

Aware

Spring 1994

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

Mitigation Efforts

Among the hazards community, the concept of mitigation is finally taking off. This can be attributed to the Director of the Federal Emergency Management Agency (FEMA), James Lee Witt, who stated that he was putting mitigation back into the forefront of disaster preparedness. The intent of his remarks was to ensure that this Nation took positive proactive steps to keep future natural and technological events from becoming disasters. Recent events suggest that Mr. Witt's visions are becoming a reality.

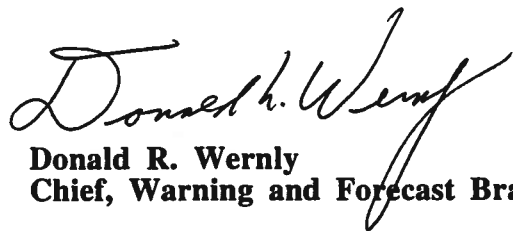
Following the Palm Sunday tornadoes that ravaged Alabama, Georgia, and other sections of the Southeast, Vice President Al Gore exclaimed that timely warnings must get to every part of the Nation, including rural areas. As a result of that statement, a national task force was formed to seek public/private partnerships to upgrade and expand the NOAA Weather Radio (NWR) Program. The goal is nothing less than to have NWR receivers in every school, critical care facility, place of worship, work place, and home in the Nation. Pilot projects getting underway in Florida and Alabama are focusing national attention on how this can be done.

Similarly, FEMA has formed a National Hurricane Task Force to enhance mitigation efforts to blunt the fury of nature's most powerful storms. For the first time, the National Hurricane Program is receiving funds commensurate with those being expended for earthquakes. This should enable FEMA, the National Oceanic and Atmospheric Administration (NOAA), the Corps of Engineers, and the American Red Cross

to better support evacuation studies. Furthermore, local emergency managers are assisting this multiagency effort in defining how resources should be allocated to deal with such issues as training, exercises, and public education.

NOAA and the NWS are also participating in a concept called "Sustainable Redevelopment" where towns wishing to rebuild following a disaster do so in a manner that ensures that they will not again become a statistic. The key to this initiative is rebuilding while considering all potential hazards and doing this in an ecologically and energy efficient manner.

These examples illustrate that this Nation has the power and resolve to undertake proactive preparedness actions. Mitigation is evolving from a concept to a reality. It can only reach fruition if all members of the hazards community make mitigation their first priority. As this issue of the *Aware Report* goes to press, the international hazards community is meeting in Yokohama with these same goals in mind. Let's keep the inertia going. Our future and the future of the global community depend on it.

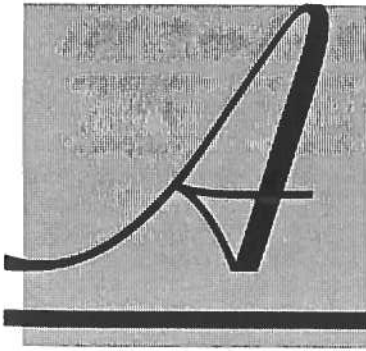


Donald R. Wernly
Chief, Warning and Forecast Branch

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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Please share this copy of the *Aware Report* with others in your office.

Mitigation

National Hurricane Task Force

FEMA has operated a Hurricane Program since 1983. The focus of the program, which has been limited in scope due to resource constraints, has been in conducting hurricane evacuation studies in partnership with NOAA, the National Weather Service (NWS), the National Hurricane Center (NHC), and the Corps of Engineers. With the involvement of James Lee Witt as the new FEMA Director, FEMA has committed itself to develop a National Hurricane Program.

In order to flesh out the initial structure of the National Hurricane Program, local, state, and Federal officials met last September in Tampa, Florida. That Task Force outlined the goals of the National Hurricane Program that included:

- State and local assistance,
- Property protection,
- Hazard analysis and population preparedness,
- Post storm analysis,
- Training and exercises, and
- Public awareness and education.

Since then, working groups were formed for state and local assistance, property protection, training and exercises, and public awareness and education. These working groups met at FEMA's special facility in Berryville, Virginia, on April 19 and 20 to develop objectives, action plans, and short- and long-term needs for their activities. Property protection and the hazard analysis and population preparedness goals were judged to be covered already under the Interagency Coordinating Committee on Hurricanes that includes representatives from FEMA, NOAA, the Corps of Engineers, and the American Red Cross.

During the working group deliberations, it was frequently stated that emergency managers want more education about how to use NWS products. This was noted as extremely valuable for the hurricane program as local decision makers must make decisions well before watches and warnings are issued.

The next session of the National Hurricane Task Force is slated to meet in early September to formalize the direction that the National Hurricane Program will take. [24]

—Don Wernly, Chief, Warning and Forecast Branch

Sustainable Redevelopment

NOAA and the NWS have participated in two multiagency meetings of the Working Group on Sustainable Redevelopment at the Old Executive Office Building. Sustainable Redevelopment is sponsored by the Alliance to Save Energy in cooperation with the Office of Management and Budget and the Office of Environmental Policy.

The objectives of the Working Group on Sustainable Redevelopment are to:

Research and identify existing energy and environmental policy gaps and barriers to rebuilding and relocating communities using energy efficiency and sustainable development principals.

Identify short, medium, and long-term measures to remedy policy gaps and regulatory barriers.

Make ongoing energy and environmental policy recommendations to the White House Office of Management and Budget, the White House Office on Environmental Policy, and other government decision makers.

During these meetings, the NWS advised the group that any actions taken to rebuild or relocate towns should account for all possible hazards that could affect the area. For example, a town wishing to relocate due to flooding threats must also take into account severe local storms, winter storms, high winds, etc.

Following the Working Group sessions, the NWS committed to including concepts of Sustainable Redevelopment in our Warning Coordination Meteorologist (WCM) Training Course. Our goal is to ensure that communities wishing to relocate or rebuild should develop preparedness and action plans to accommodate all potential hazards. This includes consideration of shelters in schools, critical care facilities, and mobile home parks; ensuring means of receiving critical information, such as supporting use of NOAA Weather Radio; participating in state awareness weeks and hazardous event drills; and developing action plans that make the best use of NWS products.

