>
<severity>Severe</severity>
<certainty>Observed</certainty>
<category>
  <valueName>SAME</valueName>
  <value>SVR</value>
</category>
<wmoHeader>
  <valueName>WMOHEADER</valueName>
  <value>WUUS52</value>
</wmoHeader>
<ugc>
  <valueName>UGC</valueName>
  <value>FLC057-103-192230</value>
</ugc>
<vtec>
  <valueName>VTEC</valueName>
  <value>/O.NEW.KTBW.SV.W.0060.060919T2135Z-060919T2230Z</value>
</vtec>
<effective>2006-09-19T21:37:00</effective>
<expire>2006-09-19T22:30:00</expire>
<senderName>NATIONAL WEATHER SERVICE TAMPA BAY AREA - RUSKIN FL</senderName>
<headline>THE NATIONAL WEATHER SERVICE IN RUSKIN HAS ISSUED A * SEVERE THUNDER
HILLSBOROUGH COUNTY IN FLORIDA, NORTHERN AND CENTRAL PINELLAS COUNTY IN
<description>AT 535 PM EDT...NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED A S
PRODUCING DAMAGING 70 MPH WINDS... OVER CLEARWATER... MOVING EAST AT 20 M
NEAR... SAFETY HARBOR BY 540 PM EDT. LD SMAR BY 545 PM EDT. TOWN 'N' COUNTRY
TAMPA INTERNATIONAL AIRPORT BY 600 PM EDT. AT
530 PM EDT...COASTAL OBSERVING EQUIPMENT IN CLEARWATER REPORTED WIND GUS
<instruction>THIS IS A DANGEROUS STORM! MOVE INTO AN INTERIOR ROOM ON THE LOWES
FROM WINDOWS. COVER YOUR HEAD WITH PILLOWS OR CUSHIONS. IN ADDITION TO
DEADLY LIGHTNING ARE EXPECTED. STAY INSIDE AWAY FROM WINDOWS UNTIL THE S
<contact>PLEASE REPORT TORNADOES OR FUNNEL CLOUDS...WINDS OF 58 MPH OR HIGHER.
LARGER...AND ANY WIND DAMAGE TO YOUR NATIONAL WEATHER SERVICE IN RUSKIN
```

Portion of sample CAP message

The screenshot shows the National Weather Service website's 'Alerts' section. It features a search bar for 'City, St' and a 'Go' button. Below the search bar, there are links for 'RSS Feeds', 'Alerts', and 'Observations'. The main content area is titled 'Experimental XML Feeds and Web Displays of Watches, Warnings, and Advisories'. It provides information about NOAA's XML services and lists various products like 'Forecasts', 'Watch/Warnings', 'Current Observations', etc. A table below lists states with links to XML, CAP, and RSS feeds. The table is organized by state and includes columns for HTML/WEB, RSS, CAP, and RSS feeds.

State	HTML/WEB	RSS	CAP	RSS
Alabama		XML	CAP	XML
Alaska		XML	CAP	XML
America Samoa		XML	CAP	XML
Arizona		XML	CAP	XML
Arkansas		XML	CAP	XML

NWS Alerts Webpage with XML Feeds

- ◆ Partners will have XML/Keyhole Markup Language formats to enable use of NWS products in better ways, such as with Geographic Information System applications. In addition XML reduces the cost of entry for NWS partners to parse and use NWS local products; for example, rip currents alerts will be available in standard national formats.
- ◆ CAP will enhance government's "situational awareness" at the state, regional and national levels by providing a continual real time database of all warnings, even local ones. Local warnings in CAP, unavailable to state and local officials at present, could be crucial to the timely evaluation of certain threats, like biological terrorist attacks, which are most readily identified by detecting patterns in local responses.
- ◆ Special needs populations such as the deaf and hearing impaired, the blind and visually impaired and non-English speakers will be better served by consistent delivery of warnings and public safety information through all available channels.
- ◆ CAP format will enhance warning system "interoperability" and will free system providers to be innovative and improve their services without facing technological barriers.

A future *Aware* article will describe how NWS CAP initiatives relate to other CAP initiatives in and outside the federal government. ✱

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## HazCollect Launch Delayed to Ensure System Reliability

By Herb White, NWS Dissemination Services Manager and Will Fellows, HazCollect Project Manager  
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Transition issues continue to delay the availability of HazCollect. In 2007, NWS and the Department of Homeland Security (DHS) went through a number of program office transfers, staff changes, physical hardware moves and resulting communications infrastructure changes. NWS knows how important it is to ensure the HazCollect system is reliable and resilient. The prudent course of action is to wait until HazCollect meets those criteria.

The HazCollect team is also addressing concerns expressed by NWS management regarding policy issues and resolution of Test Trouble Reports.

NWS also is working with DHS to demonstrate the HazCollect Applications Program Interface

(API) needed for Commercial Off-the-Shelf and Government Off-the-Shelf systems to interface with Disaster Management Open Platform for Emergency Networks (DM OPEN). To send NWEMs through HazCollect and other NWS systems, government and commercial incident management applications must interface with DM OPEN and be enabled to Common Alerting Protocol. DM OPEN enables secure data exchange when sharing emergency alerts or incident-related information by using standards-based messages. There is no charge for the use of these government interfaces.

