

Aware

Aware is published by NOAA to keep communications lines open within the Agency and with the emergency management community.

Winter 2004-05

Climate, Water, Weather

How Partners in Service Can Save More Lives

By Dennis H. McCarthy, Acting Director, Office of Climate, Water, and Weather Services

Many of you have been dealing with a variety of hazardous weather and flood events in recent months. It has been an active winter, especially in southern California, several Southern states, parts of the Ohio Valley and much of the northeast. Meanwhile, drought and wildfire threats prevail in other areas.

As we prepare for severe weather season, it's a good time to reflect on the value of partnerships that serve the public so well. All of us have a role in raising awareness and encouraging people to prepare and develop a plan of action. Because observations and ground truth reports are so important, partnerships also contribute directly to the warning decision-making process. Timely reports increase accuracy, add vital lead time and add credibility to warnings. Effective partnerships also speed distribution of critical warning information to the public.

Remember hearing about the Parsons Manufacturing Plant? What a fantastic story! Last July, the central Illinois plant was demolished by an F4 tornado. Thanks to a strong preparedness program, none of the 140-150 people in the plant were killed or injured. The Parsons story can serve as a severe storm safety model for any business, institution or family. We hope to have a short video on this event available soon to emphasize the importance of planning, staying informed and taking quick action.

The plant's restrooms served as safe rooms. An effective plan was in place and practiced. A manager assumed the role of "Designated Weather Watcher," monitoring NOAA Weather Radio (NWR) and watching for tornadoes. Employees knew what to do when warned and acted promptly.

Designated Weather Watcher

Have you ever served as a Designated Driver? This concept has caught on so well it has become a common term and has probably saved countless lives.

See *Partners in Service*, Page 2

Last Paper Edition of *Aware*! Subscribe to E-Aware Now!

By Donna Ayres, *Aware* Editor
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Aware will be distributed electronically after this issue. This will be the last edition mailed. The benefits of an electronic *Aware* are many: saving trees, funds and labor, faster delivery and color printing options. As we make the change, we will try to minimize inconvenience to you, our customers.

We will send you an email alert when a new *Aware* is published. We intend to give you a dynamic, eye-catching newsletter in a more convenient, timely and flexible format.

To continue receiving *Aware*, just to go <http://weather.gov/os/awarelist.shtml> and fill out our two question form. *

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Partners in Service

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Remember the story of the Goshen, AL, church struck by a tornado in 1994? A warning had been issued but people in the church were unaware of the warning. Maybe if someone knew there was an outlook for severe storms, or a watch, that person could monitor NWR or local TV. Maybe when the "Designated Weather Watcher" heard the warning he/she could have warned the other churchgoers, who might have been able to take shelter.

The Weather Watcher is a person who monitors NWR or media during a threatening weather or flood situation and relays warnings as needed. NWR and other alerting devices are perfectly suited for this function.

Two great success stories about Weather Watchers are the theater manager in Van Wert, Ohio, in 2002, who saved dozens of moviegoers' lives and the Parsons Plant manager last summer. Both demonstrated the lifesaving potential of this common sense approach to staying safe in severe weather. ✱

Digital Services

Three More Digital Elements To Be Declared Operational March 15

*By Chris Alex, NWS Digital Services
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On March 15, NWS will declare operational temperature, dew point and weather (i.e., fog, rain, snow) elements in the National Digital Forecast Database (NDFD). The elements are only for the Contiguous United States (CONUS). These three elements join maximum temperature, minimum temperature and 12-hour Probability of Precipitation (POP12) as NDFD elements officially in use for the CONUS. NDFD data are available in several ways:

- As graphics posted online at <http://weather.gov/forecasts/graphical/sectors/index.php>
- In Gridded Binary (GRIB2) format via File Transfer Protocol (FTP) servers at <http://www.weather.gov/ndfd/technical.htm>
- In eXtensible Markup Language (XML) via web service at <http://www.weather.gov/xml>

The change from experimental to operational for these three elements affects users who pull these elements in GRIB2 format via FTP. Specific information for FTP users regarding this change is available online at http://www.weather.gov/ndfd/oper_implem.htm.

Online NDFD graphics will no longer have an experimental label in the legend for these elements in the lower 48 states. Users of NDFD XML via web service will see no change. As of March 15, 2005, the status of the 12 initial elements in NDFD for the CONUS is:

Element (CONUS only):	Status:
Temperature	Operational as of 3/15/05
Dew Point	Operational as of 3/15/05
Weather	Operational as of 3/15/05
Maximum Temperature	Operational as of 12/1/04
Minimum Temperature	Operational as of 12/1/04
Prob of Precip (POP12)	Operational as of 12/1/04
Sky Cover	Experimental
Quantitative Precip	
Forecast (QPF)	Experimental
Wind Direction	Experimental
Wind Speed	Experimental
Snow Amount	Experimental
Significant Wave Height	Experimental

Status of other areas (outside of CONUS):

All elements, Puerto Rico	Experimental
All elements, Hawaii (QPF, snow not available)	Experimental
All elements, Guam (QPF, snow not available)	Experimental
All elements for Alaska	Not yet available

NWS staff will continue to enhance the remaining experimental elements, which will remain available on the NDFD directories, as graphics on the Web and as XML files via web service.

NWS staff is interested in your opinions. Give us your view on which of the remaining six experimental elements are most needed or which appear ready to become operational. Tell us how you are using the NDFD elements. A brief survey is available at <http://weather.gov/survey/nws-survey.php?code=ndfd-grids>.

Aware

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Aware in PDF—weather.gov/os/aware.PDF
AwareNow—weather.gov/os/awarenow.shtml

Over the next several months, other experimental elements may become available, such as relative humidity, apparent temperature (i.e., wind chill and heat index) and tropical cyclone surface wind speed probabilities.

Customer notification of changes are sent in Technical Implementation Notices (TIN), transmitted on NOAAPort, the Family of Services, NOAA Weather Wire Service and the Emergency Managers Weather Information Network. TINs are released under WMO heading NOUS41 KWBC and AWIPS identifier PNSWSH. TINs are posted online at <http://www.weather.gov/om/notif.htm>.

For updates, see the link above or the NDFD Development Status website: <http://www.weather.gov/ndfd/development.htm>. More details on NDFD are available at <http://www.nws.noaa.gov/ndfd>. *

NDFD Provides Improved Forecasting For Blizzard of 2005

*By Marcie Katcher, NWS Public Affairs Officer
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A dangerous blizzard packing high winds and creating whiteout conditions pummeled portions of northern New Jersey, southern New York and New England January 22- 23. The blizzard conditions prompted the governors of New Jersey, Massachusetts and Rhode Island to declare a state of emergency; New York City and Suffolk County, NY, also were declared in a state of emergency.