One town already becoming involved in sustainable redevelopment is the Village of Valmeyer, Illinois. Since last year's Midwest floods, they have decided to rebuild the town on a hill totally out of the flood plain. Our WCM in St. Louis, Jim Kramper, is working with Valmeyer to ensure that all hazards are considered. Similarly, the Mayor, Dennis Knowbloch, is on the Working Group for Sustainable Redevelopment and is exploring how his town can rebuild in an energy efficient and ecologically sound manner. [24]

—Don Wernly, Chief, Warning and Forecast Branch

Gulf Coast Hurricane Liaison Tour

I had the privilege of joining Dr. Bob Sheets, Director of the National Hurricane Center, on this year's Gulf Coast Hurricane Tour. Town meetings were held for the professional community and the public in 10 cities across the Gulf Coast from May 15 to May 20. I'm indebted to Dr. Sheets and NOAA/NWS for granting me the honor of joining this tour and making presentations at all 10 tour stops.

As we were flying in the Orion P-3 aircraft low along the Gulf Coast between stops, it became strikingly apparent how lack of zoning, misplaced construction, and the lure of the beauty of the Gulf Coast has definitely put many people at risk from the impact of hurricanes.

During my presentation, I reviewed mitigation steps that homeowners should take to make their homes more resistant to hurricane damage. Nothing will prevent major damage to homes in the direct path of a hurricane. However, many homes near the coast look like they were designed as "wind traps," built high up in the air, with many windows, eaves, and overhangs that will lead to home failure in high winds.

We encourage people to pick up a copy of the brochure and video called "*Against the Wind: Protecting Your Home from Hurricane Wind Damage*" from your local American Red Cross chapter or emergency management office. These materials are free and in the public domain. If copies of these free materials are limited in your area, please get at least one copy of the video and duplicate it to show to homeowners in your community. WCMs will find these materials particularly useful. They are available in both English and Spanish.

In addition, the American Red Cross recently updated its 2-page, four-color hurricane awareness brochure called "*Are You Ready for a Hurricane?*" It is available in English and Spanish in packages of 25 from your local Red Cross chapter or the NOAA National Logistics Supply Center (NLSC) warehouse in Kansas City, Missouri. It features the logos of NOAA, FEMA, and the Red Cross. It is only available from NOAA and the Red Cross though. The stock numbers are NOAA PA 94053 (from NOAA) and ARC 4454 (from Red Cross).


While on the Hurricane Liaison Tour, I picked up some locally-produced educational materials about hurricanes. Much of the information was very good, but some of it continued to promote information that has changed or myths that never were true. These include the following.

- *Windows on the "lee" side of a hurricane should be opened.* This is not true since hurricane winds and airborne debris come from all directions. The best thing to do is to cover all windows before a hurricane strikes.
- *Windows should be opened in a tornado or a hurricane to equalize barometric pressure.* This myth dies hard—it hasn't been true since it was started. For tornadoes, leave the windows alone and get to safety! For hurricanes, cover all windows before a hurricane strikes.

- *Drive at right-angles to a tornado.* If people are driving in a car and think a tornado is nearby, they should abandon the car and lie down on the ground, preferably in a low area not subject to flooding.
- *Put tape on windows to prevent wind damage.* Tape is virtually useless. All tape does is cause glass to form larger pieces when it breaks. Cover the windows with sturdy plywood or storm shutters.
- *Include candles for use after a storm.* Avoid using candles or any open flame indoors after a disaster. More people have died from fires after a disaster than from the direct effects of the disaster itself. Please ask people to take candles out of their supplies kits and replace them with more batteries for their flashlights.

The American Red Cross shares the concern of the National Hurricane Center and the National Weather Service that there are many people at risk from hurricanes. Concerted efforts in all hurricane-prone communities need to continue to encourage more sensible coastal construction as well as appropriate retrofit of home structural components that will reduce potential losses. While regretfully we cannot prevent future hurricanes, we can all work together to help people understand their risk and act accordingly.

Research has clearly shown that when people are given choices, they often will make the choice that, to them, is less difficult—even if it puts them at great risk. Most people will want to stay home to protect their property and to avoid the problems of mass evacuation. We encourage you to ensure that if you suggest that people build a "safe room" in their home to go to during a hurricane, you also explain why evacuation is ordered and that if such an order is given, they must leave. It's not an acceptable alternative to disobey the authority of local government, or to suggest the same.

Together, we can help people know what to do and reduce their risks from hurricanes and other severe storms. The American Red Cross enjoys its relationship with the National Weather Service and local offices of emergency management. We look forward to continuing our efforts on ensuring the public gets consistent, technically accurate, and appropriate information. 

—Rocky Lopes, American Red Cross National Headquarters Disaster Services



Modernization


Coordination in the Modernized NWS

The Weather Forecast Office (WFO) era of the NWS will present an imposing challenge for forecasters: *coordination*. With forecast offices multiplying from 52 to 116 (117, counting Guam) and forecast areas shrinking substantially, the need for a coordination plan is obvious. Such a plan should provide not only guidance for interactions between forecast offices but also ensure a consistent message among WFOs, River Forecast Centers (RFC), National Centers of Environmental Prediction (NCEM) and the Principal Forecaster (PF).

A working group met at Weather Service Headquarters (WSH) during the early part of May to consolidate a variety of suggestions submitted from NWS Regions and from Headquarters. A draft coordination plan was constructed that is being shared first with Regional Meteorological Services Divisions (MSD) and then with the field. Once accepted, the coordination plan will form the guidelines by which information is shared to build forecasts and provide appropriate watches and warnings.

Some of the basic ideas for field office coordination include the following.

- Any office may initiate the coordination process.
- WFO/RFC coordination should occur when:
 - Watches or longer lead-time warnings are contemplated.
 - A significant deviation from guidance or the past forecast is contemplated.
 - Potentially significant differences exist across forecast boundaries.
- Consistency should be achieved through consensus building.
- Ultimate authority for decisions resides with office having warning responsibility.