NWS plans to have HazCollect available nationwide by July 2008 through the Disaster Management Interoperability Services (DMIS) Toolkit and DM OPEN API. FEMA named a new DM Program Manager late last year, improving program support and sustainability.

To learn more about DMIS and DM OPEN systems, go to: [www.dmi-services.org/](http://www.dmi-services.org/) and the DM OPEN Special Interest Group Website at [www.emforum.org/OPEN/](http://www.emforum.org/OPEN/). The NWS Website [www.weather.gov/os/hazcollect/](http://www.weather.gov/os/hazcollect/) is updated regularly and will have HazCollect registration information about 60 days before HazCollect national availability. ✱



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## NOAA Weather Radio Grant Protects High Risk Citizens

By Rodney Andreasen, Jackson County, FL, Emergency Management  
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In 1994, Vice-President Al Gore pushed for an initiative to make weather radios as common in homes as smoke detectors. Public safety experts have also suggested that weather radios be a standard form of equipment in every home. Eventually, it is the goal of the Jackson County Emergency Management Agency (JCEMA) to ensure weather radios are as common as smoke detectors for county residents.

In February 2007, JCEMA took a step towards making the goal a reality. The JCEMA in Marianna, FL, applied for and received a state competitive grant of \$60,000 to fund the purchase of weather radios for distribution at no cost to county citizens. The JCEMA purchased 2,630 receivers and distributed them to each city, as well as school personnel and senior citizens, based on population. In a ceremony held before the distribution, local, state and government entities were present for the official presentation of the radios to the cities.

Out of the total county population, about 4,215 people are considered at high risk because they live in mobile homes. Over the past 2 years, Jackson County has been hit by hurricanes, tornadoes and other severe weather. In September 2004, tornadoes spawned from a hurricane, tracked through Jackson and surrounding counties. Jackson County suffered extensive property damage, especially the mobile home parks, the Marianna Federal Correctional Institute and other smaller communities. Many of the outlying and rural neighborhoods were without power or other means of communication for storm information.

Although no deaths occurred in Jackson County, the surrounding counties of Bay and Calhoun suffered fatalities. Through the distribution of weather radios, JCEMA has acted to protect its citizens from dangerous weather events. These weather radios give people advance warning, decrease the likelihood of death and injury and provide preparation for an impending storm. \*



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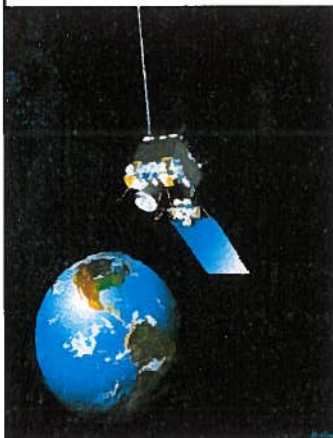
## EMWIN Plans for GOES R Satellite Generation

By Bill Johnson, NWS Office of the Chief Information Officer  
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The Emergency Managers Weather Information Network (EMWIN) team met with representatives from the National Aeronautics and Space Administration, National Environmental Satellite and Data Information Service, the Geostationary Satellite R (GOES R) Program office and several supporting contractors, to discuss plans for an EMWIN capability on the GOES R satellite generation.

The first launch of the GOES R series of satellites is scheduled for 2014. The GOES R series will bring improvements to spacecraft and instrument technologies. The result will be more timely and accurate weather forecasts and improved support for the detection and observations of meteorological phenomena. These improvement will directly affect public safety, protection of property and ultimately, economic health and development.

These improvements will include an enhanced EMWIN component and will result in an increased data set of products for the EMWIN broadcast. In addition, the EMWIN team is striving to keep EMWIN receive system costs low. While an operational GOES R satellite is many years away, these plans lay the groundwork for EMWIN to support the emergency management community well into the future.



GOES Satellite



## EMWIN-N Continues to Mature

The EMWIN-N test broadcast, using the GOES 10 satellite, has proved to be invaluable. The broadcast, which closely mimics the signal that will be available from GOES 13 (N), has allowed additional testing of the software defined receiver and vendor prototypes. The EMWIN Website offers details for acquiring the broadcast from GOES 10. After some additional testing, the EMWIN team plans to release an updated install set of the software defined receiver that has improved signal lock capability.

To keep abreast of new developments in the EMWIN transition, please visit the NWS EMWIN Website at: [www.weather.gov/emwin/index.htm](http://www.weather.gov/emwin/index.htm). ✱

## Climate/Drought

### Innovative Efforts to Deal With Southeast Drought

By Ron Trumbula, NWS Southern Region Public Affairs  
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Last fall, as the Southeast drought dragged on, the NWS Southeast River Forecast Center (SERFC) added new products and services to help customers cope with an increasingly difficult situation. Two of these new services are a Water Watch Webpage and a multimedia Water Resources Outlook.

The Water Resources Outlook provides long-term hydrometeorological information in a series of graphical illustrations, supplemented with easy-to-understand audio interpretation. NWS staff frequently updates the outlook to reflect the latest drought developments. To access the outlook, visit [www.srh.noaa.gov/alr](http://www.srh.noaa.gov/alr) and click on the Water Resources Outlook icon. The current presentation includes topics such as river systems in drought states.