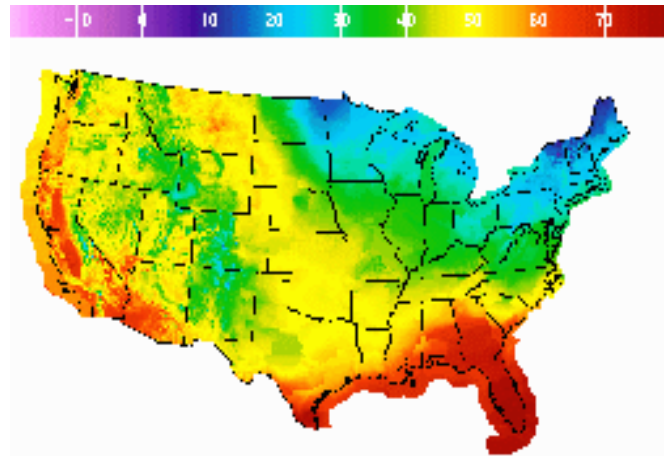
New technologies and advanced computer processing used in National Digital Forecast Database (NDFD) continue to revolutionize how forecasts are prepared and disseminated, changing the day-to-day forecasting process. During this blizzard, meteorologists used their knowledge of the local area and mesoscale effects of the atmosphere to generate graphical, gridded and text-based forecasts of the phenomenon.

"We know our users are using the new tool to see how forecast elements vary across space and time in a way that we never could accomplish by conventional text products," said Meteorologist in Charge Robert Thompson, WFO Taunton, MA. "We were able to incorporate our local knowledge to accurately forecasting snowfall ranging from 30" to 36" across Cape Cod, Plymouth and Essex Counties."

NDFD also improved service to the weather sensitive New England marine community. During this storm, NDFD enabled NOAA's NWS to provide a visual depiction of forecasted sea heights. The commercial fishing industry uses sea height forecasts to plan their fishing trips. The more detailed depiction of the sea height forecast through

NDFD provides the industry with more information to make better decisions.

Thompson added, "Other unique applications of NDFD include graphically depicting the evolution of temperature and associated life-threatening wind chills. We were also able to visually depict expected wind speeds that exceeded 60 miles per hour in gusts along much of our coastline. The highest wind recorded was a hurricane force gust of 74 miles per hour on Nantucket."



"The value of the NDFD and the new Interactive Forecast Preparation System has opened the door for providing snowfall forecasts and other hazardous information in gridded and graphical formats which are readily available on the Internet," said NWS Eastern Region Deputy Chief of Meteorological Services, I. Ross Dickman.

"Our NWS Eastern Region website server on January 22 set a 1-day record with over 45 million hits. During the storm, WFO Taunton alone recorded nearly 4 million hits," noted Dickman.

Nick Mahlstedt, Greenville, SC, wrote, "Your new Graphical Forecasts are excellent. It creates a vivid picture of expected weather without strain."

NDFD contains a seamless mosaic of digital forecasts from NWS field offices working in collaboration with the National Centers for Environmental Prediction. The database is made available to customers and partners from public, private and academic sectors using an open GRIB2 and XML protocols.

Customers and partners can then use this data to create a wide range of text, graphic, gridded and image products of their own. In fact, any technology that can use digital information can access NDFD data. For more information, go to: <http://www.nws.noaa.gov/ndfd/technical.htm>. *

Dissemination

HazCollect System To Go Nationwide by Next Winter

*By Herb White, Dissemination Services Manager
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NWS expects national availability of the HazCollect system capability through FEMA's Disaster Management Interoperability Service (DMIS) in the winter of 2005-2006. A limited system demonstration was successfully completed on February 22. Development Test and Evaluation and Operational Acceptance Testing of the HazCollect system will be completed between June and August 2005.

The All-Hazards Emergency Message Collection System (HazCollect) will be a one-stop location for the collection and distribution of non-weather emergency messages, commonly known as Civil Emergency Messages, to the NWS dissemination infrastructure, other national systems such as DMIS, and to the Emergency Alert System. HazCollect will use some features of DMIS, such as automated user authentication and authorization.

For more information, visit these websites: NWS HazCollect at: <http://weather.gov/os/hazcollect/> and FEMA's Disaster Management Interoperability Services at: <http://dmi-services.org/>. *

EAS and Public Warning Update

*By Herb White, Dissemination Services Manager
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The first EAS Summit was held February 26 in Crystal City, VA. Attending were nearly 200 EAS experts, FEMA and state emergency management and homeland security advisors and state EAS and Emergency Communications Committee chairs from all 50 states, DC and Puerto Rico.

Reynold Hoover, Director of FEMA's Office of National Security kicked off the Summit with news of improvements to the national component of EAS. He reported the Federal government is now using digital technology to upgrade the national 34 Primary Entry Points radio stations to a satellite-based system.

FEMA is also making efforts to allow transmission of warning information via outlets such as the Internet, wireless and satellite-based digital systems.

NWS presented its Dissemination Capabilities and HazCollect program. Attendees received EAS resource materials, including NWS and NWR information. The primary sponsors were the National Alliance of State Broadcast Associations and the U.S. Justice Department's Office of Justice Programs. *

Valid Time Event Code Update Implemented for Six Products

*By Art Kraus, Awareness Branch
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Valid Time Event Code (VTEC) was operationally implemented in six severe weather warning and watch products on February 8 (See article Page 12). A second round of VTEC testing for other Watch, Warning and Advisory (W/W/A) products has begun, using the new Graphical Hazards Generation (GHG) ability within the AWIPS Graphical Forecast Editor (GFE).

NOAA's NWS conducted an Initial Risk Reduction Field Test from mid-February into March at 16 Weather Forecast Offices (WFOs) and two Regional Offices. These offices issued operational and primarily test Winter Weather and Non-Precipitation W/W/A Products and Watch County Notification (WCN) messages. The messages contained experimental VTEC using GHG/GFE.

The Risk Reduction Test will exercise many aspects of the VTEC functionality within GHG/GFE before the Initial Operational Test and Evaluation (IOT&E), planned for mid-to-late March at the Forecast System Laboratory (FSL) facilities in Boulder, CO. FSL is the primary developer of GFE. WFO forecasters and Regional and National Headquarters personnel will spend a week running prepared weather scenarios to test VTEC in GHG/GFE for the W/W/A products the system will issue.

NWS will address problems arising during the IOT&E before a larger Operational Test and Evaluation (OT&E) for GHG/GFE, planned for 30 to 35 offices (WFOs and Regional Offices) in May and June.