Much of the coordination methodology will be possible only through new technologies, i.e., Advanced Weather Interactive Processing System (AWIPS) and an enhanced FTS-2000 telephone system. Coordination will be accomplished among multiple offices (e.g., the PF, NCEMs, WFOs, and RFCs), using a slave graphics briefing capability in AWIPS and a "party line" type of capability over an enhanced FTS-2000. With these technologies, a forecaster may lead others through his/her thought processes, and others may break in with their own considerations. Details of this process will be introduced as the plan matures. 

—Bill Alexander, Warning and Forecast Branch


WFO Backup

A major concern in the development of modernized and restructured (MAR) operations pertains to operational backup of WFOs. In the event a WFO is unable to continue all or part of its original product-and-service responsibilities, there needs to be in place a nationally standardized program to back up those products and services.

A working group has developed a draft plan to back up WFOs in the event of such a failure. That draft plan is completing a field review at this writing. The backup plan, essentially, directs adjacent WFOs to assume the product and services responsibilities of the failed WFO based on a hybrid paired adjacent approach. The primary determinant for backup responsibility is 10,000-foot Weather Surveillance Radar-1988 Doppler (WSR-88D) coverage. The WFOs surrounding the failed WFO pick up the county responsibilities for all products and services. As many as four or five WFOs may back up a single failed WFO.

Facilitating such a backup scheme is not as complex as first would appear. AWIPS product and data redundancy will ensure that sufficient information will be available at each backup site to generate products and services for users of the failed WFO. Also, the assumption of backup responsibilities by the backup office should be virtually transparent both to the user and the backup site since AWIPS product generators will make both the changeover to backup operations and adjustments to product headers and routing electronically.

Some exceptions to the paired adjacent scheme are necessary. For example, WFOs with Great Lakes, marine, agricultural, and fire weather responsibilities may need to be backed up by WFOs with similar problems. Furthermore, special considerations will need to be made to accommodate counties where there exists no primary WSR-88D 10,000-foot coverage. This is most prevalent in the western United States.

A final WFO plan will be submitted for approval by Dr. Friday toward the end of summer 1994. Its essence will be detailed in a future edition of the *Aware Report*. 

—Bill Alexander, Warning and Forecast Branch

Decentralization of the Severe Local Storms Watch Program

The process of decentralizing the severe local storms watch program continues to mature enroute to a 1995 implementation. Software is being built for Personal Computer (PC)-based processing of guidance produced by the National Severe Storms Forecast Center (NSSFC), Severe Local Storms (SELS) Unit.

Here is an overview of the initial stage of the decentralized watch program:

Concept:

- Parallelogram is replaced by county-based watch product.
 - Smaller watches better describe risk area.
 - Each forecast office can have a unique watch valid time period (as coordinated with SELS).
- Watches created by Weather Service Forecast Office (WSFO)/Next Generation Weather Radar (NEXRAD) WSFO (NWSFO) forecast area, equating *generally* to one watch per state, although:

- some states, e.g., Texas and Oklahoma, have more than one forecast area;
- some forecast offices, e.g., Sterling and Taunton, have more than one state.

- Forecast offices use PC-based (or Automation of Field Operations and Services (AFOS)-based) software to modify the SELS guidance watch graphically. This points forecast offices to AWIPS-type capabilities.
- A consistent watch clearance policy is established which gives the "counties" Universal Generic Codes (UGC) to commercial users.

Procedures:

- SELS provides suite of routine and event-driven guidance products, e.g., Outlooks, Discussions, etc.
- Coordination: SELS initiates coordination call with affected WSFO/NWSFOs to discuss future watch about 5 minutes before Watch Guidance Message (WGM) issuance. During conference call, forecast offices coordinate valid times in their watch area.
- SELS transmits Watch Outline Message (SAW) which defines a polygon of no more than 6 points around the aggregate watch area.
- SELS product SAW used to produce watch summary graphic for overlay onto National Radar Summary.
- SELS transmits a Watch Guidance Message to forecast offices under the PIL WGM, covering affected WSFO/NWSFO forecast areas.
- Forecast offices use PC or AFOS to perform graphic modification of WGM to create severe local storm watch external product SEL.
- Forecast offices transmit product SEL which includes a listing of counties in their watch area.
- Forecast offices (and Weather Service Offices [WSO]/NEXRAD WSOs, at Regional discretion) may clear counties within their county warning area using product category SLS.

Benefits:

- Forecast offices become more involved in the watch process.
- Users acclimatized to more and smaller watches.
- Watches describe area of risk with greater precision.
- Support given to commercial users' automated watch tracking procedures.

EX. 1: WATCH OUTLINE MESSAGE

MKCSAW0 424,1053 412,1045 385,1045 380,1047 392,1051 409,1063
 WWUS40 KMKC 261705
 WW 100 TORNADO CO..WY..NE..KS 261710 - 270100Z

FROM 10W CYS TO 30S RAP TO 15NW LBF TO 10E GLD TO 10SW
 GLD TO 70NE DEN TO 10W CYS

HAIL SURFACE AND ALOFT..2 INCHES. WIND GUSTS..90 KNOTS. MAX
 TOPS TO 450. MEAN WIND VECTOR 25040.

FOR ADDITIONAL DETAILS...REFER TO TORNADO WATCH
 PRODUCTS MKCSEL0A...0B...0C...0D...AND 0E.

**EX. 2: WATCH GUIDANCE MESSAGE
 (FROM SELS TO FORECAST OFFICES)**

MKCWGM0 424,1053 412,1045 385,1045 380,1047 392,1051 409,1063
 WWUS09 KMKC 261705
 MKC WW 261706

BULLETIN - IMMEDIATE BROADCAST REQUESTED
 TORNADO WATCH NUMBER 100
 NATIONAL WEATHER SERVICE KANSAS CITY MO
 DATE/TIME GROUP

A...THE NATIONAL SEVERE STORMS FORECAST CENTER HAS ISSUED
 A TORNADO WATCH

A TORNADO WATCH MEANS CONDITIONS ARE FAVORABLE FOR
 SEVERE THUNDERSTORMS AND TORNADOES IN AND CLOSE TO THE
 WATCH AREA. PERSONS IN THESE AREAS SHOULD BE ON THE
 LOOKOUT FOR THREATENING WEATHER CONDITIONS AND LISTEN
 FOR LATER STATEMENTS AND POSSIBLE WARNINGS.

