AWARE

SPRING 1992

NATIONAL WEATHER SERVICE / *Warning Coordination and Hazard Awareness Report*

Continuum of Information

As the Modernization of the National Weather Service (NWS) gathers steam, one is tempted to focus on the technologies that are increasing our capabilities to detect and warn for hazardous weather events. Though the new technologies are critical for us to fulfill our mission, they alone are not sufficient to ensure an effective warning program.

In concert with these new technologies is the requirement to communicate information that is readily understandable to the user so that knowledgeable decisions can be made. This means that a suite of products must be available that have discrete roles, support one another, and provide a heightened level of information as the threat of the hazard becomes more certain. This suite of products has been termed the "Continuum of Information."

This summer will see a series of Weather Service Operations Manual (WSOM) chapters issued that contain significant changes to point us down this path. The "Winter Weather Warning" chapter has been totally rewritten to introduce a new product for issuing winter storm watches, warnings, and advisories. A new chapter, "Non-Precipitation Weather Hazards," has been created to pull together the high wind, excessive heat, and obstruction to vision programs which before had resided in rather inappropriate chapters in the Operations Manual. This chapter also contains a new product for issuing applicable watches, warnings, and advisories for these hazards.

For the first time, all public weather watches, warnings, and advisories will be issued under a defined product as opposed to a generic "Special Weather Statement." This means that special and severe weather statements will be used to amplify watches, warnings, or advisories but will not be the vehicle to issue them. For emergency managers with limited redistribution systems, this means that they will be able to program their systems to capture the watch, warning, and advisory products that they need.

The Operations Manual Letter (OML) for the Area Weather Update (AWU) and Short Term Weather Summaries and Forecasts (NOW) is undergoing union review and is expected to be issued later this summer. Additionally, in response to user requests, a new "State and Extended Forecast" chapter has been introduced to marry the state and extended forecasts into one product in the period by period format.

Many additional changes are occurring that I do not have space to highlight here. Hopefully, the following articles will help you understand the changes and the reasons for them. The goal is nothing less than to create products that make sense operationally for both the users and those in the NWS responsible for issuing them.

Donald R. Wernly

Donald R. Wernly
Chief, Warning and Forecast Branch

U.S. DEPARTMENT OF COMMERCE • National Oceanic and Atmospheric Administration

AWARE Report is an administrative document, issued by the National Oceanic and Atmospheric Administration, for the information and use of the agency and the natural hazard community.

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MODERNIZATION

Area Weather Update (AWU) - *Becker*

This is a summary of the latest news regarding the implementation of the AWU and "precursor AWU" (NOW). We have forged consensus guidelines for the AWU/NOW from numerous regional/field reviews, including trips to Norman to talk with the forecasters and exchange valuable information. The resulting OML for the AWU/NOW is now finalized, having been reviewed by NWS upper management. It is also in review by the NWS Employees Organization and will be implemented upon LMR completion.

The OML provides a measure of standardization of the headers, format, and content of the AWU and optional NOW products. At the same time, it allows considerable flexibility for field offices to provide the public with up to date, short-term information while accounting for workload, resources, etc.

The Weather Service Forecast Office (WSFO) at Norman, Oklahoma, has been issuing routine AWU-type products following the intent of the OML guidelines under the aegis of a formal risk reduction activity. Central Region offices, which have been issuing early versions of a Nowcast-type product, and Eastern Region offices will begin issuing NOWs (precursor AWUs) under the guidelines of the OML when official. The evaluation of the AWU risk reduction and lessons learned from offices issuing NOWs will help mold the AWU into what we hope will be one of the mainstay products of the NWS modernization.

New Winter Weather and Non-Precipitation Weather Hazards Chapters - *Wernly*

This summer, a significantly revised Winter Weather Warning chapter as well as a totally new Non-Precipitation Weather Hazards chapter will be issued. The implementation of these two chapters will herald a new era for the public weather programs. For the first time, all public weather watch, warning, and advisory products will be issued under a defined Automation of Field Operations and Services (AFOS) product category.

A recent poll of emergency management communications systems pointed out that many such systems are limited in the amount of weather information that they can redistribute. Such systems redistribute only watch and warning products. As a result, winter storm watches and warnings, issued under special and severe weather statements, were not reaching all of the emergency managers and other decision makers that needed them.

With the implementation of these two chapters, emergency managers and the remainder of our users will be able to program their systems to capture and redistribute the watch, warning, and advisory information that they need. Special and severe weather statements will be used to enhance or amplify watches, warnings, and advisories but not to issue them.

Further specifics on the new chapters are enumerated on the following page.

- **Winter Weather Warning Chapter, WSOM C-42**

This chapter has been totally rewritten and basically can be considered an entire new chapter. Substantial changes include:

- The introduction of the winter storm watch, warning, advisory product (AFOS category WSW) for issuing winter storm watches/warnings/advisories. The Mass News Disseminator, at forecaster discretion, can be either a generic "Winter Storm Watch," "Winter Storm Warning," etc., or event specific for warnings and advisories, such as "Heavy Snow Warning," "Ice Storm Warning," "Snow Advisory," etc.

- Special weather statements are used to amplify watches, warnings, and advisories as well as to cancel them. Severe weather statements should be used for blizzard situations.

- Event specific headlines are authorized for warnings and advisories when the forecaster has confidence that only one event might occur. When more than one event is possible, a generic "Winter Storm Warning" headline is used.

- **Non-Precipitation Weather Hazards Chapter, WSOM C-44**

This is an entirely new chapter that places in one location guidelines for high winds, excessive heat, and obstructions to vision. Formerly, NWS personnel were required to turn to the winter weather chapter to find guidance on high wind products as well as obstruction to vision products. Excessive heat information was included in the chapter on zone and local forecasts. The major highlights of the chapter include the following.

- Guidelines on how to issue high wind warnings not only for gradient winds but for mesoscale convectively-induced events, such as wake depressions and mesohighs.

- Guidelines on how to issue high wind watches and warnings for the inland effects of hurricanes.

- Guidelines for the issuance of products for excessive heat, such as excessive heat advisories and warnings, as well as civil emergency messages.

- Guidelines for the issuance of products, normally advisories, for obstructions to vision.

- The introduction of a new non-precipitation watch, warning, advisory product (AFOS category NPW) for the issuance of watches, warnings, and advisories for non-precipitation hazards.

- Use of event specific Mass News Disseminator headers for the products as well as event specific headlines.

- Guidelines for the use of special and severe weather statements for highlighting these products.