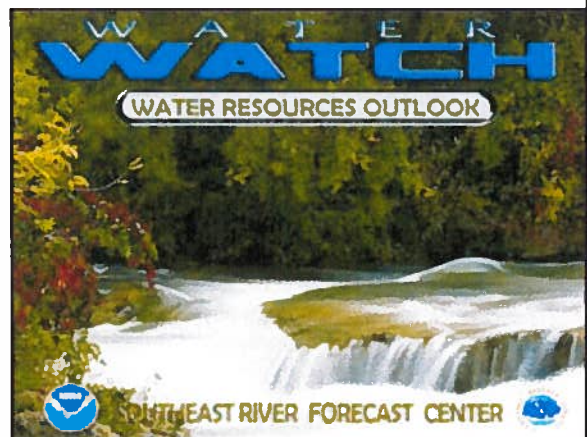
The Water Watch includes information on topics such as inflows into the hardest hit reservoirs. NWS is providing short and long-term water resource outlook information for these areas. To access the Water Watch page, visit [www.srh.noaa.gov/alr](http://www.srh.noaa.gov/alr) and click on the Critical Water Watch icon.

In addition to providing these Web resources, the forecast center Senior Hydrologist and Water Resources Manager Todd Hamill is regularly updating federal and state officials through multimedia briefings or on-site constituent meetings.

In addition to gathering all the meteorological and climatological data used to determine the severity and extent of the drought, NWS forecast offices in the area have also been proactive in supporting local officials. Offices serving Tennessee, Alabama and Georgia issue Drought Information Statements, take part in numerous conference calls and provide comprehensive Website support, data and information for water resource managers and local and state emergency management officials.

"We are now entering a more critical phase of the drought in the southeast," said John Feldt, SERFC Hydrologist-in-Charge. "Local and state officials are pondering far-reaching actions in coping with the drought and the possibility of community water shortages. We are committed to supporting them any way we can."

In addition to these resources, a coalition of federal agencies has developed a new drought information site. To access the Drought Portal, go to [www.drought.gov](http://www.drought.gov). ✱



*A new Water Watch Website offers one-stop shopping for drought information in the Southeast.*

## Flood Awareness

### NWS to Hold 4th Annual Flood Safety Awareness Week

By Larry Wenzel, NWS Hydrologic Services Division, National Hydrologic Outreach Program Leader  
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The NWS Flood Safety Website now includes a section on drought resources.

This year NWS will hold its annual Flood Safety Awareness Week from March 17-21, 2008. The week highlights the hazards of floods and flash floods along with related issues such as drought, debris flow and ice. Floods and flash floods, more often than not, lead the list of severe weather related deaths and property damage each year. That's because floods and flash floods occur year round from border to border and coast to coast. Several new informational resources have been added this year:

- ◆ A DVD entitled, "Cyclone: The Second Wave," in three parts:
  - ◆ Tropical Cyclone Inland Flooding
  - ◆ NWS Flood Severity Scale
  - ◆ Turn Around Don't Drown campaign
- ◆ New yellow warning sign for Turn Around Don't Drown campaign that includes information and specifications for the sign
- ◆ A section on drought resources

For more information, go to [www.weather.gov/floodsafety/](http://www.weather.gov/floodsafety/). The site divides each day of the week into unique informational groupings. \*

## Heat Workshop

### Excessive Heat Workshop Develops Strategies for Change

By Jannie G. Ferrell, Health Weather Program Leader, OCWWS Fire and Public Weather Services  
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The NWS Office of Climate, Water and Weather Services (OCWWS) cosponsored an excessive heat workshop with the Centers for Disease Control and Prevention (CDC), the Environmental Protection Agency (EPA) and Arizona State University, November 14-16, 2007, in Arizona. The workshop, entitled "Excessive Heat Events: Confronting Climate Change, Vulnerability and Urbanization by improving Heat Health Services, Mitigation Strategies and Communications," was hosted by WFO Phoenix and Arizona State University at Tempe.

Human exposure to extreme heat events is an increasing public health problem. Compounded with the pressures of urbanization, an aging population and climate change, heat waves are bringing significant challenges to U.S. public health and emergency response organizations.

The main objective of this workshop was to collaborate with federal, state and local government agencies, academia, industry and other stakeholders to identify public health priorities, data gaps and decision support tools to enhance local response to heat waves. Another objective was to establish a model for future workshops to address national heat wave issues.

By the conclusion of the workshop, attendees had developed the following actions:

- ◆ Improve heat forecast and warning products
- ◆ Develop strategies to target under-served populations such as the homeless
- ◆ Create a one-stop Website for information related to excessive heat forecasting, mitigation and adaptation

There were about 80 participants representing state, county and local public health communities, the research community, universities and Phoenix area media. The following “beta” Website has been developed as a result of the workshop to serve those involved or who have an interest in heat wave issues: [www.heat-waves.org/indextest.php](http://www.heat-waves.org/indextest.php). ✽

## Outreach Innovations

### TERRI the Robot Stars at NOAA's World Space Expo Booth

By Ron Gird, NWS OCWWS Outreach Manager  
[Ron.Gird@noaa.gov](mailto:Ron.Gird@noaa.gov)

NWS teamed with other NOAA offices to take part in the NASA World Space Expo at Kennedy Space Center last November. The star of the event was TERRI the robot. TERRI helped introduce NOAA programs and draw visitors into the NOAA exhibit. NOAA and Conceptual Vision staff successfully loaded TERRI with information on-the-fly to correspond with ongoing questions from visitors. TERRI continues to “learn” at each event he attends—as do his “handlers.”