B...STATE/COUNTY INFORMATION

COC075-063-087-095-115-121-123-125-270100-
 .100A
 FOR PORTIONS OF NORTHEAST COLORADO UNTIL 7 PM MDT THIS
 WEDNESDAY EVENING. THE ...8... COUNTIES INCLUDED IN THE
 WATCH ARE

KIT CARSON... LOGAN... MORGAN... PHILLIPS... SEDGWICK... WELD...
 WASHINGTON... YUMA

\$\$

WYC015-021-270100-
 .100B
 FOR PORTIONS OF EXTREME SOUTHEAST WYOMING UNTIL 7 PM
 MDT THIS WEDNESDAY EVENING. THE ...2... COUNTIES INCLUDED IN
 THE WATCH ARE

GOSHEN... LARAMIE

\$\$

SDC047-113-270100-
 .100C
 FOR PORTIONS OF EXTREME SOUTHWEST SOUTH DAKOTA UNTIL 6
 PM CDT THIS WEDNESDAY EVENING. THE ...2... COUNTIES INCLUDED
 IN THE WATCH ARE

FALL RIVER... SHANNON

\$\$

NEC005-007-013-029-033-045-049-057-069-075-085-087-101-105-111-
 123-135-157-161-165-270100-
 .100D
 FOR PORTIONS OF WESTERN NEBRASKA UNTIL 6 PM CDT THIS
 WEDNESDAY EVENING. THE ...20... COUNTIES INCLUDED IN THE
 WATCH ARE

ARTHUR... BANNER... BOX BUTTE... CHASE... CHEYENNE...
 DAWES... DEUEL... DUNDY... GARDEN... GRANT... HAYES...
 HITCHCOCK... KEITH... KIMBALL... LINCOLN... MORRILL...
 PERKINS... SCOTTS BLUFF... SHERIDAN... SIOUX

\$\$

KSC023-153-181-193-270100-
.100E

FOR PORTIONS OF WESTERN NEBRASKA UNTIL 6 PM CDT THIS
WEDNESDAY EVENING. THE ...4... COUNTIES INCLUDED IN THIS
WATCH ARE

CHEYENNE... RAWLINS... SHERMAN... THOMAS

\$\$

C...A FEW SEVERE THUNDERSTORMS AND TORNADOES WITH HAIL
SURFACE AND ALOFT TO 2 INCHES...EXTREME TURBULENCE AND
SURFACE WIND GUSTS TO 60 KNOTS. A FEW CUMULONIMBI WITH
MAXIMUM TOPS TO 530. MEAN WIND VECTOR 28530.

D...RAPID THUNDERSTORM DEVELOPMENT IN NORTHEAST
COLORADO EXPECTED TO CONTINUE IN AXIS OF BEST SURFACE
CONVERGENCE AND INSTABILITY. THUNDERSTORMS EXPECTED TO
BUILD NORTH AND MOVE EAST SOUTHEAST ACROSS DEW POINT
AXIS IN RESPONSE TO WEAK UPPER LEVEL IMPULSE. AIRMASS
UNSTABLE WITH LIFTED INDICES OF MINUS 10. FAVORABLE
VERTICAL WIND PROFILE WILL SUPPORT ISOLATED SUPERCELLS
WITH POSSIBLE TORNADOES.

...WILSON

EX. 3: FORECAST OFFICE GENERATED WATCH (SEL)
(Based on WGM Above)

MKCSEL0B
WWUS09 KMKC 261705
MKC WW 261706
WYC015-021-270100-

BULLETIN - IMMEDIATE BROADCAST REQUESTED
TORNADO WATCH NUMBER 100B
NATIONAL WEATHER SERVICE KANSAS CITY MO
DATE/TIME GROUP

A...THE NATIONAL SEVERE STORMS FORECAST CENTER HAS ISSUED
A TORNADO WATCH OVER PORTIONS OF EXTREME SOUTHEAST
WYOMING UNTIL 7 PM MDT THIS WEDNESDAY EVENING. THE ...2...
COUNTIES INCLUDED IN THE WATCH ARE

GOSHEN... LARAMIE

A TORNADO WATCH MEANS CONDITIONS ARE FAVORABLE FOR
SEVERE THUNDERSTORMS AND TORNADOES IN AND CLOSE TO THE
WATCH AREA. PERSONS IN THESE AREAS SHOULD BE ON THE
LOOKOUT FOR THREATENING WEATHER CONDITIONS AND LISTEN
FOR LATER STATEMENTS AND POSSIBLE WARNINGS.

C...A FEW SEVERE THUNDERSTORMS AND TORNADOES WITH HAIL
SURFACE AND ALOFT TO 2 INCHES...EXTREME TURBULENCE AND
SURFACE WIND GUSTS TO 60 KNOTS. A FEW CUMULONIMBI WITH
MAXIMUM TOPS TO 530. MEAN WIND VECTOR 28530.

D...RAPID THUNDERSTORM DEVELOPMENT IN NORTHEAST
COLORADO EXPECTED TO CONTINUE IN AXIS OF BEST SURFACE
CONVERGENCE AND INSTABILITY. THUNDERSTORMS EXPECTED TO
BUILD NORTH AND MOVE EAST SOUTHEAST ACROSS DEW POINT
AXIS IN RESPONSE TO WEAK UPPER LEVEL IMPULSE. AIRMASS
UNSTABLE WITH LIFTED INDICES OF MINUS 10. FAVORABLE

VERTICAL WIND PROFILE WILL SUPPORT ISOLATED SUPERCELLS
WITH POSSIBLE TORNADOES.