New Hurricane Warning Chapter to be Implemented this June - *Wernly*

Following the National Oceanic and Atmospheric Administration (NOAA)/NWS Hurricane Conference last fall and the Interdepartmental Hurricane Conference last January, a new chapter for Hurricane Warnings, WSOM Chapter C-41, is due out in June. Major highlights include the following.

- The issuance times for the Atlantic Hurricane Package have been moved up to coincide with the issuances of the Central Pacific Hurricane Center in Coordinated Universal time (UTC).

- The format of the hurricane strike probability tables have been revised to shorten their length without eliminating any information.

- The format of the marine advisory has been changed to streamline its size without reducing content.

- All depressions, tropical or subtropical, are now numbered in the same sequence. Separate subtropical AFOS products are eliminated.

Revised WSOM Chapter C-10, State Forecasts (SFP) - *Becker*

The new draft WSOM Chapter C-10 is currently undergoing an agency-wide review. The policy establishes that the SFP for a state (or part of a state) will include the Extended Forecast Product (EFP), thereby becoming a 1- to 5-day forecast in discrete periods. The separate EFP will be eliminated at the operational inception of the new SFP once C-10 is official.

This basic policy, which is expected to provide a more readily understandable and convenient package for users, has been agreed to by all NWS regions. What's left to approve are specific operational features of the format, etc., as detailed in the draft. The effective date of implementation is awaiting completion of the review process but should occur this summer. Speedy implementation is needed because C-10 directly affects several other revised chapters. These include C-41, Hurricane Warnings; C-42, Winter Storm Warnings; and C-44, Non-Precipitation Hazards. These chapters use the guidelines and show examples of the combined SFP as directed in C-10.

Rewrite of WSOM Chapter C-40, Severe Local Storm Warnings - *Alexander*

WSOM Chapter C-40 is undergoing a major rewrite. Concepts and technologies associated with the modernization and restructuring of the NWS make it necessary to update. For example, incorporating the AWU into the suite of NWS products mandates that we redefine the purpose of special and severe weather statements. The new version of C-40 is targeted for release in November of this year. Please read through chapter C-40 and forward your comments to the Warning and Forecast Branch (Attn: Bill Alexander).

Service Changes - *Berger*

We have been processing a significant number of service changes recently, such as transfers of counties to another office's warning and/or forecast area and changes to forecast zones. Many of these changes are related to modernization. We appreciate the assistance of the regional and field offices in their analyses needed to determine the proper service changes. However, with many more changes to come as the modernization continues, we will need even more assistance for timely processing of the changes and dissemination of clearly written letters of notification (with accompanying graphics) to users. The following procedure will be followed for Public Warning and Forecast changes.

1. If the change has been approved previously as part of the baseline under the Transition Change Management Program, then the procedure starts at step 2. If not, the Regional Headquarters sends a letter requesting approval to the Transition Program Office for modernization-related changes to the county warning and forecast areas. For other changes, send a letter to the Warning and Forecast Branch.

2. After approval of the change, the Regional Headquarters sends a draft letter of notification to users along with "camera ready" graphics to the Warning and Forecast Branch. When a county changes to a different forecast zone and/or another office's warning and/or forecast area, the letter must have details for users on reprogramming changes to different product identifiers and Universal Generic Codes.

3. The Warning and Forecast Branch will review the letter and coordinate with the Regional Headquarters on any needed modifications and/or corrections.

4. The Warning and Forecast Branch will disseminate the letter to the national users by mail, NOAA Weather Wire Service (NWWS), and Family of Services circuits at least 60 days before the effective date of change. Concurrently, field offices will notify local users.

This procedure will be a part of the Internal and External Communication and Coordination Plan and the WSOM Chapter C-47, County Warning Areas. Significant service changes have been approved for this summer in Iowa, New York, Oklahoma, and part of north Texas.

Graphics Capabilities at Headquarters - *Berger*

With WSOM chapters being updated and changes occurring to warning and forecast areas, we must implement a computer graphics generating capability. This will allow us to issue WSOM chapters and other documents, such as updated Public Service Transition Plans, in a more timely fashion with quality graphics. This will eliminate the need to contract out to graphic art firms which is more costly and time consuming.

Status WSR-88D Delivery - *Pierce*

To date, ten WSR-88D units have been deployed by the NWS and the Department of Defense (DOD). The NWS has installed seven of these located in: Norman, Oklahoma; Melbourne, Florida; St. Louis, Missouri; Dodge City, Kansas; Houston, Texas; the Washington, D.C., area; and a maintenance training unit in Kansas City, Missouri. The DOD has installed Doppler radars at Frederick AFB, Oklahoma; Eglin AFB, Florida; and a training unit at Keesler AFB, Mississippi. The WSR-88D units are currently being used to demonstrate operational readiness and will undergo acceptance testing beginning this summer.

Some exciting features have been seen on the WSR-88D during precipitation and severe local storm events. This high resolution data looks promising in our ability to gain a greater understanding of the mesoscale phenomena present during storm events and also to enhance our warning and forecast services to the public.

WSR-88D External User Familiarization Activities - *Pierce*

The NWS remains committed to familiarizing NWS product users of our modernization plans. The WSR-88D is one of the key technological elements behind NWS modernization efforts. As such, it is important that the hazards community (emergency managers, media personnel, storm spotters, etc.) have a limited understanding of the Doppler radar and the products being provided to the community. Local NWS station managers, regional, and national headquarters program managers are taking an active role in meeting with users to provide briefings and orientation sessions regarding the WSR-88D and the products available to them.

Each NWS local manager and regional headquarters have the flexibility to participate in the type of activities that best suit the needs of the users. These familiarization activities range from formal briefings provided to entire communities by NWS Headquarters personnel, to informal meetings between the local NWS manager and emergency managers or media personnel to discuss specific concerns regarding receipt of radar data and training issues. In addition, NWS is working with the NEXRAD Information Dissemination Service (NIDS) providers to make government developed Doppler materials available to them for use in their training programs.

Special Subscribers - *Pierce*

The Office of Systems Operations (OSO), Observing Systems Branch, is putting together an information package for those organizations requesting special subscriber status under the NIDS Implementation Plan. The package will contain information regarding the criteria an organization must meet to be eligible for consideration as a special subscriber, information on how and where to apply and the application form. Please submit requests for this package to:

National Weather Service, W/OSO14
1325 East West Highway
Silver Spring, MD 20910
TEL: 301-713-1733

Consideration for special subscriber status is given to those organizations that provide direct support to the NWS, universities, and research organizations.