NWS headquarters and the Melbourne, FL, WFO provided staff and materials for the NOAA Exhibit. NWS OCWWS demonstrated its “Xtreme Weather CD” and conducted Weather Jeopardy games during the 4-day event. The Melbourne WFO provided a miniature “Fujita Tornado” exhibit, assisted in the daily weather balloon launchings by students and staffed the NOAA exhibit. NOAA exhibited Science on a Sphere and NOAA’s Second Life Island.

The Expo’s goals were two-fold: to offer an informal educational opportunity for 3,000 students from local schools visiting Kennedy Space Center, and to provide a general public outreach program that helped draw 12,000 visitors to the center. The next event for TERRI is the American Meteorological Society annual meeting in New Orleans in January. For more information about TERRI, contact [Ron.Gird@noaa.gov](mailto:Ron.Gird@noaa.gov). ✽



*TERRI the robot answers student questions at Kennedy Space Center.*

### Customer Service Workshops Help Build Trust, Relationships

By Rick Shanklin, WCM, NWS Paducah, KY  
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Looking to refine products and services to best benefit users and partners, WFO Paducah, KY, staff collected volumes of feedback through four customer service workshops held during November. Workshops were set up in each of the four states encompassed in the WFO’s county warning and forecast area: Kentucky, Illinois, Indiana and Missouri.

Participants covered the gamut of groups NWS serves. More than 200 individuals represented the fields of agriculture, aviation, emergency management, fire departments, forestry, hydrology, manufacturing, medicine, transportation, schools, utilities, the public, media, legislatures and more.

Day-long sessions were structured to cover four primary components: Review of NWS products and services, breakout sessions of eight similar interest groups, a panel discussion and winter weather. Participants provided input on existing products and services as well as identifying additional or unmet needs.

Success of the workshops was reflected in a comment from Henderson County, KY, Emergency Management Director Larry Koerber, who said, "I am blown away that we have a federal agency that is so eager to listen to those it serves."

WFO Paducah employees are involved in an intense effort to formulate an action item spreadsheet of feedback to help steer future products and services provided by the WFO. This spreadsheet will be made available to all participants.

Preparatory work on the project began a couple of years ago. Each workshop entailed the efforts of 10-12 WFO staff members to plan and organize. That effort more than paid off for both WFO staff and the attendees. For more information, go to [www.crh.noaa.gov/images/pah/pdf/cswfindings.pdf](http://www.crh.noaa.gov/images/pah/pdf/cswfindings.pdf). \*

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## NWS Helps Train Saudi Arabian Meteorologists

By Charlie Paxton, SOO, NWS Tampa Bay Area, FL  
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NWS Tampa Bay, FL, Science and Operations Officer Charlie Paxton demonstrates the Weather Research and Forecasting (WRF) model for Saudi Arabian Meteorologists.

NWS Tampa Bay, FL, Science and Operations Officer Charlie Paxton traded the wet beaches of Tampa Bay for the dry sands of Saudi Arabia last fall. Paxton traveled to Jeddah to conduct Weather Research and Forecasting (WRF) model training for the staff at the Presidency of Meteorology and Environment. The Tampa Bay Area NWS office used the WRF model to provide forecasts for severe weather scenarios to Saudi emergency managers.

The high resolution WRF model is another piece of information that shows meteorologists timing of precipitation, winds and parameters leading to storm severity. The WRF model is widely used in NWS offices to improve mesoscale forecasting. This technology has also been used by other countries including much of Europe, Japan, China, Brazil and Canada to help protect life and property. The Saudis will be using the WRF model primarily for forecasting precipitation, sand and dust storms and for aviation forecasts. \*

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## Workshop Targets Offsite NWS Support

By Richard Okulski, WCM, WFO Memphis, TN  
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NWS Memphis, like many other local NWS offices, has become more involved in providing "on site" and "off site" support for non-weather related incidents. Two examples for the Memphis office are the September 11, 2001, Space Shuttle Columbia response and recovery operations, and the 2007 Spill of National Significance Exercise. To better respond to these new responsibilities, NWS Memphis will host an All Hazards Weather Support Workshop on February 6-7. Key speakers include top state emergency management personnel, commercial partners and NWS regional and local staff members for Memphis, Chicago and Jackson. For more information email [Richard.Okulski@noaa.gov](mailto:Richard.Okulski@noaa.gov). \*

## Great American Teach-In Brings Scientists to Schools

By Dan Noah, WCM, NWS Tampa Bay Area, FL  
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All across America, men and women from many walks of life took time out of their busy schedules to share their professions with our nation's youth during the 2007 Great American Teach-In. Throughout the week of November 12-16, 2007, meteorologists from NWS Tampa Bay, FL, spoke at eight elementary schools reaching 1,652 students. The meteorologists described careers within NWS, hazardous weather in Florida and discussed the warning process, including the vital roles of emergency management and broadcast and print media. Attendance at each of the presentations ranged from 20 students in a classroom to 200 students in an auditorium. As a result of this outreach, NWS Tampa Bay Area received three requests from students and parents to job shadow meteorologists. \*

## Governor Proclaims November as Volunteer Weather Observer Month

By Ralph Troutman, Observing Program Leader, NWS Nashville, TN  
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As a way to encourage and thank its volunteer weather observers, Tennessee Governor Phil Bredesen officially proclaimed November 2007 as Volunteer Weather Observer Month. The state honored its more than 900 weather observers for dedicated service to their fellow citizens, the state and the NWS. The proclamation recognized the historic NWS Cooperative Observer Network and the rapidly expanding Community Collaborative, Rain, Hail and Snow Network, commonly known as CoCoRaHS.