...WILSON

NNNN

EX. 4: WATCH CLEARANCE MESSAGE

SATSLSxx
TTAA00 KFTW 060200

WATCH CLEARANCE MESSAGE FOR TORNADO WATCH NUMBER xxx
NATIONAL WEATHER SERVICE SAN ANTONIO TX
900 PM CDT TUE APR 5 1994

THE NATIONAL WEATHER SERVICE IN SAN ANTONIO HAS CLEARED A
PORTION OF TORNADO WATCH NUMBER xxx IN SOUTHEASTERN
TEXAS. TWO COUNTIES HAVE BEEN CLEARED AND 16 COUNTIES
REMAIN IN THE WATCH. THE CLEARED COUNTIES ARE WEST OF
THE HOUSTON METROPOLITAN AREA.

(PLAIN LANGUAGE MESSAGE, IF ANY)

TXC015-481-060400-
COUNTIES CLEARED FROM THE TORNADO WATCH INCLUDE

AUSTIN... WHARTON


\$\$

TXC039-071-157-167-199-201-241-245-291-321-351-361-457-473-
TXZ511-512-513-060400-
THE TORNADO WATCH REMAINS VALID UNTIL 11 PM CDT IN THE
FOLLOWING COUNTIES

BRAZORIA... CHAMBERS... FORT BEND... GALVESTON... HARDIN...
HARRIS... JASPER... JEFFERSON... LIBERTY... MATAGORDA...
NEWTON... ORANGE... TYLER... WALLER... AND ADJOINING COASTAL
WATERS OF THE FOLLOWING COUNTIES:
BRAZORIA... CHAMBERS... GALVESTON... JEFFERSON... MATAGORDA

\$\$

The Warning and Forecast Branch staff in the Office of
Meteorology already have begun to brief commercial users on the
decentralization plans. Written articles are being included in
national newsletters of emergency management organizations. The
National Air Transport Association (ATA) Meteorological
Committee and the FAA will be briefed on the decentralization at the
ATA meeting in Boulder, Colorado, in late May. National media,
including The Weather Channel and Accu-Weather, also are being
briefed on the decentralization's impact.

Should all the necessary software and coordination work be
completed in a timely manner, implementation of the initial step
should occur January 1, 1995. Alternative implementation will be
July 1, 1995. Further details will be supplied in the fall 1995 issue
of the *Aware Report*. 


—Bill Alexander, Warning and Forecast Branch

Short-term Forecasts (NOW) and Radar Narrative Summaries (RNS)

The NOW is multifaceted, a temporal and spatial short-term forecast issued by a number of NWS field offices for their County Warning Areas (CWA) of Responsibility. The number of offices issuing NOWs will increase as the modernization of the NWS proceeds. The NOW may include current or recent past information that forms the basis for, or an enhancement to the short-term forecast. The NOW uses all available data sources, especially the WSR-88D. In contrast, the RNS, issued from conventional network radar sites, is only an observational description of radar returns for a specific time, which contains highly perishable information.

Since there should not be inconsistent information issued for the same area, the NOW will replace the RNS issued by conventional network radars, at regional discretion, where possible. If the NOW and RNS coverage areas have substantial overlap but are not coincident, this may mean expanding the NOW beyond the county warning area to account for the areas previously served by the RNS. For areas with substantial conflicts, Regional Headquarters, on an office-by-office basis, will decide on the coverage areas for NOWs and any existing RNSs.

For those areas where RNSs are still issued, at regional discretion the RNS may be combined with the NOW under NOW category, with Special Weather Statements (SPS) under the category SPS, or with Severe Weather Statements (SVS) under the category SVS.

If an RNS is to be discontinued, the supervising WSFO or WSO designated by the WSFO will announce the discontinuation in a Public Information Statement (PNS). The PNS will give 30 days notice and indicate the NOW(s) that the user should refer to in place of the RNS. The PNS should also discuss the enhanced service aspects provided by short-term forecasting in the NOW. A brief note will also be appended to the end of the RNS during the last 30 days of its issuance indicating the discontinuance date and the NOW(s) the user should refer to. 

—Ron Berger, Warning and Forecast Branch

Warning Coordination Meteorologist (WCM) Training Course

The next WCM course will be conducted in Kansas City between July 11-22, 1994. The intent of the course is to give new WCMs the basic tools they will need to get started on this—one of the NWS's most critical positions.

The role of the WCM is considerably different than the Warning Preparedness Meteorologist (WPM) position as the WCM is literally the service representative to all users of NWS products in the local office's area of responsibility. Accordingly, the WCM must be able to assess user requirements, work with the local office to meet these requirements, educate the users on how to best use NWS information, and evaluate the local office's service programs in light of user requirements.

This is the first time that a 2-week WCM course will be conducted. David Runyan of Central Region Headquarters and Bill Bunting, Kansas City WCM, have agreed to assist WSH in putting this course together. In fact, without their involvement, we would not have been able to conduct the course in July.

Dave and Bill both attended last summer's Warning Coordination Meteorologist Conference as well as the 1-week WCM course held last fall. As a result, they knew best what needed to be done to make the full 2-week course the most effective. Under their leadership, the 2-week course has undergone considerable revision. Highlights include 2 days of service evaluation training from the Office of Personnel Management; training on effective media relationships; and overviews of user's needs for the aviation, marine, fire weather, agricultural, and emergency management communities.



—Don Wernly, Chief, Warning and Forecast Branch

Joint FEMA/NWS Training for Emergency Managers Update

We are progressing rapidly on creating training courses for emergency managers on topics taught by WPM's and WCM's. The first course, "Workshop in Emergency Management: Creating and Maintaining Spotter Groups," will be taught in pilot form in Virginia on June 14, 1994, by members of the Curriculum Advisory Committee Brian Peters, Deputy Meteorologist in Charge, at Birmingham, Alabama; and Randy Duncan, Public Safety Director, from Ponca City, Oklahoma. The second pilot offering will be in Park City, Utah, and be taught by Dave Toronto, WCM at Salt Lake City, Utah, and Steve Rundquist from the Utah Division of Comprehensive Emergency Management. The pilot courses will be evaluated and revisions incorporated into the final version of the Instructor's Guide and Student Manual. We are targeting to have the materials out to the WCMs and state emergency management training officers by late fall.

The next course will provide a basic scientific understanding of various flood and weather hazards, such as tornadoes, severe winter storms, flash floods, riverine floods, high winds, and hail. This course will also identify the hazard-specific local preparedness activities that local officials need to incorporate in their planning and response processes. We expect to begin work on this course in mid June.