NWS will issue a separate test schedule in the next few months for the Riverpro software. Many Hydrologic W/W/A products are issued using Riverpro.

The VTEC Policy Directive (NWSI 10-1703) is being updated to reflect the capabilities of GHG/GFE, to add some additional codes and to make clarifications to VTEC policy and procedures.

More information on the VTEC testing, along with the latest draft of NWSI 10-1703, may be found on the VTEC website at <http://weather.gov/os/vtec/>. *

Prototype Test of More Efficient EMWIN Looks Positive

By Rob Wagner, EMWIN Team Member
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The Emergency Managers Weather Information Network (EMWIN) team, working with the NOAA Satellite and Information Service (NESDIS), is reworking EMWIN for the GOES-N era. The GOES-N satellite will result in lower power broadcasts and a frequency change for EMWIN.

Users and vendors have stressed the importance of increasing the EMWIN data rate and keeping the cost of the GOES-N transition as low as possible. To meet the needs of EMWIN users, the team is developing a prototype system that would operate at 19.2 kbps, using offset QPSK modulation, and convolutional Reed Solomon error correction coding. Preliminary results from a test of the prototype the week of February 21 look good. NWS will post a summary of the test results on the EMWIN website listed below. To follow up, more testing will be conducted later this year, most likely using the GOES-N satellite.

In a related effort, development is underway to encapsulate the EMWIN broadcast in the Low Rate Information Transmission (LRIT). This NESDIS system is the replacement for the current WEFAX transmission. To keep abreast of EMWIN developments, go to <http://iwin.nws.noaa.gov/emwin/index.htm>. *

Hurricanes

NOAA Prepares for 6th National Hurricane Preparedness Week

By Scott Kiser, Tropical Cyclone Program Manager
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One of NWS's major efforts in educating the public is taking part in the annual National Hurricane Preparedness Week. This year's awareness campaign runs from May 15-21. A press conference is tentatively scheduled for May 16 at the Tropical Prediction Center/National Hurricane Center. NOAA's seasonal hurricane outlook will be released at the press conference.

This year, NOAA hopes many states will again conduct awareness weeks during the national event. Look for an updated hurricane preparedness poster this spring. Staff are working to obtain Presidential recognition for this awareness event for the 5th straight year.



For National Hurricane Week materials and tips, go to <http://www.nhc.noaa.gov/HAW2/english/intro.shtml>

Last year's busy tropical cyclone season resulted in 60 fatalities. Four storms crossed the Florida coastline, but damage and fatalities occurred across many other states. Flash floods from Tropical Storm Gaston in the Richmond, VA, area resulted in eight fatalities. Five of those deaths were a result of motorists driving through flooded roadways.

Eight of the 26 U.S. fatalities from Hurricane Ivan were a result of the 111 tornadoes spawned across seven inland states—as far north as Pennsylvania. The United States once again can see the far-reaching effects from tropical cyclones, and NWS will continue to educate the public about the full suite of tropical cyclone hazards and impacts.

Next year, the National Hurricane Preparedness Week will be permanently moved from the third week in May to the fourth week. So in 2006, National Hurricane Awareness week will be observed May 21-27. *

TPC/NHC Offers Introduction To Hurricane Preparedness

By Stacy Stewart, Hurricane Specialist & WCM
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In January and February of this year, the TPC/NHC offered three, 1-week, "Introduction to Hurricane Preparedness" courses, sponsored by FEMA. Course topics and materials offered by TPC/NHC included:

- Tropical cyclone basics
- TPC/NHC forecast operations
- Forecasting exercises
- Field trip survey of the 1992 Hurricane Andrew storm surge at the Deering Estate in southeastern Miami-Dade County.

The TPC/NHC instructors taught the meteorology and storm surge sessions and answered attendees' questions regarding NHC operations.

The "Introduction to Hurricane Preparedness" course is updated yearly and remains one of the highest rated FEMA-sponsored training courses. The National Hurricane Conference offers a shorter version of the course, this year from March 21-25 in New Orleans, LA. For more information, email: stacy.r.stewart@noaa.gov. ✱

HURREVAC: Inland Flood Planning and Response Tool Released

*By Doug Marcy, Mark Kolowitz, Russell Jackson
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*By Glenn Austin, Thomas Graziano, Hydrologic Services Div.
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A major challenge facing both the Federal Emergency Management Agency (FEMA) and NOAA's NWS is providing timely, accurate inland flood information to the emergency management community. To address this challenge in hurricane prone states, FEMA, NWS, NOAA's Coastal Services Center and their partners developed the Inland Flood Planning and Response Tool. The tool is part of the HURREVAC software, the HURRICANE EVACUATION planning decision-support computer program.

HURREVAC is an easy-to-use decision support tool that functions as a stand-alone desktop application. One mouse click downloads data quickly and assembles weather information from multiple NOAA sources. This ease of use make HURREVAC fast, reliable and efficient to use.

The addition of the Inland Flood Planning and Response Tool to HURREVAC provides a one-stop way to access real-time inland flood data, better meeting the operational needs of state and local emergency managers. The new tool allows users to view 24-hour Quantitative Precipitation Forecast (QPF) out to 3 days, affected area lists for rain, river flood outlook products and river gage observations and forecasts.

The new river-gage data display allows users to view color coded conditions on their computers. Users can see detailed hydrograph data for specific forecast points. This option presents observed and forecast data as well as information on historical crests and flood impacts.

The hydrograph display also identifies stage values for NWS flood warning categories for flood stage, minor, moderate and major flooding, as well as the FEMA 1-percent annual chance flood. By combining the agencies' flood risk conveyance methods into one product, emergency/floodplain managers will have a better understanding of the local threats in their area.

The 2004 release (Version 3.0.13) includes flood forecast points from NWS that range from Texas to Maine and include Puerto Rico and the U.S. Virgin Islands.

FEMA Region IV has asked NOAA Coastal Services Center to provide inundation maps of the 1-percent chance flood at NWS forecast locations in the Southeastern United States. These maps will be included as static images in future releases of HURREVAC as a reference for emergency managers. For more information on HURREVAC, go to <http://hurrevac.com>. ✱

Hydrology

First National Flood Safety Awareness Week, March 21-25

*By Larry Wenzel, Hydrologist
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In conjunction with the spring Flood Outlook news conference, NOAA's NWS will host the first annual National Flood Safety Awareness Week, March 21-25.