Tennessee has 193 Cooperative Observer stations. The Tennessee Cooperative Observer Network dates back to the 1850s and is part of a national network that includes more than 11,700 observers.

The state's CoCoRaHS program boasts 745 observers. They are part of a unique, non-profit, community-based, network of volunteers working to measure and map precipitation. This popular program originated with the Colorado Climate Center at the University of Colorado in 1998 and has since expanded to include approximately 12,000 volunteers in 23 states.

Weather records retain their importance as time goes by. Long and continuous records provide an accurate picture of a locale's normal weather and give climatologists and other experts a basis for predicting future trends. These data are invaluable for scientists studying floods, droughts and heat and cold waves. Each month, Cooperative Observers mail their records to the National Climatic Data Center for publication in Climatological Data or Hourly Precipitation Data.

NOAA is dedicated to enhancing economic security and national safety through the prediction and research of weather and climate related events, through information service delivery for transportation, and by providing environmental stewardship of our nation's coastal and marine resources. Through the emerging Global Earth Observation System of Systems, NOAA is working with its federal partners, more than 70 countries, and the European Commission to develop a global monitoring network as integrated as the planet it observes, predicts and protects. \*



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### SPC To Hold 8th Annual National Severe Weather Workshop

*By Greg Carbin, WCM, NCEP Storm Prediction Center; John Ferree, Severe Storm Service Leader  
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Representatives from NWS, emergency management and the media are busy preparing for the 8th Annual National Severe Weather Workshop (NSWW) March 6-8, 2008, in Norman, OK. The National Center for Employee Development (Postal Training Center) will again host NSWW's Thursday and Friday sessions, including the popular scenario exercise. The National Weather Center, located on the south campus of the University of Oklahoma, will serve as the venue for the final day of the workshop, Saturday, March 8. Free transportation will be provided between the Training Center and the Weather Center.

The preliminary speaker agenda at NSWW 2008 includes a diverse group of NWS managers and forecasters, emergency managers from state and federal agencies and members of academia. The dynamic array of topics targets extreme weather event forecasting and disaster mitigation. Staff have also begun planning for the scenario session, which features a simulated weather emergency. The actual weather event should prove to be a challenge for all who choose to predict or manage it, whether meteorologists, emergency managers or media representatives.

SPC staff will summarize knowledge gained from the speaker and scenario sessions to help improve emergency communications and the warning process. On Saturday, staff will summarize the NSWW 2008 theme, "From Readiness to Recovery," through a number of presentations at the National Weather Center. The final afternoon session will feature storm spotter training and amateur radio training and testing opportunities.

Information is available on a wide array of accommodations and area activities. With participants expected to attend from more than 20 states, this promises to be the best National Severe Weather Workshop yet. For additional information and to register for NSWW 2008, please visit the workshop Website at [www.norman.noaa.gov/NSWW2008/](http://www.norman.noaa.gov/NSWW2008/). \*

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### NWS Releases Service Assessment Report on 2007 Tornadoes in Southern Alabama and Georgia

*By Wayne Presnell, Meteorologist, NWS Performance Branch  
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On November 29, NWS released the Service Assessment report "Tornadoes in Southern Alabama and Georgia: March 1, 2007." The most devastating tornado of the outbreak was rated EF4 on the Enhanced Fujita Scale. This twister struck a high school in Enterprise, AL, killing eight students when a concrete wall collapsed on them. Another strong tornado in this event caused the death of six people in a mobile home park near Newton, GA, and claimed five more victims in Alabama and Georgia.

A total of 31 verified tornadoes struck 45 counties in Georgia and southern Alabama, including 13 strong or violent tornadoes: EF2 or greater. The deadliest was the EF4 in Enterprise.

The lead time for all Tornado Watches issued by the Storm Prediction Center during this outbreak was 8.5 hours. NWS issued Tornado Warnings for all of the tornadoes producing fatalities; the average lead time was 20 minutes. This average was 7 minutes greater than the NWS 2007 national goal for tornado lead time.

“The tragic events of March 1 show that even when people have ample time and opportunity to take cover from a devastating tornado, the need for proper shelter is imperative,” said retired Navy VADM. Conrad C. Lautenbacher, Ph.D., Under Secretary of Commerce for Oceans and Atmosphere, and NOAA Administrator. “Despite warning lead times that exceeded national standards, 19 lives were lost. Our team concluded that survival in violent tornadoes often depends on reaching an adequate hardened safe room.”