The Curriculum Advisory Committee includes Rich Douglas, Western Region Headquarters (WRH); Beverly Poole, WSO Paducah; Brian Peters, WSFO Birmingham, Alabama; Floyd Shoemaker of FEMA Region VIII, Bob Koneval of Port Charlotte, Florida, Office of Emergency Management; Marc Breckenridge of Washtenaw County, Michigan, Office of Emergency Management; and Randy Duncan, Ponca City, Oklahoma, Department of Public Safety will be involved in the course development. In addition, members may be added to provide a breadth of scientific and forecast experience from within the NWS. This course is slated to be pilot tested in the spring of 1995.

The third course will focus on the weather and flood warning process and integrated warning systems. This course will incorporate ideas from Warning: A Call To Action and subsequent

research on effective public warning systems. It is designed to provide lessons learned on effective warning coordination within the hazards community and communication to the public. [REDACTED]

—Chris Adams/Bill Alexander, Warning and Forecast Branch

Local Data Acquisition and Dissemination (LDAD) Function of AWIPS

Plans for the modernization of the NWS have recognized the need for the automation of field offices' interactions with local data observation systems, spotter networks, cooperative observers, and members of the local decision-making community as vital to the success of the NWS modernization. This automation is required to (1) acquire observational data to complement the basic Federal weather observing systems and (2) disseminate warning information to key decision makers in local and state communities.

Hurricane Andrew, the 1993 Storm of the Century, and recent floods have again demonstrated the necessity for continuous environmental hazard information exchange among NOAA, state and local public safety officials, and the public. For the first time, LDAD will provide to the meteorological side of the NWS the capability to have an information exchange between emergency managers and NWS operations. Furthermore, LDAD will provide emergency managers the ability to interactively access the NWS data base.

In addition to coordination and dissemination to emergency managers, the NWS is charged with providing warnings and forecasts directly to the public. The NWS accomplishes this in two methods: (1) direct radio broadcasts from forecast offices, and (2) in partnerships with the media and other information disseminators. The primary, initial notification of warnings will still be done via NWR and NOAA Weather Wire Service (NWWS).

The LDAD Requirements Working Group released the initial version of the User Language Requirements Document (ULRD) for the LDAD Function of AWIPS in July 1993. AWIPS specifications now under contract include the majority of the system requirements needed to support the LDAD functions in general. The LDAD User Language Requirements Document provides additional requirements and clarifications in cases where either the original requirements have changed or require further details to develop complete LDAD engineering specifications and designs. The LDAD functionality will provide local external interfaces that are requisite to the activities of the modernized NWS and to the operations and services of a modernized community of local users and collaborators.

Several reiterations of the ULRD have been produced with the latest being issued in April 1994. The refinements of LDAD requirements have been the result of the collaborative work of members from the Office of Meteorology, Office of Hydrology, Office of Systems Operations, and Office of Systems Development. An important component of the latest version is a revised communication analysis. The ULRD should be finalized by late spring 1994. [REDACTED]

—Gary Charson, Services Development Branch

Proposed Policy for Telephone Service from Modernized Offices

The following proposals, considered part of the standard level of telephone service at modernized offices, were presented to the NWS directors. The directors have requested that these proposals be resubmitted within the planning strategy for phasing down services at non-modernization NWS offices. We will continue working with the MSD chiefs on these proposals.

1. 800 unlisted numbers in support of emergency operations only

- An unlisted 1-800 number should be placed at each WFO only for emergency operations within the WFO's county warning and forecast area.
- These unlisted 800 numbers should be available for use by each county warning point and to any municipal or local entity, such as spotter nets that were not linked to the county warning point.
- If the National Warning System (NAWAS) is upgraded and is expanded to all county warning points in a WFO's area, those county warning points should no longer use the 800 number.
- Unlisted numbers for municipal spotter nets should continue until they can properly interface with the county warning points.

2. Telephone service to the public

- Unlisted administrative number
 - There should be an unlisted administrative number for non-emergency use by all members of the hazards community.
 - The hazards community is defined to include Federal, state, and local government agencies, elected officials, emergency managers, the media, and local decision makers (e.g., school officials and plant managers).
 - Almost all offices currently have this kind of line for the following purposes.
 - Access by the media for interviews.
 - Coordinating plans for warning preparedness activities.
- Listed administrative number for business hours.
 - There should be a listed administrative line for the general public. Use of this line would be during normal weekday business hours.
- Recorded service.
 - Official NWS recordings should be provided 24 hours a day. Each modernized office should eventually be responsible for recordings to all current and former NWS cities in its county warning area of responsibility.
 - Service can be provided either directly by the NWS office or by agreement with an outside cooperators, or combination thereof. [REDACTED]

—Ron Berger, Warning and Forecast Branch


Fire Weather Summit Held in Santa Monica

An Intergovernmental Fire Weather Users Summit was held in Santa Monica, California, April 13-14. The Summit was sponsored by the NWS and the National Fire Weather Advisory Group and attended by representatives of 13 Federal, state, and local agencies.

A luncheon address was provided by Patrick L. Patterson, Executive Director of the Congressional Fire Services Institute. Also in attendance was Dave Hackett of Congressman Curt Weldon's office.

The purpose of the Summit was to provide a forum for discussion of changing needs among users of fire weather products. Topics of discussion included the role of fire in ecosystem management, the Southern California wildfires of 1993, the NWS modernization, smoke management, the urban/wildland interface, and weather-related fire research.

Lessons learned at the Summit will help NWS managers to plan for the future of the Fire Weather Program. Among these are the need for a nationwide, year-round Fire Weather Program. Increased prescribed burning for reduction of fire hazards and ecosystem management will require more spot forecasts from NWS. At the same time, increased pressure for clean air will require more precise forecasting for smoke management.

The fire management community has led the way in interagency cooperation. The Intergovernmental Fire Weather Users Summit was a good example of this type of cooperation. The NWS seeks to continue to strengthen its partnership with these agencies throughout the modernization era and into the 21st century. 