HAZARD AWARENESS PROGRAM

"Flash Floods and Floods...The Awesome Power" Brochure - *Kremkau*

A final draft of the flash floods and floods brochure has been distributed to the NWS regions, and the comments are being incorporated at this time. Once all the changes are made, the brochure will be sent to graphics for color layout and then sent to the printer. We expect delivery of the 50,000 copies to the National Logistics Supply Center (NLSC) by late summer. The NWS will be giving 10,000 copies to the American Red Cross for distribution to their chapters.

Status Report on Tornado Awareness Package - *Bill Bunting, WSFO Norman, Oklahoma*

I have contacted all NWS Regions concerning input into the revised tornado awareness package and have received several excellent suggestions that will contribute to a higher quality product. I am emphasizing the regional differences that exist with respect to tornado frequency, development, and appearance in order to enhance its nationwide utility.

The outline of the tornado safety brochure will contain information on how tornadoes develop, what general weather patterns account for most significant tornadoes (thunderstorms associated with strong synoptic-scale surface systems, drylines, and upslope flow), differences in tornado appearance and variability in tornado size and movement. The difference between tornadoes and waterspouts will also be explained. I will present figures showing averages for tornadoes, tornado deaths and injuries by state, and monthly and yearly variations for the Nation through 1990. Three recent outbreaks will be highlighted: the Carolina outbreak of March 1984; the Pennsylvania-Ohio outbreak, May 1985; and the Plains outbreak of April 1991.

Safety rules will obviously be covered in detail, including sections on safety while camping, safety for the impaired and elderly, and safety at school. I will also present a general description of the effects of tornadic wind speeds on buildings. I will emphasize visual appearances of tornadoes and provide some information on environmental clues that may precede tornadoes. There will be several photographs of tornadoes, from the midwest, the Colorado front-range, and the eastern United States.

The NWS watch/warning program will be emphasized, including the role of radar and spotters, and I plan to include a WSR-88D radio velocity photograph of a violent Oklahoma tornado, with a corresponding photo of the tornado at the same time.

I welcome any additional input on this subject.

"Thunderstorms and Lightning" Brochure Status - *Dombrowsky*

The "Thunderstorms and Lightning" brochure update has been slowed by my transfer to Headquarters. My hope is to actively pursue the first phase of its completion by the end of June. This affords field offices some additional time to submit suggestions that might enhance this brochure. It is my sincere hope that we can develop a brochure that meets the needs of all regions. If you know of unique photos that might fit well in this brochure, please forward a copy to the Warning and Forecast Branch for consideration. We need photos and slides for both the brochure and the supporting training slide series.

WARNING AND FORECAST BRANCH INITIATIVES

New Hurricane and Winter Storm Program Leader - *Wernly*

I am proud to announce that Rainer Dombrowsky has been selected as our new Hurricane and Winter Storm Program Leader. Rainer hails from Central Region where his last assignment was the Warning and Preparedness focal point at WSFO Minneapolis. In this position, he was given an award by the State of Minnesota for his outstanding achievements in preparedness planning. To assist him in his work, Rainer took numerous Federal Emergency Management Agency (FEMA) courses to broaden his understanding of hazard planning and mitigation efforts. Before his present position, he worked hard as a supervising met tech at WSFO Minneapolis and acquired the necessary credits to cross over into the meteorologist ranks.

Since reporting on duty in early May, he has represented the Operations Division and the Office of Meteorology at the ASOS Commissioning Meeting at Kansas City and has accompanied Dr. Robert Sheets on the NOAA P-3 for the Gulf Coast Hurricane Preparedness Tour.

Automation of Storm Data - *Alexander*

Since the inception of electronic mail via personal computers (PC), preparedness people throughout the NWS have longed to transfer Storm Data files to the National Severe Storms Forecast Center (NSSFC) using this technology. By now, all WSFOs should be transferring their F-8 data to NSSFC via floppy disk. Many are using OMNET to do the file transferral. By this time next year, standardized software will be in place to download floppy disk files from Weather Service Offices (WSO) into the Warning Preparedness Meteorologist/Warning Coordination Meteorologist's (WPM/WCM) PC database. That

software also will allow Storm Data files to be forwarded via OMNET directly into the NSSFC database. NSSFC will be able to forward the entire monthly block of Storm Data directly into the National Climatic Data Center database for publication.

Tom Carey, NSSFC, is developing Storm Data software using PARADOX to accomplish the task. During the coming months, a Concept Paper detailing this task will be circulated for review. The software will be field tested during the late summer of 1992, and in the early fall a Users' Guide will be drafted. By early spring 1993, the completed Users' Guide will be distributed to the field--electronic transmission of Storm Data from the field directly into NSSFC will be a reality. The result will be a greatly shortened lag time between submission of Storm Data files and distribution of the publication.

Naturally, all of these changes mandate a complete rewrite of WSOM Chapter F-42. Yours truly and Leo Grenier (formerly with NSSFC) are scripting a new F-42 which should be out this fall. Virtually every aspect of the Storm Data chapter will be rethought since the concept of producing a printed F-8 will be outmoded.

Substantial human and economic resources are being committed to the modernization of Storm Data. Not only is it the foundation of our National Severe Weather Events Database, but it is used regularly by the scientific and legal community. We need to provide concise, readable issues in as short a turnaround time as possible. With publication costs continuing to rise, it is cost effective to increase the number of paid subscribers. Promote Storm Data whenever possible; libraries, spotters, and the educational community are good candidates to receive Storm Data. The more subscribers we have, the more refined the publication can become. **Promote Storm Data!**

Emergency Broadcast System (EBS) Upgrade - *Becker*

The prime components of the Integrated Warning Concept that most officials involved in the protection of life and property operate under are **detection** and **dissemination** of the event and appropriate public **response**. Only through effective application of these equally important aspects of the warning process can people reduce their risk. Dissemination has been a weak link, however.

Just as the NWS is on the verge of issuing more timely and accurate warnings and follow-up statements through use of enhanced technologies, so is its ability to reach the public ever more imperative. While NOAA Weather Radio (NWR) will play an important role, only the broadcast media has the ability to reach all of the people all of the time with hazardous messages. At the same time, ironically, advances in home electronics are tending to remove a growing segment of the population from receipt of these messages.

Many radio stations are automating their programs. Cable television broadcasts programs that originate from outside the local viewing area. Even if local warnings were to reach the cable facility, few of them have "All Channel Voice Override," the technology to

display these messages on all channels. Further, many television sets are hooked to VCRs or electronic games. And, of course, radios and televisions may be turned off, especially overnight. Finally, outdoor warning devices like sirens are becoming less effective as homes and businesses are built farther away and increasingly sound proof. So how can people at home or work get life- or property-saving messages? It's becoming increasingly apparent that the most practical solution is some form of indoor warning system. Enter the EBS.