The two goals of this event are to heighten the public's awareness to the dangers and causes of flooding and to help protect life and property. The event will be officially kicked off on Thursday, March 17, at the Department of Commerce in Washington, D.C. Hosting the event will be Admiral Conrad Lautenbacher, NOAA Administrator, and General David L. Johnson, Director of NOAA's NWS.

Each day of the following week will highlight a different element of NWS hydrologic services program.

- Monday: Advanced Hydrologic Prediction Service
- Tuesday: Turn Around Don't Drown
- Wednesday: Tropical Cyclone Inland Flooding
- Thursday: Flood Hazard Mitigation
- Friday: Flood Safety

Joining NOAA are the following partners:

- National Safety Council
- Federal Alliance for Safe Homes
- Federal Highway Administration
- Federal Emergency Management Agency
- National Hydrologic Warning Council



Details for each event, including a Fact Sheet, safety rules and resources such as brochures, videos, public service announcements and more can be found at <http://www.floodsafety.noaa.gov>. ✱

NWS Sponsors National Rip Current Awareness Week to Curb Fatalities

By Deborah Jones, Marine and Coastal Services Branch
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In an effort to heighten public awareness of rip currents at surf beaches, NOAA's Break The Grip of the Rip™ 2005 campaign has designated June 5-11 as National Rip Current Awareness Week. The focus of this year's campaign will be unguarded beaches. Watch for our Mark Trail comic strip on Sunday, June 5, offering safety tips!

Rip currents are powerful currents of water moving away from shore. On average, more people die every year from rip currents than from shark attacks, tornadoes, lightning, or hurricanes. According to the United States Lifesaving Association, 80 percent of surf beach rescues are attributed to rip currents, and more than 100 people die annually from drowning when they are unable to escape a rip current.

Rip current speeds are typically 1 to 2 feet per second, though speeds as high as 8 feet per second have been measured. This is faster than an Olympic swimmer can sprint! Even the strongest swimmers have been pulled offshore by rip currents.

Although rip currents can occur at any time in any location along our nation's beaches, they can become extremely dangerous under the right conditions. As a result, one of the most important rip current forecasting goals is to identify those days when rip currents are expected to become strong and pose a threat to anyone who enters the water.

Many NWS Forecast Offices along the Atlantic, Gulf and Pacific Coasts issue a daily Surf Zone Forecast product through the summer season. The Surf Zone Forecast provides information on the anticipated rip current hazard for the day in that area. A three-tiered structure of low, moderate, high is used to describe the rip current risk. This outlook is communicated to lifeguards, emergency management, media and the general public.

NOAA has developed a new rip current brochure in English and Spanish, outdoor information signs for posting by municipalities along boardwalks and beachfronts and a website full of rip current information, links, photos and templates for brochures and signs. Help us spread this lifesaving information to others. You can access the website at <http://www.ripcurrents.noaa.gov>. ❄



Guam's beautiful Pacific shoreline at night.

Multi-Agency Campaign Aims To Reduce Rip Current Deaths

By Chip Guard, WCM, WFO Guam
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In 2004, 22 people drowned in the Guam surf zone—a near record number representing a 350 percent increase over 2003. Despite WFO Guam's barrage of media and outreach initiatives to curb drownings, it was clear the problem required a broader effort. Following the first 2005 drowning on January 1, WFO Guam teamed with the Visitor's Bureau to attack the problem.

The Visitor's Bureau chaired a group that included police and fire departments; the Parks and Recreation Department and its lifeguards; the Bureau of Planning Coastal Management Division; the U.S. Coast Guard; Guam Homeland Security/Civil Defense; Restaurant and Hotel Association; Japanese, Korean and Chinese tourism reps; surfer and diver reps; and the University of Guam Sea Grant Program. In less than 2 months, the Committee met four times and developed a program that included:

- More lifeguards and upgraded equipment such as a vehicle, jet skis and radios
- Color-coded flag and sign system in six Asian and Island languages to visibly identify coastal hazards
- NWRs for life guards and Police Patrol
- Surf spotter training for the lifeguards
- Daily weather, surf and rip current discussion between lifeguards and WFO Guam forecasters
- WFO Guam Website training for Police Patrol
- Fine-tuned NWS Surf Zone Forecasts and High Surf Advisories.

A March press conference will introduce the campaign's safety features and programs to save lives. Future initiatives will include:

- Adding more parks and beaches to the program
- Developing a "Break the Grip of the Rip" brochure that addresses Guam's unique issues
- Conducting research between WFO Guam and the University of Guam through a NOAA Sea Grant
- Enlisting Guam legislature involvement and corporate assistance and sponsorship.

Guam newspapers have agreed to publish the coastal hazards criteria for the flag alert system regularly, and area hotels will publicize it on their in-house TV channels. High school groups, working with the University of Guam, also will help educate students and the public. ✱

Lesson in Teamwork: Responding to M/V Selendang Ayu Oil Spill

*By Jim Jones, Chief, Alaska Data Acquisition Branch
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On December 8, 2004, the M/V Selendang Ayu, a 738-foot Malaysian-flagged freighter, ran aground in the isolated Aleutian Islands during a winter storm. What followed was a well-coordinated team effort between federal, state and local officials to support the initial rescue efforts and longer-term Hazmat cleanup and salvage operation.

A unique aspect to this response was the involvement of the area Port Meteorological Officers (PMO), in addition to the NWS Incident Meteorologists (IMETS) and NOAA Hazmat personnel. Voluntary Observing Ships (VOS) were critical in helping forecasters, search and rescue, and Hazmat responders evaluate atmospheric and oceanic conditions in this data sparse section of Alaska.

From the time the incident first came to light and especially during the initial couple weeks of operational support, PMOs Rich Courtney (Kodiak) and Larry Hubble (Anchorage) coordinated VOS data collection efforts. They identified which vessels would be in the area and the most feasible means of communication with those vessels. Due to the remoteness of the incident site, High Frequency/Single Side Band, satellite phone, cell phone and VHF all presented limitations with respect to reliable communications.

Another way PMOs helped on-scene IMETS and operational forecasters was by sharing metadata and data quality characteristics about the various VOS and Marine Report vessels in the area. The knowledge concerning the ships providing observations in and around the area helped bolster the forecasters' confidence levels in the quality of the data being used to make critical decisions.

Eddie Zingone, Marine Focal Point, WFO Anchorage, says, "From the perspective of a forecaster writing a



Selendang Ayu sinking with its load of crude oil.

Hazmat forecast, or any marine or near-shore forecast for that matter, the ship reports received from vessels participating in the VOS program are *gold!* There is no better way to both write a quick and accurate forecast and to verify the existing forecast than with these observations."