—*Jeanne Hoadley, Marine and Applied Services Branch*





International Decade For Natural Disaster Reduction


World Conference on Natural Disaster Reduction, Yokohama, Japan, May 23-27, 1994

Dr. William Hooke, Director, U.S. Weather Research Program, Office of Oceanic and Atmospheric Research; Dr. Robert Sheets, Director, NHC; and I represented NOAA at the World Conference on Natural Disaster Reduction that met from May 23-27, 1994, in Yokohama, Japan. This was the mid-term review of the International Decade for Natural Disaster Reduction (IDNDR). The U.S. delegation was led by Ambassador to Japan, Walter Mondale; James Lee Witt, Director of FEMA; and Dr. Frank Press, former President of the National Academy of Sciences and the father of the IDNDR. The Conference was attended by over 2,000 individuals representing 148 countries, nongovernmental organizations, international organizations, the scientific community, business, industry, and the media. The Conference was addressed by James Lee Witt and viewed a 5-minute videotape message from Vice President Al Gore which focused on the U.S. commitment to reducing the impacts of natural hazards.

The goal of the Conference was to encourage a new spirit of partnership to build a safer world and to share the deep concern for the continuing human suffering and disruption caused by natural disasters.

The outcome of the Conference was the Yokohama statement and a plan of action. It affirmed that disaster prevention, mitigation, and preparedness are better than disaster response in achieving the goals and objectives of the Decade. Disaster response alone is not sufficient, as it yields only temporary results at a very high cost. That we have followed this limited approach for too long and only prevention will contribute to lasting improvement in safety and is essential to integrated disaster management.

The U.S. delegation was actively involved in all aspects of the Conference from participating in the drafting of the Yokohama statement, working with UNESCO and the World Meteorological Organization (WMO) on the organization and operation of scientific poster sessions, and in making presentations at various technical committee sessions. The U.S. National Report—Facing the Challenge, a joint effort of the National Research Council and the Federal Subcommittee for Natural Disaster Reduction, was made available at the Conference and was well received.

This was an exciting Conference which reaffirmed the world's commitment to changing the way we deal with natural hazards from disaster response to disaster prevention, mitigation, and preparedness. 

— Ed Gross, Chief, Industrial Meteorology Staff

United States Student Art Contest

I attended the exhibit of national finalists in the United States Student Art Contest for the United Nations World Conference on Natural Disaster Reduction. The judging was held at the National Academy of Sciences located in Washington, D.C. The poster competition was organized in response to an invitation by Dr. Olavi Elo, Director of the IDNDR Secretariat of the United Nations, to all nations to participate in an exhibition of children's drawings at the United Nations World Conference. The winning posters in each of three age categories were displayed at the United Nations World Conference for Natural Disaster Reduction on May 23 to 27, 1994, in Yokohama, Japan. The posters were judged for originality, design, art work, and overall effectiveness of the message. The posters were designed based on the theme "Natural Disasters—Awareness and Preparedness." The national winners were:

Christopher Rayl, 8, Earhart Environmental Magnet Elementary School, Wichita, Kansas

Mark Bigler and Justin Holeman, 11, Earhart Environmental Magnet Elementary School, Wichita, Kansas

Ryan Kerns, 14, Edison Elementary School, Grandview Heights, Ohio

Of the 11 posters submitted by the National Weather Service in cooperation with their partnership schools, two won. They were in the 5 to 8 and 9 to 11 year-old categories.

The Office of Meteorology expresses its deepest gratitude to the NWS offices which unselfishly provided their time, effort, and expertise in support of these young students. Those offices involved with this project were:

WSFO Chicago, Illinois
WSFO Seattle, Washington
WSO Wichita, Kansas
WSFO Fort Worth, Texas
WSFO Pittsburgh, Pennsylvania
WSFO San Francisco, California

Thank you again for your support. 

—Linda Kremkau, Warning and Forecast Branch

Operations and Services

Excerpts from the Executive Summary of the "Southeast United States Palm Sunday Tornado Outbreak," March 27, 1994, Disaster Survey Report

Sunday, March 27, numerous killer tornadoes, leaving trails of devastation, raced northeastward across the southeastern United States mainly from central Alabama and northern Georgia to the Carolinas. A total of 42 deaths and over 320 injuries has been attributed directly to the storms, and damage to property has been estimated at \$107 million. Alabama, with 22 fatalities and Georgia, with 18, sustained the brunt of the storms' effects, while two deaths occurred in North Carolina.

Twenty people died and 90 were injured in the Goshen United Methodist Church (UMC) when a tornado (hereafter called the "Cherokee County Tornado") collapsed the roof on the congregation during the ongoing Palm Sunday service. The center of the one-half mile wide tornado with maximum F3¹ wind speeds passed about 200 yards north of the church, resulting in damage correlating with F1 wind speeds toward the tornado's southern periphery.

The tornado struck the rural church at 11:39 a.m. CST, as determined by a radio time check of a Piedmont, Alabama, police officer as he spotted the tornado and radioed it to police headquarters. He had no time to communicate this information to the church. WSFO Birmingham, Alabama, issued a tornado warning for southern Cherokee County about 12 minutes before the tornado struck the Goshen UMC. The congregation did not have a NOAA Weather Radio or any other means of receiving the warning.

The most fatalities in Georgia occurred in Pickens County, where nine people died in two tornado events. Of the 14 family members attending a reunion, six of seven died in a mobile home that was destroyed at 3:24 p.m. EST near the small community of Jerusalem in the Henderson Mountain Road area. The other seven survived without serious injury, even though their mobile home next door also was destroyed. The F3 tornado was estimated at about one mile wide. The tornado continued moving northeast and killed two more people at 3:34 p.m. EST, less than a mile northwest of the city of Jasper. WSFO Atlanta issued a tornado warning for Pickens County about 4 minutes before the mobile homes were struck. It is not known whether the family received warning of the tornado. In total, of the 18 people killed in Georgia, 16 (about 90 percent) occurred in mobile homes.