But before the EBS can provide this improved service, it must be modernized. Current equipment is becoming antiquated and requires intensive manual effort. Service is rendered on a volunteer basis by broadcast stations, many of which have a high staff turnover with consequent erosion of EBS communications skills. The Federal Communications Commission (FCC), FEMA and the NWS, the Federal Government managing partners of the EBS, are urging a systemwide upgrade to take place over the next few years. To that end, the FCC issued a Notice of Inquiry (NOI) to industry on possible upgrades of the EBS last June.

To discuss preliminary responses to the NOI, the FCC sponsored the National EBS Advisory Committee meeting in Washington, DC, on April 23, which I attended. The nationwide audience consisted of the General Council for the National Association of Broadcasters, FCC and FEMA officials, radio, television and cable television broadcasters and engineers, and state and local EBS chairmen. Some of the industry representatives are also presidential appointees to the Advisory Committee.

Among several industry, FCC, and FEMA presentations, I gave a talk on NWS's modernization as a lead in to the necessity for, and a brief description of, an enhanced EBS. A majority of preliminary industry responses seemed to echo NWS's goals that the upgrade should be fully automated, include increased participation of radio, television, and cable television facilities and, most importantly, allow, at user selection, some form of automatic turn-on/off of home or business receivers (radios or other devices) for receipt of emergency messages that affect only their area.

The technology to meet these requirements is already available. WRSAME, NWS's NWR Specific Area Message Encoder, is one such device that can automate the dissemination of weather and flood warnings to EBS stations. Similar equipment can be used at the EBS stations to further disseminate NWS or civil defense messages to the public. A simple and inexpensive device would need to be added to home and business radios to allow receipt of emergency messages. Other technologies are also under consideration by the FCC. Final determinations on the EBS upgrade probably will occur by early 1993.

Update on WSOM Chapters - *Berger*

WSOM CHAPTERS	STATUS
C-10, State Forecasts	Reviews of the draft revision have been received. Approval of a final draft is expected this summer. State forecasts will be for 1 to 5 days, incorporating extended forecast information.
C-12, 6- to 10-day, 30-day, and 90-Day Outlooks	A draft revision will be sent out late this spring. Approval is expected this summer.
C-20, National Public Weather Products	Reviews of the second draft have been received. Approval is expected this summer.
OML to C-21, Local and Regional Statements, Summaries, and Tables	Reviews of the draft OML on the AWU and its precursor products were received. Further review continues by senior management and the union. Approval of a final draft is expected by this summer.
C-21, Local and Regional Statements, Summaries, and Tables	Reviews of the second draft revision were received. Approval is expected this summer after approval of the AWU OML.
C-40, Severe Local Storm Warnings	The chapter is undergoing a major rewrite. A new version to accommodate the AWU will be developed this summer for a late fall implementation date.
C-41, Hurricane Warnings	The chapter was signed and sent to the printer.
C-42, Winter Weather Warnings	The final draft is being reviewed by senior management and the union. Approval is expected this summer before the next winter weather season.
C-44, Non-Precipitation Weather Hazards	The final draft is being reviewed by senior management and the union. Approval is expected this summer before the next winter weather season.
C-47, County Warning Areas	A draft will be sent out for review by late spring or early summer. Approval is expected in the fall.
C-49, Warning Coordination and Hazard Awareness	An OML will be sent out this summer that allows emergency management organizations to order NWS publications through their local WSFO/WSOs or the WSH only and not directly from NLSC in Kansas City, Missouri.
New Forecast Coordination Chapter	A draft will be sent out this late this spring for review. Approval is expected this summer.

INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION - *Wernly*

On April 30, Ed Gross, Linda Kremkau, and I attended a meeting of the U.S. National Committee for the Decade for Natural Disaster Reduction at the National Academy of Sciences. Attachment A lists the current members of the U.S. Committee as well as the members of the Subcommittee for Natural Disaster Reduction.

Mrs. Marilyn T. Quayle addressed those present and voiced not only her support for the Decade initiatives but also outlined how she is attempting to garner private sector support for not only the Decade but for greater involvement by U.S. multi-national corporations in all aspects of hazard mitigation issues.

Discussion then centered on how the U.S. can go beyond the conceptual stage and begin implementation of specific strategies in support of the Decade. Mrs. Quayle charged the group to implement a national education and awareness program for October 14 which would be geared toward school age children with the 3rd through 6th grades as a dominant focus. This would be a kick off for a longer preparedness effort that could continue yearly throughout the decade.

Ed Gross, Bill Alexander, Linda Kremkau, and I are working to explore how NOAA and the NWS can become involved in the development of a classroom kit as well as a potential television show on PBS for October 14. The show would be created with assistance from the National Academy of Sciences and a prominent public television station.

HAZARDS-93 - *Kremkau*

The Fifth International Conference on Natural and Man-made Hazards (HAZARDS-93) is to be held in Qingdao, China, on August 29-September 3, 1993. The theme for HAZARDS-93 is "DISASTER MITIGATION: Scientific and Socio-economic Aspects." The organizing committee welcomes papers on all aspects of natural and man-made disasters, but priority will be given to those emphasizing the mitigation aspects. For more information, please contact the following.

Dr. T. S. Murty
Chairman, Scientific Committee
HAZARDS-93 International Symposium
Institute of Ocean Sciences
P.O. Box 6000,
Sidney, B.C. V8L 4B2
CANADA

HAZARD COMMUNITY FORUM

American Meteorological Society (AMS) Launches Project ATMOSPHERE: Includes K-12 School Hazardous Weather Studies - *Dr. Ira W. Geer, Director, Education Programs, AMS*

The AMS, with support from the National Science Foundation, has inaugurated Project ATMOSPHERE, a 5-year, $2.8 million program using the study of weather to improve and broaden the teaching of mathematics and science in the Nation's elementary and secondary schools.

The Project includes the nationwide delivery of instructional materials and teacher training on such topics as hurricanes, severe weather, flash flooding, lightning, and winter storms.

The AMS, with the cooperation and support of NOAA and other atmosphere-oriented organizations, will work toward overcoming a serious deficiency in fostering interest in science, mathematics and technology by the school children of America.