We usually view the VOS program in a "big picture" context - as input to the synoptic scale surface analysis process and a source of valuable climate data over the data sparse oceans. Likewise, PMOs are usually seen as non-operational staff who support these functions. This article was written to highlight the value of close proximity (~150 nautical miles) VOS observations in support of dynamic and evolving near-shore operational forecasts and to show how PMOs can be an integral part of an operational scenario by providing liaison with various marine interests and coordinating marine data collection and data quality control. ✱

NWS Works with Coast Guard For Marine Observations and Training

*By Richard May, Meteorologist, Marine and Coastal Branch
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The NOAA's NWS has completed a new Memorandum of Understanding (MOU) with the U.S. Coast Guard Auxiliary. The MOU was signed by the Director of NWS Office of Climate, Water, and Weather Services and the Commodore of the Auxiliary in September 2004. Under this MOU, similar to one signed with the U.S. Power Squadron in May 2003, the Auxiliary will take voluntary marine weather observations that will be sent to forecasters to help provide critical information in data sparse coastal marine areas. In return, NWS will conduct training and outreach to the local flotillas. ✱

NOAA Weather Radio

Proposed Budget Would Fund 17 New Weather Radio Transmitters

*By Ron Gird, National Outreach Program Manager
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The President's Budget is requesting \$5.6 million for the NOAA Weather Radio All Hazards Program to install 17 new transmitter stations in high-risk areas and refurbish 64 of the 400 transmitter stations installed in the early 1970s. Stay tuned for details. *

Nation's Second Spanish Language NWR Installed Near Palm Springs, CA

*By Ed Clark, WCM, WFO San Diego, CA
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Last fall, WFO San Diego held a dedication ceremony to celebrate the installation of the nation's second NOAA Weather Radio (NWR) transmitter dedicated entirely to Spanish language transmission. The radio was purchased and is maintained by the Coachella Valley Water District (CVWD) near Palm Springs, CA. The broadcast is generated and converted to Spanish by the WFO San Diego.

This is the second radio transmitter in the CVWD, which also hosts an English version. In addition, CVWD has allocated \$5,000 to purchase radios for schools and the area's Hispanic community. Members of the Hispanic community have responded very positively to these efforts. *

Outreach/Education

Next Partners Meeting Set for June 23

*By Ron Gird, National Outreach Program Manager
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The second NWS Partners Meeting of 2005 is set for June 23 at NWS Headquarters in Silver Spring, MD. This date was based on feedback from partners. The Partners

asked for continued participation by NWS Director D.L. Johnson.

At the NWS Partners meeting last summer, the NWS Director led a 1-hour question and answer session that most of the NWS Partners found useful. Also on the agenda for the next meeting will be an Introduction to NOAA's Surface Weather Program, scheduled to start in FY07 with significant funding from Congress. For further information, contact Ron Gird at 301-713-0090x154 or Ron.Gird@noaa.gov. *

Is it Chilly or Chili? Groundhog Day Celebration

*By Vernon Preston, WCM, WFO Pocatello, ID
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Have you ever dreamed of combining the cold of winter with the heat of the southwest? WFO Pocatello, ID, used the unusual duo to draw media, Homeland Security Staff, Natural Resources Conservation Service and EM managers to its second annual Groundhog Day Chili Cook-Off Contest and Hydrologic Outlook Briefing on February 2.



Emergency Coordinators sample the chili.

The event featured a spring hydrologic briefing, live NWR weekly alert demonstration and weather briefing.

Following the briefings, the emergency coordinators received personal training and a review of the NWS forecaster process using AWIPS and the new digitized forecasts. Local TV stations used footage from the event to highlight Groundhog Day and our hydrologic concerns. And of course, there was the chili contest. Prizes were awarded for Most Colorful, Taste/Flavor, Texture, Aroma/Smell and Hot and Spicy. Chili names were as hot as the contents:

- Western Storm-Front
- Blizzard Express
- Tsunami Surprise
- I Can't Believe It's Not Chili
- Tantalizing Tuber Tornado
- Con las Frijol Negras
- Wickedly Windy
- WMD

The event was so well received that next year's plans are already in the making (or is that cooking?). By the way, Phil did see his shadow, so eastern Idaho is planning for additional winter episodes. Many of our farmers are very happy about this since eastern Idaho is now in its 6th year of a severe drought. ✽

Spotter Training for Prisons Helps Reach Isolated Areas

*By John Robinson, WCM, WFO Little Rock, AR
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When the subject of spotter training for prisons is first raised, everyone's first question is: "How are the inmates supposed to call in the reports?"

In reality, the training is not for the inmates, but for prison administrators, guards and "riders" (guards on horseback who watch over prisoners working in prisons' farm fields).

John Robinson, WCM at WFO Little Rock, provides regular spotter classes for the Arkansas Department of Correction. The prison system had a renewed interest in such classes after a tornado in January 1999 barely missed a maximum security prison in southeast Arkansas. Although the prison itself was undamaged, a number of houses on the prison grounds, belonging to corrections officials, were destroyed.

Within the first 2 years, the Department of Correction already had two success stories to report. At one prison, a guard who had taken the class saw a storm approaching that appeared to be severe. This particular facility, rather than having individual cells, has large rooms in which many inmates are housed. Based on the guard's report, inmates were moved back away from windows and there were no injuries as the storm moved through. In another instance, a tower guard spotted a funnel cloud developing.

As part of John's orientation to the Department of Correction, he was given tours of a number of the system's facilities. At a super-maximum security prison, there was one empty cell on the day John toured, so he was invited to try out the cell. Prison officials did let him back out after a couple of minutes!

In addition to storm reports received from the corrections facilities, NOAA benefits in another way. When

severe weather damaged two prisons in northern Arkansas, John easily gained access to the prison grounds to survey the damage and take photographs. ✽

Space Environment Center Moves

*By Ron Gird, National Outreach Program Manager
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Recently the NOAA Space Environment Center (SEC) moved from NOAA Research to NOAA's NWS. SEC publishes a quarterly newsletter and plans an outreach event, Space Weather Week, April 5-8, 2005, in Boulder, CO. For information about the newsletter or Space Weather Week, go to <http://sec.noaa.gov/>.

Weather for Lewis and Clark Expedition Draws Teachers to Safety

*By Vernon Preston, WCM, WFO Pocatello, ID
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Spokane, WA, WCM Ken Holmes and I snared the interest of more than 800 science teachers from Idaho and eastern parts of Washington by tagging weather to history. Special science education materials on the weather of the Lewis and Clark Expedition highlighted the NWS display booth I designed and researched. We received praises from teachers of the value our information provides and how they use our various Web pages in their classroom activities. It's tough getting attention to weather safety at times. This hook made the job easy. ✽



Spokane WCM Ken Holmes shows off the Lewis and Clark Weather Safety display that drew more than 800 teachers.