Enterprise High School officials and students followed appropriate safety measures before and during the March 1 tornado outbreak. This event further demonstrated the need for such facilities to have hardened safe rooms. A hardened safe room may have provided adequate shelter from the powerful tornado and allowed the eight students to survive.

Hardened safe rooms, windowless rooms lined and topped with concrete, are designed to withstand severe sustained winds and wind gusts; however, these interior safe rooms are not practical for mobile homes, which often move off their foundation during extreme winds. The team concluded that a necessary component for tornado safety in a mobile home park is a hardened safe room easily accessible and shared by the community.

Risk of fatality in a mobile home is 15 to 20 times greater than for those in permanent structures. Only 7 percent of U.S. residents live in mobile homes, yet mobile home residents account for approximately 50 percent of tornado fatalities. Even permanent structures, however, are at risk in tornadoes rated EF3 or higher.

“We saw permanent structures completely removed from their foundations during the March 1 outbreak,” said Team Leader Glenn Lussky, Meteorologist-in-Charge, at NWS La Crosse, WI. “Hardened safe rooms are essential for tornado safety.

This is perhaps the only thing that could have made a difference for the students in Enterprise.”

At the time of the deadly outbreak, school officials were criticized for not releasing the students before or during the outbreak. Students and staff at Enterprise High School sheltered in place for 2.5 hours.

“Dismissing the students could have been just as dangerous,” said Lussky. “Tornado warnings were in place the entire time. The team agreed that shelter in place was the best response.”

Since the Enterprise tornado outbreak, NWS has moved from a county-based system of warnings to a more geographically specific storm-based warning system. The new storm-based warnings provide more precise information about the location of severe weather and the direction in which it is expected to move. Testing revealed that storm-based warnings would have reduced the warning coverage area by 58.4 percent. Nevertheless, the high school and the town of Enterprise would have been under a warning for the same amount of time.

“Three successive supercell thunderstorms moved over or near Enterprise during that time,” said Lussky. “We believe the warnings and response would have been the same under storm-based warnings. This is just one of those cases where everyone did everything they could. The only thing left is the hardened safe room.”

Overall, the report offers six findings and recommendations which will help the NWS improve its products and services. The service assessment “*Tornadoes in Southern Alabama and Georgia: March 1, 2007*” is available online at: [www.weather.gov/os/assessments/pdfs/AL-GA\\_tornadoes07.pdf](http://www.weather.gov/os/assessments/pdfs/AL-GA_tornadoes07.pdf). \*



*Tornadoes in Southern Alabama and Georgia. EF4 tornado near Enterprise, Alabama, March 1, 2007. Photo courtesy of J. Barry Mott.*

## StormReady/TsunamiReady

### What Harvard University Staff Thinks of StormReady

By Melody Magnus, Aware Managing Editor  
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Harvard University joined the StormReady program in July 2007. So was it worth the paperwork to join? Here's what Colt Hagmaier of the Harvard EM staff has to say about the process of becoming StormReady. "We became a StormReady University earlier this year. I would very much appreciate it if you would communicate to the [StormReady] board how valuable we have found the StormReady program and thank them for their efforts. I wholeheartedly support the program and have tried to encourage other colleges and universities to participate. As an

FYI, I have submitted a piece for the February IAEM Bulletin about our interaction with the StormReady program. The StormReady program can truly be adapted to work in almost any environment. And while the program has an obvious severe weather emphasis, the benefits of participation in terms of communication and coordination can be seen in response to any type of threat. I have found it is really an all-hazards preparedness approach to natural hazards."

Harvard isn't the only university to join StormReady recently. The program also gained Drake University in Iowa and Pennsylvania State University's main campus. The University of Nevada's Fire Science Academy became a supporter in November.

The StormReady program knows how to have fun as well as teach safety lessons. The Hershey Park Entertainment Complex in Pennsylvania joined this fall. Six Flags Kentucky Kingdom joined as a supporter.

Other notable gains include the Flathead Indian tribe in Montana. Idaho gained six new sites, bringing that state's total to an amazing 164 StormReady counties and communities.

The TsunamiReady program gained the Mayport Naval Station in Florida as its newest East Coast site. For more information on the benefits of the StormReady program, contact your local NWS office or go to [www.stormready.noaa.gov](http://www.stormready.noaa.gov). ✱



Mayport Naval Station in Florida joined the TsunamiReady program as the first military TsunamiReady site.