The two-pronged program enlists many of the AMS's over 10,000 members and other distinguished atmospheric science leaders to update weather literature with reference papers, information packets, and single-topic materials of scientific integrity, which could bring marked improvement of major elements of the schools' weather education tools. Its grassroots operation utilizes a network of Atmospheric Education Resource Agents (AERAs)--master precollege teachers who carry out special leadership roles in their local and state school systems and their professional associations. There are now 58 AERAs in 28 states. When the network is fully implemented, there will be at least one AERA in every state.

The AERAs serve as regional contact points with teachers seeking information on atmospheric science, function as liaison between teachers and their organizations, schools, and atmospheric science organizations and related professional communities. They represent the AMS at professional meetings, teacher workshops, and education conferences, and work actively with AMS staff and members to develop and implement improved instructional materials.

Nearly all of the current AERAs have already taken a 2-week training course at the National Weather Service Training Center in Kansas City, Missouri, with specific instruction on hurricanes, severe weather, weather radar, interpretation of satellite imagery, and operation and modernization of the Weather Service. This July, 50 AERAs will continue their training in Boulder, Colorado, at NOAA's Environmental Research Laboratories and the National Center for Atmospheric Research. There they will be trained specifically to conduct hazardous weather training sessions for teachers during the next school year. Many are actively engaged in revamping curriculum and in encouraging a hands-on approach to the teaching of weather education--an approach most youngsters enthusiastically approve and enjoy.

Project ATMOSPHERE seeks connections between the AERAs and Weather Service personnel and others involved in hazardous weather preparedness and response education at the precollege levels.

The AWARE Report is pleased to endorse and cooperate in Project ATMOSPHERE. A brochure, naming the current AERAs, is attached to the back of this publication, and interested readers, both inside and outside the Weather Service, are warmly invited to contact AERAs in their service areas. This should lead to dynamic and fruitful working relationships and to new opportunities to reach and intellectually enrich America's greatest resource--the children.

The AMS education program, at professional and other levels, has always benefitted from the Society's tradition of wholehearted volunteerism. That tradition flourishes today.

The Society's Project ATMOSPHERE offices are at 1701 K St., NW, Suite 300, Washington, DC, 20006.

State Computer Link - *Bill Parker, MIC/AM, WSFO Cheyenne, Wyoming*

The WSFO in Cheyenne was recently successful in linking the NWWS directly to the Wyoming Criminal Justice Information Network (WCJIN). WCJIN is a statewide computer network for handling vital law enforcement information which feeds directly into 45 county offices, police departments, and sheriff offices around the state. On Friday, February 28, 1992, the link was established, and the first products were successfully received. In April, during the state Severe Weather Awareness Week, an extensive test of the new warning distribution system was planned. After the "bugs" are worked out of the system, the ability to distribute warnings more quickly in Wyoming will be accomplished.

In 1989, work was started to achieve an automated link to the individual Wyoming counties directly from the NWS. Larry Stoltz of the Wyoming Department of Administration and Fiscal Control, was instrumental in making this project a success. Through his expert guidance, NWS requirements were built into a planned state computer purchase to replace the aging WCJIN system. This winter, the new computer system finally came on line, and the NWWS link followed in February.

For Wyoming, this automated link will help disseminate warnings, watches, and other vital weather information much more efficiently. No longer will the Highway Department employees be required to retype the warnings before they are entered into the state law enforcement network. And in time, this system will only become better. In effect, the completion of this link was an important advancement for the citizens of Wyoming and the NWS.

PUBLICATIONS AND AUDIOVISUALS

Spanish Version of "Weather Woodies" - *Alexander*

A Spanish version of "How the National Weather Service Works, A Story with the Weather Woodies" is under development. Carolyn Gurney, WSO Colorado Springs, created the cartoon characters several years ago. The Weather Woodies are furry little cartoon characters used to educate elementary school children as to what the National Weather Service does.

After speaking with Ada Monzon, WPM from the San Juan WSFO, Carolyn realized a need for a Spanish version of the program. Spanish can be used with greater effectiveness than English in many areas of the country. Ada is translating the original English text to Spanish, and WSO Pueblo Official in Charge, Rafael Gallegos, is translating the words that appear on the slides. Carolyn is redrawing the pictures and reshooting the slides for the Spanish version. Completion date is scheduled for July 1, 1992.

If you would like to borrow the Spanish or English version of the program, contact the Warning and Forecast Branch, Weather Service Headquarters, or write to Carolyn at:

National Weather Service, NOAA
1599 Aviation Way
Colorado Springs, CO 80916

To Order or Not to Order - *Kremkau*

NLSC continues to receive letters from outside the Federal Government requesting NWS publications. NLSC can no longer fill requests in this manner. Only orders using the NOAA Form 24-12 "Publications Requisition" can be submitted to NLSC. Letters received at NLSC will be forwarded to NWS Headquarters, Warning and Forecast Branch.

So to make life easier, NWS offices wishing to obtain up to 300 copies of any of the Weather Service publications, please use the NOAA Form 24-12. All individuals outside the Federal Government who wish to order NWS publications, please contact the nearest NWS office so they can place the order or write to Weather Service Headquarters at the address below.

National Weather Service, NOAA
Warning and Forecast Branch, W/OM11
1325 East-West Highway, Rm. 14370
Silver Spring, MD 20910
Tel: (301) 713-0090

Remember, offices requesting **MORE** than the 300 maximum number of copies must obtain approval from the Warning and Forecast Branch. We will, in turn, submit the NOAA Form 24-12 to NLSC. This process normally takes about 2-3 weeks.

The Weather Channel--Project: Tornado - *Kremkau*

Attachment B is an order form for a teacher's guide and video of "The Enemy Wind" which was produced for the first time in both English and Spanish and shown in April on The Weather Channel. As with all its documentary programs, The Weather Channel is providing a guide to help classroom teachers and other group leaders use the program, "The Enemy Wind," to interest their audiences in the subject of tornadoes. This 22-minute documentary takes a look at the most recent research on improving the ability to forecast a storm and highlights the work of a group of bold and nerveless adventurers, The Tornado Chasers.

The American Red Cross's Public Perception of Disaster Preparedness Presentations Using Disaster Damage Images - *Kremkau*

Rocky Lopes, American Red Cross, has given us permission to reproduce a report on a nationwide study on the use of disaster damage images (specifically about tornadoes, floods, and earthquakes) in presentations for the public (attachment C). This study was conducted from May through November 1991 by researchers from the University of Maryland at College Park with analysis and final reporting prepared by the national headquarters of the American Red Cross. The National Weather Service is striving to work with the American Red Cross to incorporate some of the findings into our hazard awareness materials.

Other NWS Hazard Awareness Materials - *Kremkau*

-- Attachment D is "The Naming of Hurricanes" for the Atlantic storms. This list is now available from NLSC. Only 5,000 copies were printed at this time.