Emergency Managers Get Survey Training for Storm Damage

By Daniel Noah, WCM, WFO Tampa Bay Area, FL
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On February 2, WCMs in Florida provided a storm damage survey workshop to 45 emergency management officials at the Florida Emergency Preparedness Association's 2005 Annual Conference.

Storm damage surveys completed by NWS determine the type of hazardous weather event that occurred and the effectiveness of the NWS watch/warning system. Due to limited staff, however, NWS surveys are usually restricted to large events or those with extensive media coverage. In many cases, the NWS relies on emergency management to provide feedback on significant storm damage from a county. The workshop's purpose was to give emergency management personnel the information they need to conduct accurate storm damage surveys. This presentation was divided into three parts:

- Multimedia presentation to introduce attendees to the NWS method of conducting storm surveys.
- Hands-on exercise in which students mapped out damage to determine if it was caused by a tornado or a downburst and the estimated the wind speed.
- Game show exercise to show the variability of estimating wind speed based on damage.

Each student received a 100-page guide titled, "A Guide to F-Scale Damage Assessment" that was reprinted by General Physics Corporation out of Tampa, FL. Students also received a printed copy of the multimedia presentation and a copy of 27 different damage indicators to estimate wind speed.

For more information, contact:

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Keeping Potatoes and Tractors Safe

By Vernon Preston, WCM, WFO Pocatello, ID
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WFO Pocatello staff got its message out to farmers and ranchers via a one-page flyer on "Your Hometown National Weather Service." This flyer was sent to over 10,000 farms in Idaho, Oregon and Washington.

In addition to reaching this hard to attract audience, from January 18-20, WFO Pocatello, ID, took part in the



Forecaster Jack Messick talks to visitors at the Ag Expo and Idaho Potato Conference in Idaho.

2005 Eastern Idaho Agriculture Expo and Idaho Potato Conference with an information booth inside the Idaho State University's football stadium. Amongst large combines and tractors, forecasters Greg Kaiser and Jack Messick, Observing Program Leader Gary Wicklund and I provided information to around 6000-8000 farmers, ranchers and ag industry businesses.

The display centered on the uses of the new gridded forecast concept with emphasis on changes in our drought and how to obtain climate information. We received numerous complements from attendees about our web page and comments about how they really appreciated the real-time nature of our data and forecasts. ✪

Publications

NWS Expands Publications Web Page

By Donna Ayres, Aware Editor
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Aware staff members have expanded and updated the Office of Climate, Water, and Weather Services publications website.

We've deleted some of the older publications, such as the individual booklets on thunderstorms and lightning (PA 92053), flash floods and floods (PA 92050) and tornadoes add (PA 92052). Those booklets were combined into NOAA PA 99050, "Thunderstorms, Tornadoes, Lightning . . . Nature's Most Violent Storms," which is expected to be in stock again by late April. We've also removed the out-of-date "Survival in a Hurricane" wallet card and "Hurricane . . . A Familiarization Booklet."

In response to requests for more children's publications, we have added a link to the "Billy and Maria" series of coloring books that discuss weather.

Also new are links to the home pages of partners who offer publications about disaster preparedness and education, such as American Red Cross, FEMA, U.S. Geologic Survey and the National Disaster Education



Coalition. You can also find new links to NOAA's other line offices and their educational resources.

Our goal is to provide you access to the most current information in as accessible a format as

possible. Just about all of our publications are available by download from our publications page. Unfortunately, current funding restraints prevent us from reprinting our publications as frequently as we'd like. Access to publications via the Internet, CDs and DVDs is fast becoming the norm in these days of limited resources.

Read future issues of *Aware* and *AwareNow* for updates on availability of publications and the introduction of new products. You can also check our website at <http://www.nws.noaa.gov/om/brochures.shtml>.*

Owlie Skywarn: Endangered Species?

By Donna Ayres, *Aware* Editor
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One of our most popular publications, "Owlie Skywarn: Watch Out... Storms Ahead!," is still out of stock and will remain so indefinitely due to lack of funds.

In the meantime, please feel free to download Owlie from our website and reprint as many copies as you need. You can download either the entire booklet or the individual sections, each a stand-alone booklet:

- Hurricanes
- Lightning
- Tornadoes
- Floods and Flash Floods
- Winter Storms



Check future issues of electronic *Aware* and *AwareNow* to find out when Owlie is reprinted. We'll also be updating our publications page about Owlie's availability. To download Owlie or check status, go to <http://www.nws.noaa.gov/om/brochures.shtml>.

Severe Weather

NOAA's NWS Expands Severe Weather Program in 2005

By Richard Okulski, *Office of Services*
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NOAA's NWS is making several major changes to its Severe Weather Program for the 2005 season. On February 8, NWS added an event specific dissemination code known as Valid Time Event Code (VTEC) to the Tornado Warning, Severe Thunderstorm Warning, Severe Weather Statement, Special Marine Warning, Marine Weather Statement (which follows-up a Special Marine Warning) and Watch Outline Update Message products.

VTEC is an event specific dissemination code that provides automated and timely dissemination of weather information to the public through several different methods, such as paging systems and emergency television message crawl systems.

The NWS Performance Branch started using VTEC to verify Tornado, Severe Thunderstorm and Special Marine Warnings on March 1. Thanks to VTEC, an NWS office can now track multiple events in a county or marine zone in a given time period.

NWS is also moving to a modernized convective watch product suite known as "Watch By County." As part of this program, the NWS Storm Prediction Center now issues a national convective watch product known as the Watch Outline Update Message (WOU). The WOU replaces a product called the State Areal Outline Statement (SLS) as the primary product for county, marine zone and independent city information in Severe Thunderstorm and Tornado Watches.

To compliment the WOU, local WFOs will soon start issuing the Watch County Notification Message (WCN) on a test basis. The WCN is tailored to local customers and will replace the Special Weather Statement (SPS) for convective watch clearance or cancellation information in the late summer or fall of 2005.

NWS will also test software that allows WFOs to issue warnings for parts of a county. This software, using polygons, will be tested at 22 WFOs from March 1 to September 30. NWS has been issuing short-duration event warnings for entire counties for decades. Warning for a whole county does not always provide the best service, particularly in Western counties the size of small states.

This methodology also does not show the skill NWS forecasters possess in warning for specific areas under the threat of tornadoes, damaging winds and large hail. The goal of the 22-WFO test and evaluation is to

demonstrate that partial county warnings will improve service by reducing areas needlessly warned. Included in the test will be warnings for severe thunderstorms and tornadoes, special marine events and short-duration floods.