## Winter Weather

### SPC Provides Short-Term Mesoscale Winter Weather Guidance

By Jonathan Racy and Jared Guyer  
Mesoscale Forecasters at the NCEP/Storm Prediction Center, Norman, OK  
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The SPC is again offering scheduled short-term winter weather mesoscale discussions (MD) in support of NWS and external partners this winter season. This is the third year the SPC has issued winter weather MDs on a scheduled basis. The scheduled MDs are composed and

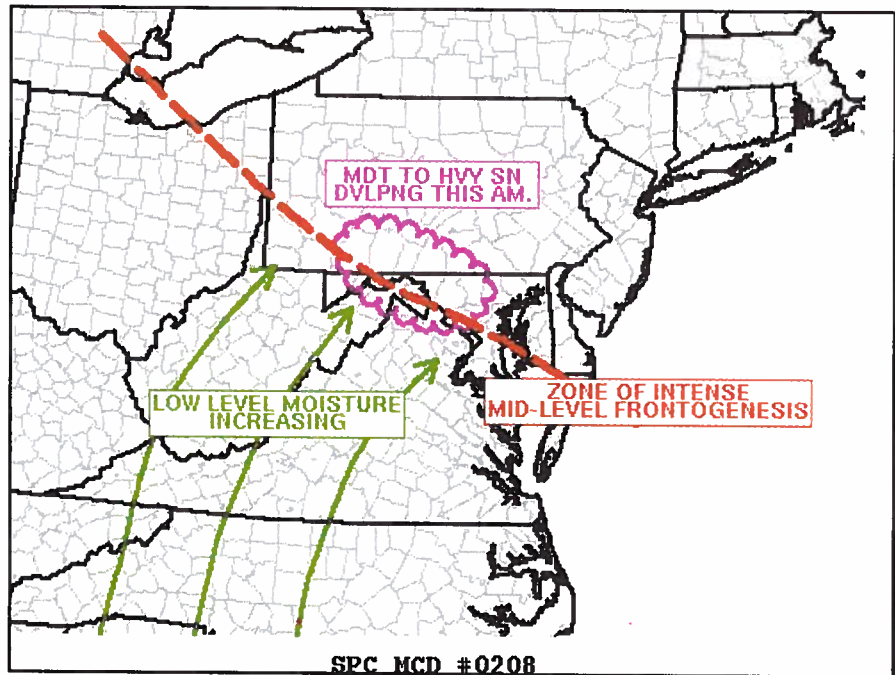


transmitted four times daily between the hours of 00-01, 06-07, 12-13 and 18-19 UTC. The MDs are issued when short-term hazardous winter weather impacts the continental United States. This schedule is followed from December 1 through February 18. A more predictable format makes it easier for NWS offices to anticipate and include SPC information in their latest statements and warnings related to hazardous winter storm situations. On rare occasions, when conditions warrant, SPC staff may also issue non-scheduled winter weather MDs. SPC mesoscale discussions for other severe weather types remain unscheduled but are usually tied to Severe Thunderstorm and Tornado Watches.

SPC winter weather forecasters maintain regular collaboration with the Hydrometeorological Prediction Center's (HPC) winter weather desk as well as local WFOs. The NWS chat room allows SPC forecasters to be in constant contact with other NWS forecasters. SPC forecasters also monitor Iowa Environmental Mesonet (IEM) chat for pertinent updates from the emergency management and media communities.

The winter weather MD provides technical analysis and forecast of mesoscale processes contributing to heavy snow, significant icing and blizzard conditions up to 6 hours in advance. The MD provides forecast information on the *what, when, where and why* of the impending, or evolving, winter weather hazard.

Typically, SPC uses the first paragraph to describe the location, timing, precipitation rates and radar trends of a hazardous weather situation. Additional paragraphs explain the *why*, or the meteorological processes contributing to the event or hazard, e.g., frontogenesis, thermodynamics or isentropic lift. SPC also provides a graphic summarizing the forecast hazard and threat area that is viewable on AWIPS and on the SPC Website. SPC winter weather MD Issuance/Forecast Criteria are as follows:



SPC also provides a graphic summarizing the forecast hazard and threat area that is viewable on AWIPS and on the SPC Website.

- ◆ Mesoscale precipitation systems producing snowfall rates of at least 1 inch per hour, lasting 2 hours or longer, at elevations below 4000 feet Mean Sea Level (MSL)
- ◆ Mesoscale precipitation systems producing snowfall rates of at least 2 inches per hour, lasting 2 hours or longer, at elevations at or above 4000 feet MSL or in lake effect areas
- ◆ Freezing rain events producing greater than five-hundredths of an inch water equivalent precipitation in a 3 hour period
- ◆ For spatial and temporal trends in precipitation type such as snow changing to freezing rain, rain changing to snow
- ◆ For the initiation of mesoscale blizzard conditions (visibility less than 1/4 mile in snow, blowing snow and winds in excess of 35 mph, including non-precipitating ground blizzards) expected to last at least 3 hours
- ◆ For climatologically rare winter precipitation situations as might occur across the southern tier of the United States.

SPC welcomes your comments on the winter weather MD product. Please email [spc.feedback@noaa.gov](mailto:spc.feedback@noaa.gov). Comments will guide improvements to winter weather products and services. For more information, please visit the SPC Website at: [www.spc.noaa.gov/products/md](http://www.spc.noaa.gov/products/md). \*

## WAS\*IS in Practice: Forecast Impacts During a Blizzard

By Amanda Graning, Forecaster, WFO Duluth, MN  
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There was a definitive weather and society connection involved in communicating information during the complex blizzard of March 1, 2007, in northern Minnesota and Wisconsin. The blizzard affected the western edge of Lake Superior, included the Duluth, MN, and Superior, WI, metro areas. This event highlights how WAS\*IS training helped staff navigate standard NWS practices and make critical decisions. This knowledge, in turn, allowed the Duluth NWS office to successfully convey the dangers of this storm.