-- Attachment E is "The Naming of Hurricanes" for the eastern Pacific storms. Weather Service Headquarters printed 5,000 copies, and the bulk of the copies went to the Pacific and Western Regions with smaller amounts going to the rest of the regions.

-- Currently, several publications are at the printer and copies should be available from NLSC by late June. They are:

Dust Storm Driving Safety Wallet Card	NOAA PA 82002	30,000 copies
Heat Wave	NOAA PA 85001	50,000 copies
Storm Surge and Hurricane Safety	NOAA PA 78019	75,000 copies
Hurricane Tracking Chart	NOAA PA 77020	30,000 copies
Winter Storms...The Deceptive Killers	NOAA PA 91002	50,000 copies
SKYWARN Decal	NOAA PA 92051	20,000 copies

-- The following brochures are out of stock at this time but will be printed in the near future.

Hurricane! A Familiarization Booklet	NOAA PA 91001	10,000 copies
Spotter's Guide	NOAA PA 81011	50,000 copies
Watch Out, Storms Ahead	NOAA PA 82004	50,000 copies

-- Just a reminder--the "Tornado Safety" (NOAA PA 82001) and "Thunderstorms and Lightning" (NOAA PA 83001) brochures are rapidly being depleted from NLSC. These two publications, as they exist now, will not be reprinted. New versions of both of these brochures hopefully will be available by late fall.

AWARE Report Roster - *Kremkau*

Attachment F is the AWARE Report Roster. Please review the list of new telephone numbers and notify me at 301-713-0090 if there are any changes. Also, if you know of someone who would like to be on the AWARE Report distribution list, please have him/her contact the Warning and Forecast Branch.

STATISTICS - *Kremkau*

The "Summary of Natural Hazard Deaths for 1991 in the United States" will be forthcoming this summer. The summary, which includes deaths, injuries, and damage costs, will be sent out under separate cover using the AWARE Report distribution list. Additional copies can be obtained from the Warning and Forecast Branch.

Attachment A

U.S. NATIONAL COMMITTEE FOR THE DECADE FOR NATURAL DISASTER REDUCTION

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Updated: 12/13/91

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PROJECT: TORNADO
Materials Order Form

Name: _____

Grade: _____

School: _____

School Address: _____

City: _____ State: _____ Zip: _____

Phone: _____

NOTE: MATERIALS NOT AVAILABLE UNTIL AFTER AIR DATE OF DOCUMENTARY ON APRIL 12.

DUB OF "THE ENEMY WIND" (ID# 21690)

Please specify either: ☐ VHS format ☐ 3/4" format

Please indicate the method of payment:

☐ $25.00 per tape enclosed (Check payable to: The Weather Channel)

☐ Bill me for $25.00 (per tape)

☐ Send tape; I will dub and return it within 30 days. If it is not returned within 30 days, I understand that school will be billed $25.00 for each tape.

"PROJECT: TORNADO" TEACHER GUIDE (ID#21689)
To be used with *"The Enemy Wind"*

Quantity: _____ (Maximum order: 50)

"THE ENEMY WIND" POSTER (ID#21843)

Quantity: _____ (Maximum order: 5)

Please mail to:
THE WEATHER CHANNEL
ATTN: EDUCATIONAL SERVICES
2600 CUMBERLAND PARKWAY
ATLANTA, GEORGIA 30339

PLEASE ENCLOSE $5.00 SHIPPING AND HANDLING FEE.
MAKE CHECK PAYABLE TO THE WEATHER CHANNEL.

Department 98

Attachment C

PUBLIC PERCEPTION OF DISASTER PREPAREDNESS PRESENTATIONS USING DISASTER DAMAGE IMAGES

Rocky Lopes, Ph.D.
The American National Red Cross
Disaster Services Division

A nationwide study on the use of disaster damage images in presentations for the public was conducted from May through November, 1991, by researchers from the University of Maryland at College Park, with analysis and final reporting prepared by the national headquarters of the American Red Cross.

Many presentations for the public made by representatives from state and local emergency management, the American Red Cross, the National Weather Service, and others, use disaster damage images to illustrate certain points or to emphasize the drama of disasters. The study compared what people did to prepare for disasters after attending a slide presentation that included damage images with what people did to prepare after attending a slide presentation that did not use damage images.

Forty people were recruited from 16 Red Cross chapters, 4 universities, and 5 local emergency management offices in 18 states to make 30-minute slide presentations to groups of people about how to prepare for one of three disasters: tornadoes, floods, or earthquakes. Each presenter was provided a script to follow for his/her assigned topic (American Red Cross: *Talking Points for Disaster Education Presentations*, 1991) and two slide sets for each topic; one slide set included disaster damage images, and one set did not.

Each presenter was given instructions to alternate the presentations he or she made between those that included disaster damage images and those that did not. Each person attending the presentations was asked to register, provide his/her name, address, and telephone number, and agree to be telephoned six months after attending the presentation for follow-up. In addition, before each person saw the presentation, he or she was asked to complete a short questionnaire that was coded for later correlation. The anonymous questionnaire asked background information about each person's personal level of preparedness for the specific disaster.

Presenters encouraged personal and family disaster preparedness. After making the presentations, volunteers distributed hazard-specific Red Cross brochures that suggested specific recommendations on how to prepare for disaster. A total of 254 presentations were made to 4,739 people.

Six months after a presentation was made, researchers attempted to reach each person who attended the presentation. Data collected from successful contacts were correlated with the data collected from the initial questionnaires from the group to which the presentation was made.

The data from comparing the level of personal disaster preparedness before and six months after attending a presentation show significant and somewhat surprising results.

The data in the study show a frightening lack of personal and family disaster preparedness, knowledge of community warning systems, or belief that a disaster could really happen to them. After six months, about 79% of the people who saw disaster damage images in their presentation remembered seeing it. Only about 47% of the people who did not see disaster damage images remembered the presentation. This is the reason--that disaster damage images are memorable--that people who talk to the public about disaster preparedness often claim that it is important to use disaster damage images. "People like them." "They are dramatic." "They capture the audience's attention."

However, this study went one step further and asked people what they did to prepare for disasters after seeing the presentations. And after computing and including the "recall factor" influence, the following table shows dramatic results:

Topic	Damage or no damage shown	Got Supplies ready
Tornado	Damage	3.7%
	No damage	23.3%
Flood	Damage	0.0%
	No damage	21.8%
Earthquake	Damage	8.9%
	No damage	20.5%

Since one of the fundamental principles for public preparedness is how important it is to get personal supplies ready before disasters occur, the data show that people who did not see disaster damage images were more likely to assemble disaster supplies kits compared with people who did see disaster damage images.