Change can be a cause for concern, especially when NWS has followed certain standard operating procedures for decades. The goal of these changes is to best leverage the skills of NWS local forecasters and severe weather specialists and to improve the service to the public. ❄

2005 Lightning Safety Awareness Week To Focus on Water Safety

By Donna Ayres, WCM Program Staff
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The fourth annual National Lightning Safety Awareness Week will be held June 19-25. The theme for 2005's campaign will be lightning safety for water-related activities and outdoor recreation. The message we'll be trying to spread is that no place outdoors is safe during a thunderstorm.

Events during the week will feature safety tips, the science of lightning and medical aspects of lightning. A new poster, created by talented NWS field personnel and focused on the average citizen, is being prepared for release.

Partners in this awareness campaign include NOAA, FEMA, the 45th Weather Squadron, the American Red Cross, the Institute for Business & Home Safety, the Lightning Injury Research Program, Vaisala Inc., Lightning Strike & Electric Shock Survivors International Inc., the National Lightning Safety Institute and Flash: Federal Alliance for Safe Homes

For more information on this year's campaign, visit <http://www.lightningsafety.noaa.gov/week.htm>. ❄

Texas Tornado Hole Teaches Little Golfers Safety Essentials

By Steve Drillette, WCM, WFO Amarillo, TX
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It's called "Fore Amarillo." The Don Harrington Discovery Center has called on the community and put together a temporary miniature golf course for kids. Each hole is designed to be educational as well as fun. Amarillo ESA Ken Hunter and Electronics Tech David Wilburn spent many hours constructing the tornado hole Number 16 (see photo).



From left: Amarillo ET David Wilburn, Discovery Center Executive Director Ganesh Ganpat and Amarillo ESA Ken Hunter present the "tornado hole." The hole was built and sponsored by WFO Amarillo as part of an attraction at the Don Harrington Discovery Center in Amarillo, TX. Photo provided by the Discovery Center staff.

A small motor spins the tornado. The golf ball enters the tornado and is spiraled to the top of the tornado and then is dropped through the rear-flank downdraft chamber. "It's the most popular hole," said Ganesh Ganpat, Discovery Center Executive Director. The special golf course exhibit runs from January through May 2005.

40th Anniversary of Palm Sunday Tornado Outbreak Highlight Gains

By Wayne Presnell, NWS Performance Branch
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April 11, 2005, marks the 40th anniversary of one of the most devastating tornado outbreaks in U.S. history. On that day, 47 tornadoes causing 271 fatalities and 1,500 injuries in six Midwestern states. Indiana suffered the most, with 137 fatalities and 1,200 injuries.

Another tragic tornado outbreak occurred on Palm Sunday, March 27, 1994, mainly affecting Alabama and Georgia. In that outbreak, 8 tornadoes caused 40 fatalities and 283 injuries.

One goal of NOAA's NWS is to constantly improve its severe weather warnings, dissemination of these warnings, and public education efforts. NWS's improved warning capability was seen in the Record Tornado Outbreaks of May 4-10, 2003, when 393 tornadoes struck 19 states in the central U.S. but resulted in only 39 fatalities. This number is particularly impressive because F4 tornadoes (207-260 mph) moved through metro areas of Kansas City and Oklahoma City.

Kansas City attributed only one fatality to the event and Oklahoma City counted none. By comparison, during the April 11, 1965, outbreak, each tornado claimed an average of 5 lives. The average for the May 2003 event was one fatality over an average of 10 tornadoes. Improvements in tornado detection, dissemination of warnings and public response to warnings all contributed to the decrease in tornado fatalities.

Common to all three events was the large number of fatalities in rural areas, which receive less TV and radio coverage. In response, the NWS assessment of the 1994 event spurred an accelerated plan to increase NWR coverage nationwide, helping rural areas in particular.

NWS continues to add new NWR transmitters nationwide, adding coverage to more rural areas. With new digital technology and Specific Area Message Encoding, lifesaving NWR broadcasts can now be targeted to a specific area, such as a county or portion of a state, to bring more specific information to the listening area.

This technology provides automated broadcast capability for more timely service and allows broadcast, cable, satellites and other media to automatically receive communications through the Emergency Alert System. NWS's goal is to expand the reach of NWR to 95 percent of the U.S. population and reduce even further fatalities, injuries and damage from severe storms. *

Storm/TsunamiReady

TsunamiReady: Preparing Our Coastal Communities

*By Stephan C. Kuhl, National WCM Program Leader
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Following the tragic Indian Ocean tsunami of last December, the need for U.S. coastal communities to be better prepared for risk of tsunamis has taken on greater meaning. NOAA's NWS TsunamiReady program is ready to help with this effort.

TsunamiReady, a companion program to StormReady, was set up in 2001 to promote tsunami hazard preparedness. The program fosters collaboration between federal, state and local emergency management agencies, the public and the NOAA tsunami warning system. This collaboration supports improved tsunami awareness and mitigation efforts among communities at risk. As of March 2005, there were 15 TsunamiReady communities in five states: Alaska, Hawaii, Washington, Oregon and California.



The goal of TsunamiReady is to ensure communities know what to do if a tsunami hits the coastlines of the United States or protectorates in the Pacific Ocean. TsunamiReady helps ensure communities follow standards for tsunami readiness, and encourages consistency in educational materials and response among communities. The program also recognizes communities that have adopted TsunamiReady guidelines and increases public awareness and understanding of the tsunami hazard.

To be recognized as TsunamiReady, a community or county must:

- Establish a 24 hour Warning Point and Emergency Operations Center
- Have the ability to disseminate Tsunami Warnings
- Possess a formal Tsunami Hazard Plan
- Set up tsunami evacuation routes
- Designate tsunami shelter/areas in safe zones
- Run a proactive community tsunami awareness program
- Establish multiple ways to receive Tsunami Warnings, such as NOAA Weather Radio All Hazards, Emergency Alert System and the Web

As the public becomes more familiar with powerful natural events such as the tragic tsunami in Asia in December 2004, they will gain a better understanding that, while TsunamiReady does not mean tsunami proof, the preparedness and communication the program promotes can save lives. The ultimate goal of the TsunamiReady program is to ensure that when a tsunami warning is issued, the public gets the warning, knows what to do about it and takes appropriate action.

For more information about TsunamiReady, go to: <http://www.nws.noaa.gov/stormready> or visit NOAA's NWS Tsunami web page at: <http://tsunami.gov>. *

NOAA to Produce Tsunami Education Resource Kit

*By Ron Gird, National Outreach Program Manager
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Several NOAA offices are collaborating to produce the first NOAA Tsunami Education Resource Kit for the National Science Teachers Association annual conference in Dallas, TX, March 30 through April 3, 2005.