WAS\*IS

WORKSHOPS

weather & society \* integrated studies

Changing from what WAS to what IS the future of integrated weather studies



In late February and early March 2007, a series of winter storms struck the Duluth area, including a paralyzing blizzard that dropped more than 20 inches of snow. Heavy snow, falling at rates up to 3 inches per hour, combined with persistent 60 mph wind gusts, created whiteout conditions and snow drifts as high as 25 feet. The blizzard—the first in 10 years—was preceded by a more typical snow event that recorded 6 inches of snow. While locals are accustomed to severe cold and snow, the topography and dense forestation in the area often reduces the threat of high winds and whiteouts.

About 18 hours before the initial 6 inch snow event and nearly 36 hours before the anticipated significant blizzard, weather forecast models consistently agreed on the likelihood of a blizzard. With forecaster confidence high, NWS Duluth had already issued a winter storm warning to cover the first snowfall and the impending blizzard. This pattern is a complex scenario for a forecaster since NWS warning criteria defines each storm as two distinct events: a “low-end” winter storm and a rare and intense blizzard separated by a several hour lull. NWS staff needed to make a critical decision between the options below:



Duluth, MN, resident, Pam Bonkoski digs out her car after a blizzard.

- ◆ Keep the winter storm warning for both the initial snow and the blizzard.
- ◆ Issue two separate warnings: a winter storm warning for the first 6 inches and a blizzard warning for the much more dangerous high-impact event to follow.
- ◆ Issue a single blizzard warning covering both events.

At this point, WAS\*IS experience became invaluable. During significant weather events, like this blizzard, understanding how to communicate the message of enhanced threat effectively is arguably as important as the physical science of

the event. Because of WAS\*IS involvement, forecasters were able to thoroughly consider the impacts and consequences of the decision.

Duluth staff replaced the *winter storm warning* with a single *blizzard warning* that treated both events as one storm. This decision was based both on the staff's high confidence that blizzard conditions would soon occur and in the belief that such a warning would result in better preparation and response by partners in the media, emergency management, local government services and the general public. Many factors went into this decision:



*Snow reached up above street signs after the Duluth blizzard.*

- ◆ Anticipating unnecessary confusion of multiple warnings
- ◆ Avoiding conflicting headlines in the warning product
- ◆ Recognizing the rapid onset of the blizzard just before peak commute time
- ◆ Focusing on the primary threat—the blizzard.

By sending a clear warning nearly 2 days before a rare and potentially life-threatening storm, nearly everyone was prepared, not only for the storm, but for post-storm recovery. A local newspaper reported the “precisely predicted” storm and the fact that there were no deaths connected with this event. For more information on WAS\*IS, go to [www.sip.ucar.edu/wasis/](http://www.sip.ucar.edu/wasis/). \*

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## Online Winter and Spring Awareness Resources

For severe weather and winter awareness brochures, booklets, state awareness event links and more, go to [www.weather.gov/os/severeweather/index.shtml](http://www.weather.gov/os/severeweather/index.shtml) and [www.weather.gov/os/winter/index.shtml](http://www.weather.gov/os/winter/index.shtml). \*

### Climate, Water and Weather Links

Aviation Weather:	<a href="http://www.aviationweather.gov/">www.aviationweather.gov/</a>
Brochures/Booklets/Posters:	<a href="http://www.weather.gov/os/brochures.shtml">www.weather.gov/os/brochures.shtml</a>
Education/Outreach:	<a href="http://www.weather.gov/os/edures.shtml">www.weather.gov/os/edures.shtml</a>
Flooding/Water:	<a href="http://www.floodsafety.noaa.gov/">www.floodsafety.noaa.gov/</a>
Hurricane Awareness:	<a href="http://www.weather.gov/om/hurricane/index.shtml">www.weather.gov/om/hurricane/index.shtml</a>
Lightning Safety:	<a href="http://www.lightningsafety.noaa.gov/">www.lightningsafety.noaa.gov/</a>
Marine Weather:	<a href="http://www.weather.gov/os/marine/home.htm">www.weather.gov/os/marine/home.htm</a>
MIC/WCM/SOO/DOH List:	<a href="http://www.weather.gov/os/wcm-soo.pdf">www.weather.gov/os/wcm-soo.pdf</a>
National Digital Forecast Database:	<a href="http://www.weather.gov/ndfd/">www.weather.gov/ndfd/</a>
Natural Hazards Statistics:	<a href="http://www.weather.gov/os/hazstats.shtml">www.weather.gov/os/hazstats.shtml</a>
NOAA Weather Radio Information:	<a href="http://www.weather.gov/nwr/">www.weather.gov/nwr/</a>
Past Weather/Climate:	<a href="http://lwf.ncdc.noaa.gov/oa/ncdc.html">lwf.ncdc.noaa.gov/oa/ncdc.html</a>
Rip Current Awareness:	<a href="http://www.ripcurrents.noaa.gov/">www.ripcurrents.noaa.gov/</a>
StormReady Home Page:	<a href="http://www.stormready.noaa.gov/">www.stormready.noaa.gov/</a>
Severe Weather Safety:	<a href="http://weather.gov/os/severeweather/index.shtml">weather.gov/os/severeweather/index.shtml</a>
Tsunami Information:	<a href="http://www.tsunami.gov">www.tsunami.gov</a>