There are other data in the study about developing a family plan, choosing an out-of-state contact, and perceptions of whether a disaster could happen. The data as a whole show varying results, but generally infer the following:

- Using disaster damage images in public presentations does increase retention; however, it does not encourage a significant number of people to do something to get ready. In fact, using disaster damage images has been shown to be counterproductive;

- People who saw disaster damage images actually became more confused about what to do, and more of them said they would not know what to do in the event of a disaster;

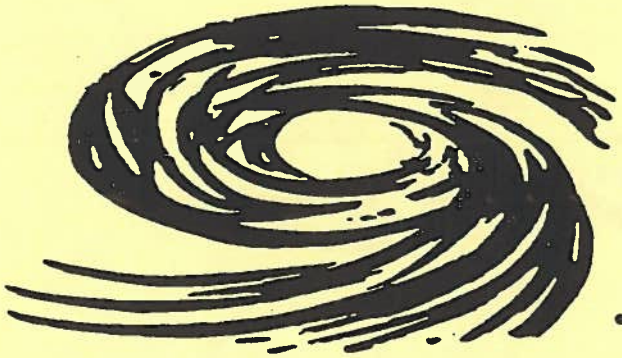
- People who saw disaster damage images said the reason why they did not take action was due to avoidance or denial factors (I don't want to think about it; if it is that bad, there is nothing I can do about it; etc.). People who did not see disaster damage images and who did not take action said their reason was "just not getting around to it."

Since the greater emergency management community believes it is important to encourage the public to prepare ahead of time for disasters, then they must provide the most persuasive argument to cause people to take action. This is done by showing people what to do, using positive, clear, and concise messages.

For a full copy of the study, send a self-addressed 9 x 12 envelope with $0.98 postage (stamps only; not metered) to the address below. For further information, call (202) 639-3656 or write to:

Rocky Lopes, Disaster Services
American Red Cross National Headquarters
431 18th Street, NW
Washington, D.C. 20006-5399

Attachment D



The Naming of Hurricanes

U.S. DEPARTMENT OF COMMERCE

NOAA - National Weather Service

Present Procedure in the North Atlantic, Caribbean, and Gulf of Mexico

The National Hurricane Center near Miami, FL, keeps a constant watch on oceanic storm-breeding areas for tropical disturbances which may herald the formation of a hurricane. If a disturbance intensifies into a tropical storm - with rotary circulation and wind speeds above 39 miles per hour - the Center will give the storm a name from one of the six lists below. A separate set is used each year beginning with the first name in the set. After the sets have all been used, they will be used again. The 1992 set, for example, will be used again to name storms in 1998. The letters Q, U, X, Y, and Z are not included because of the scarcity of names beginning with those letters.

The name lists have an international flavor because hurricanes affect other nations and are tracked by the public and weather services of countries other than the United States. Names for these lists are selected from library sources and agreed upon by nations involved during international meetings of the World Meteorological Organization.

The Six-Year List of Names for Atlantic Storms

1992	1993	1994	1995	1996	1997
Andrew	Arlene	Alberto	Allison	Arthur	Ana
Bonnie	Bret	Beryl	Barry	Bertha	Bill
Charley	Cindy	Chris	Chantal	Cesar	Claudette
Danielle	Dennis	Debby	Dean	Dolly	Danny
Earl	Emily	Ernesto	Erin	Edouard	Erika
Frances	Floyd	Florence	Felix	Fran	Fabian
Georges	Gert	Gordon	Gabrielle	Gustav	Grace
Hermine	Harvey	Helene	Humberto	Hortense	Henri
Ivan	Irene	Isaac	Iris	Isidore	Isabel
Jeanne	Jose	Joyce	Jerry	Josephine	Juan
Karl	Katrina	Keith	Karen	Klaus	Kate
Lisa	Lenny	Leslie	Luis	Lili	Larry
Mitch	Maria	Michael	Marilyn	Marco	Mindy
Nicole	Nate	Nadine	Noel	Nana	Nicholas
Otto	Ophelia	Oscar	Opal	Omar	Odette
Paula	Philippe	Patty	Pablo	Paloma	Peter
Richard	Rita	Rafael	Roxanne	Rene	Rose
Shary	Stan	Sandy	Sebastien	Sally	Sam
Tomas	Tammy	Tony	Tanya	Teddy	Teresa
Virginie	Vince	Valerie	Van	Vicky	Victor
Walter	Wilma	William	Wendy	Wilfred	Wanda

Names of particular individuals have not been chosen for inclusion in the list of hurricane names.

Why Hurricanes Are Named

Experience shows that the use of short, distinctive given names in written as well as in spoken communications is quicker, and less subject to error than the older more cumbersome latitude- longitude identification methods. These advantages are especially important in exchanging detailed storm information between hundreds of widely scattered stations, airports, coastal bases, and ships at sea.

The Naming of Hurricanes

The use of easily remembered names greatly reduces confusion when two or more tropical storms occur at the same time. For example, one hurricane can be moving slowly westward in the Gulf of Mexico, while at exactly the same time another hurricane can be moving rapidly northward along the Atlantic coast. In the past, confusion and false rumors have arisen when storm advisories broadcast from one radio station were mistaken for warnings concerning an entirely different storm located hundreds of miles away.

History of Hurricane Names

For several hundred years many hurricanes in the West Indies were named after the particular saint's day on which the hurricane occurred. Ivan R. Tannehill describes in his book "Hurricanes" the major tropical storms of recorded history and mentions many hurricanes named after saints. For example, there was "Hurricane Santa Ana" which struck Puerto Rico with exceptional violence on July 26, 1825, and "San Felipe" (the first) and "San Felipe" (the second) which hit Puerto Rico on September 13 in both 1876 and 1928.

Tannehill also tells of Clement Wragge, an Australian meteorologist who began giving women's names to tropical storms before the end of the 19th century.

An early example of the use of a woman's name for a storm was in the novel "Storm" by George R. Stewart, published by Random House in 1941, and since filmed by Walt Disney. During World War II this practice became widespread in weather map discussions among forecasters, especially Air Force and Navy meteorologists who plotted the movements of storms over the wide expanses of the Pacific Ocean.

In 1953, the United States abandoned as confusing a two-year old plan to name storms by a phonetic alphabet (Able, Baker, Charlie) when a new, international phonetic alphabet was introduced. That year, this Nation's weather services began using female names for storms.