NOAA will produce 10,000 kits for the conference to be given away at the NOAA Exhibit. The kit will contain videos showing tsunami events, fact sheets, posters, presentations, a new Teacher-at-Sea book on tsunamis and NOAA articles on tsunamis.

The material is being organized by Joyce Stark, a practicing teacher from Washington State on a 1-year assignment at NOAA's Office of Education and Sustainable Development. For information about the kit, contact Ron.Gird@noaa.gov. ❄

Winter Weather

Storm Prediction Center Tests Timely Format For Winter Weather Forecasts

*By Peter Banacos, Assistant Mesoscale Forecaster
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To better support NWS and external customer needs, NOAA's Storm Prediction Center (SPC) is testing specific issuance times for its winter weather mesoscale discussion product. When winter weather hazards impact the continental United States, Mesoscale Discussions (MD) are issued or updated four times daily by the SPC, between 00-01, 06-07, 12-13 and 18-19 UTC.

The goal of the time-specific format is to allow the user community to better anticipate the guidance product for incorporation into local forecasts, public impact statements and diagnostic assessment of winter storms.

As a component of NCEP's seamless suite of products, the SPC winter weather program provides technical descriptions of mesoscale processes contributing to heavy snow, significant icing and blizzard conditions up to 6 hours in advance. These discussions serve to compliment short-to-medium range winter weather forecasts provided by the Hydrometeorological Prediction Center and long-range guidance from the Climate Prediction Center.

The MD provides forecast information on the *what*, *when*, *where* and *why* of the impending weather hazard. Information concerning location, timing, expected rates, trends and mesoscale meteorological aspects of a hazardous winter weather event are provided in the first paragraph. The second paragraph states the *why* or meteorological processes associated with the forecast (e.g., CSI, frontogenesis, isentropic lift). A graphic summarizing the forecast hazard and threat area is also provided with the MD and is viewable on AWIPS and via

SPC's website. Winter Weather MDs are written when at least one of the following criteria is expected to be met:

- Snowfall rates of at least 1 inch per hour lasting 2 hours or longer at elevations below 4000 feet Mean Sea Level (MSL)
- Snowfall rates of at least 2 inches per hour for 2 hours or longer, at elevations between 4000 and 8000 feet above MSL, higher mountainous terrain or in lake effect areas
- For freezing rain, when greater than five-hundredths of an inch is expected within 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

The test period for the time-specific winter weather MDs ended February 28, with forecasts issued as needed through the remainder of the winter '04-'05 season. SPC welcomes Input from users on the time-specific format; email spc.feedback@noaa.gov. Comments will guide improvements to SPC's winter weather products. For more information, go to the SPC website at: <http://www.spc.noaa.gov>. ❄

Climate: True Snowfall Totals and January 2005 New England Blizzard

*By Judy Koepsell, Ron Berger, Bob Leffler
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It is hard enough to ensure accurate observations of snow measurements, but when strong, persistent winds are added to the mix, it becomes even more challenging. Such was the case during the recent January 22-23, 2005, blizzard in New England.

After the storm, the WFO Boston took steps to confirm unofficial reports received during the blizzard. After on-site inspections of the observation sites with the highest snowfall totals, an internal report was issued on February 4, 2005, by Alan E. Dunham, Observation Program Leader at WFO Boston.

Alan concluded ". . . this was a difficult storm in which to measure snow given not only the strength but also the duration of the winds. A single snowboard measurement

was impossible to take given the conditions. Observers had to take many observations from various locations, from bare ground to drifts all in order to get the best measurement possible. . .”

Alan further wrote, “A review of all the observations showed in virtually all cases of higher than expected snowfall reports, the higher reports came from the category of ‘general public.’ This is not to say that all reports from the general public were suspect. A great many were well within the range of reports received from our published COOP sites and trained spotters.”

Alan concluded that the seven highest values, ranging from 35 to 38 inches, had to be disregarded. His post-storm analysis indicated the highest snowfalls likely did not exceed 32 inches.

Two conclusions can be drawn from Alan’s analysis. First, taking accurate snowfall measurements, difficult under the best circumstances, requires training in addition to the appropriate siting and tools.

Second, NWS needs to determine the most effective way to disseminate observation information to the public and media. NWS is looking at this issue. For more information about snow measurement guidelines, go to: <http://www.nws.noaa.gov/om/coop/snowguid.htm>. *

Writer’s Corner

Comma Conundrum

By Donna Ayres, *Aware* Editor
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Leave it in, take it out? One of the most irksome punctuation decisions writers and editors face is when to use a comma. If you refer to the GPO Style Manual,

<http://www.gpoaccess.gov/stylemanual/2000/chap08.pdf>, you’ll find more than 20 rules on the use of this tiny, troublesome mark.

Here are some of the ways commas are properly used:

- To separate two main clauses: each clause expresses a complete thought
- In a compound sentence: combining two simple sentences
- When they are joined by a coordinating conjunction: and, but, or, nor

Here’s an example of two simple sentences expressing complete thoughts: “Funds are available to revise the programming study.” “The cost, schedule, and space allocation must be reviewed.

Here’s an example of a compound sentence combining two thoughts joined by a coordinating conjunction: “Funds are available to revise the programming study, but the cost, schedule and space allocation must be reviewed.”

The example above is for one type of separating comma. In a future issue of *Aware*, we’ll look at more commas of separation: serial commas and those that separate multiple adjectives.

In the meantime, when in doubt, look it up! *

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Climate, Water and Weather Links

Aviation Weather:	aviationweather.noaa.gov/
Education/Outreach:	weather.gov/os/edures.htm
Flooding/Water:	weather.gov/os/water/index.shtml
Lightning Safety:	lightningsafety.noaa.gov/
Marine Weather:	weather.gov/os/marine/home.htm
MIC/WCM/SOO/DOH List:	weather.gov/os/wcm-soo.pdf
Natural Hazards Statistics:	weather.gov/os/hazstats.shtml
National Digital Forecast Database	weather.gov/ndfd/
NOAA Weather Radio Information:	weather.gov/nwr/
Past Weather/Climate:	lwf.ncdc.noaa.gov/oa/ncdc.html
Publications List:	weather.gov/os/pubslis.htm
StormReady Home Page:	stormready.noaa.gov/
Severe Weather Safety:	weather.gov/os/severeweather/index.shtml
Tsunami Information: NOAA/NWS	www.tsunami.gov