The practice of naming hurricanes solely after women came to an end in 1978 when men's and women's names were included in the Eastern North Pacific storm lists. In 1979, male and female names were included in lists for the Atlantic and Gulf of Mexico.

Attachment E

The Naming of Hurricanes

U.S. DEPARTMENT OF COMMERCE

NOAA - National Weather Service

History of Hurricane Names

For several hundred years many hurricanes in the West Indies were named after the particular saint's day on which the hurricane occurred. Ivan R. Tannehill describes in his book "Hurricanes" the major tropical storms of recorded history and mentions many hurricanes named after saints. For example, there was "Hurricane Santa Ana" which struck Puerto Rico with exceptional violence on July 26, 1825, and "San Felipe" (the first) and "San Felipe" (the second) which hit Puerto Rico on September 13 in both 1876 and 1928.

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The practice of naming hurricanes solely after women came to an end in 1978 when men's and women's names were included in the Eastern North Pacific storm lists. In 1979, male and female names were included in lists for the Atlantic and Gulf of Mexico.

Eastern North Pacific Names

Given names are also used to identify typhoons and hurricanes in the Pacific Ocean. A set of six alphabetical lists is used in the eastern North Pacific Ocean. As in the Atlantic, the sets are used again when the six year lists are completed. The 1992 list will be used again in 1998.

The Six-Year List of Names for Eastern Pacific Storms

1992	1993	1994	1995	1996	1997
Agatha	Adrian	Aletta	Adolph	Alma	Andres
Blas	Beatriz	Bud	Barbara	Boris	Blanca
Celia	Calvin	Carlotta	Cosme	Cristina	Carlos
Darby	Dora	Daniel	Dalila	Douglas	Dolores
Estelle	Eugene	Emilia	Erick	Elida	Enrique
Frank	Fernanda	Fabio	Flossie	Fausto	Felicia
Georgette	Greg	Gilma	Gil	Genevieve	Guillermo
Howard	Hilary	Hector	Henriette	Hernan	Hilda
Isis	Irwin	Ileana	Ismael	Iselle	Ignacio
Javier	Jova	John	Juliette	Julio	Jimena
Kay	Kenneth	Kristy	Kiko	Kenna	Kevin
Lester	Lidia	Lane	Lorena	Lowell	Linda
Madeline	Max	Miriam	Manuel	Marie	Marty
Newton	Norma	Norman	Narda	Norbert	Nora
Orlene	Otis	Olivia	Octave	Odile	Olaf
Paine	Pilar	Paul	Priscilla	Polo	Pauline
Roslyn	Ramon	Rosa	Raymond	Rachel	Rick
Seymour	Selma	Sergio	Sonia	Simon	Sandra
Tina	Todd	Tara	Tico	Trudy	Terry
Virgil	Veronica	Vicente	Velma	Vance	Vivian
Winifred	Wiley	Willa	Wallis	Winnie	Waldo
Xavier	Xina	Xavier	Xina	Xavier	Xina
Yolanda	York	Yolanda	York	Yolanda	York
Zeke	Zelda	Zeke	Zelda	Zeke	Zelda

If over 24 tropical cyclones occur in a year, then the Greek alphabet will be used following Zeke or Zelda.

Attachment F
AWARE Report Roster

SPRING 1992

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Dave Smith	Regional Hydrologist	817-334-2674
Patricia Brown	Atlanta (WPM)	404-763-7886
Charles Terrell	Birmingham (WPM)	205-290-7305
John Cockrell	Fort Worth (WPM)	817-334-3884
Ron Stagno	Houston (WPM)	713-534-2157
James Butch	Jackson (WPM)	601-965-4639
Kenneth Ziegenbein	Little Rock (WPM)	501-740-5331
Gary Woodall	Lubbock (WPM)	806-743-7361
Dennis Decker	Melbourne (WCM)	407-259-7589
Andrew Sniezak	Memphis (WPM)	901-757-6441
Jim Purpura	Norman (WCM)	405-366-6583
Mario Valverde	San Antonio (WPM)	512-730-5026
Ada Monzon	San Juan (WPM)	809-253-4589
Larry Vannozzi	Albuquerque (Focal)	505-766-2170
Mike Koziara	New Orleans (Focal)	504-589-6891
Wayne Colin/Cliff Brock	Miami (Focal)	305-536-4303
Jose Garcia	Amarillo (WCM)	806-376-2360
Vacant	Tulsa (WCM)	918-581-7748

Central Region		TELEPHONE NO.
Larry Krudwig	Regional (WPM)	816-426-3239
Lee Larson	Regional Hydrologist	816-426-3220
Jim Allsopp	Chicago (WCM)	815-834-0600
David Runyan	Ann Arbor (Focal)	313-668-2223
Joe Sullivan	Des Moines (Focal)	515-284-4496
Shawn Harley	Indianapolis (Focal)	317-248-4035
Norman Reitmeyer	Louisville (Focal)	502-361-1407
Jim Kramper	St. Louis (Focal)	314-447-1876
Mike Dircksen	Sioux Falls (Focal)	605-330-4244
Mike Akulow	Topeka (WCM)	913-295-2631
Todd Heitkamp	Denver (Focal)	303-361-0661
Mike Weiland	Cheyenne (Focal)	307-772-2468
Todd Krause	Minneapolis (Focal)	612-725-6090
John Haase	Milwaukee (Focal)	414-297-3243
Richard May	Bismarck (Focal)	701-223-4582
Gary Wiese	Omaha (Focal)	402-221-4207
Steve Shurr	Wichita (WCM)	316-942-3102
Mike Szkil	Dodge City (WCM)	316-227-3311

Western Region		
Richard Douglas	Regional (WPM)	801-524-4000
Bob Tibi	Regional Hydrologist	801-524-5137
Maux Barnes	Boise (Focal)	208-334-9860
Constantine Pashos	Los Angeles (Focal)	310-575-7215
John Lovegrove	Phoenix (Focal)	602-379-4607
Tom Ainsworth	Portland (Focal)	503-326-2340
Roger Lamoni	Reno (Focal)	702-784-5794
Mike Lewis	Salt Lake City (Focal)	801-524-5133
John Quadros	San Francisco (Focal)	408-291-7767
Robert Doherty	Seattle (Focal)	206-526-6087
Lynn Valtinson	Great Falls (Focal)	406-453-9957

Alaska Region		
Jim Kemper	Regional (WPM)	907-271-5131

Pacific Region		
Saul Price	Regional (WPM)	808-541-1671
Robert Larson	Hydrology (Focal)	808-541-1671
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