About a dozen tornado-producing thunderstorms (supercells) traversed a narrow area typically less than two counties wide, spawning tornadoes in parallel tracks, some of which were nearly overlapping. Timely aerial and ground surveys were critical in resolving these tracks. The supercell that produced the Cherokee County tornado, in fact, was documented to track at least 200 miles from near Ragland in east-central Alabama northeastward through northern Georgia into South Carolina. Some evidence suggests it continued to the Atlantic coast. An article in the Atlanta Journal of

¹On the Fujita tornado intensity scale, which ranges from F0 (weak) to F5 (violent).

April 3, 1994, asked "Just how ferocious were last week's tornadoes? An employee at the state's Burton Trout Hatchery in Rabun County (Georgia) found a bank check from Piedmont, Alabama (near the Goshen UMC). The 1989 canceled check belonging to a Piedmont resident had to travel about 130 miles to reach the hatchery. While the (Piedmont area resident's) mobile home was destroyed...he apparently escaped injury."

Along this supercell path, at least four separate tornado tracks of up to 50 miles each were observed. The tornado tracks varied in width and destructive intensity. Overall, width of the tornado tracks averaged about one-half mile, to over a mile in a few places. Intensities derived from damage along the tracks ranged up to F3 with a few spots to F4.

The severe storms started early Sunday morning, complicating the process of mobilizing storm spotters. The resultant lack of ground truth further demonstrated Birmingham and Atlanta forecasters' reliance on, and confidence in, WSR-88D as the key warning tool. The East Alabama WSR-88D (Maxwell Air Force Base [AFB] Department of Defense [DOD] radar) was the sole source of warning information for WSFO Birmingham; WSFO Atlanta had dial-up capability for the WSR-88D (Warner Robbins AFB DOD radar) and the East Alabama WSR-88D and also had use of their WSR-74C local warning radar. Despite the fact the storms, for part of their evolution, were observed near the 124 nautical mile velocity display limit of both WSR-88Ds, the radars continued to provide useful data. WSO Athens, Georgia used its network radar and was ably assisted by a local Amateur Radio Group (HAM), which set up operations at the office and remained in contact with spotters in north Georgia throughout the day.


Overall, considering the frenetic activity and tension associated with wave after wave of supercells in a day-long severe weather episode, NWS personnel at WSFO's Birmingham and Atlanta, and WSO Athens, issued timely warnings for most of the affected counties in their areas of responsibility. All performed responsibly and with dedication. They issued a combined total of 75 TORs and 62 Severe Thunderstorm Warnings (SVR). Through their efforts, many lives were saved. WSFO Birmingham, with even less timely guidance information because of their closer proximity to the developing storms, was proactive in anticipating the severity of the situation and issued, well before the tornadoes, late night and early morning zone forecasts (ZFP) and a statement at 5:45 a.m. CST that heightened the public's awareness to the potential risks. ■

—Rod Becker, Warning and Forecast Branch

The Great Flood of 1993—Natural Disaster Survey Report

The Great Flood of 1993 was an unprecedented hydrometeorological event since the United States started to provide weather services in the mid-1800s. The number of fatalities caused by the flood is estimated to be 48 people. At least 75 towns were completely inundated, some of which may never be rebuilt. The initial assessment of economic impact indicate that losses will range between \$15-20 billion. In terms of precipitation amounts, record

river stages, areal extent of flooding, persons displaced, crop and property damage, and flood duration, this event (or sequences of events) surpassed all floods in the United States during modern times.

On August 22, 1993, a NOAA Disaster Survey Team met in Minneapolis, Minnesota, for a 2-week comprehensive assessment of NOAA's response to The Great Flood of 1993. After hundreds of interviews and countless hours of writing, reviewing, and editing, the Team's findings, entitled "Natural Disaster Survey Report, The Great Flood of 1993," have been published and released for distribution. More than 100 findings and recommendations are included in the Report. 


—Eugene Stallings, Office of Hydrology

Omega Radionavigational System

Long-term requirements for the operation of the Omega global radionavigational systems remain an issue. The 1992 Federal Radionavigational Plan (FRP) states that Omega will remain operational until the year 2005, while there is discussion that the 1994 FRP will establish 1996 as the shutdown date. The aviation industry has responded informally that a minimum of 3 years is needed to transition to a new satellite-based technology. The meteorological community has indicated that the transition to Global Positioning Satellite (GPS)-based technology is not planned until the year 2000, and the retention of Omega until then is essential.

The Federal Aviation Administration (FAA) is working with DOD, U.S. Coast Guard (USCG), NWS, the Office of Federal Coordinator for Meteorology (OFCM), ATA, and FAA Flight Standards (AFS) to determine the long-term requirement for the Omega system. Department of Transportation (DOT) agencies, FAA, and USCG plan to convert to GPS technology by the start of FY 97. The other user groups mentioned require the availability of Omega through 2000 but feel that it is possible to meet a December 31, 1998, date.

The international weather community relies heavily on both Omega and Loran-C radionavigational systems for support of upper air meteorological programs. They provide the very basis with which the NWS's National Meteorological Center initializes its atmospheric modeling and forecasts as well as being vital to global research programs. Any loss of this vital real-time data would result in much less accurate forecast guidance for severe weather watches and warnings, heavy precipitation events, winter storm development and evolution, airline flight planning, ship route forecasting, etc. Each of these situations have serious implications for life and property. Currently, 72 countries use upper air systems that require the use of Omega or Loran-C. There are 234 Omega and 28 Loran-C upper air stations. Outside the WMO, there are an additional 315 Omega and 142 Loran-C systems. These totals are expected to increase by 52 Omega and 81 Loran-C systems by the year 2000.

The FRP will be amended this summer with the goal of establishing a realistic Omega shutdown date that Omega users could use for long-term planning. 


—Rainer Dombrowsky, Warning and Forecast Branch

Successful Launching of the Geostationary Operational Environmental Satellite (GOES-8)

The GOES-I spacecraft was successfully launched on April 13, 1994, at 2:04 a.m., EDT, from Cape Canaveral AFB, Florida. GOES-I officially became GOES-8 at 8:50 a.m., EDT, on April 27, following a successful orbit raising maneuver placing it in geostationary orbit. The Solar Array Final Deployment was scheduled to begin on April 28. Full solar panel deployment is critical for supplying sufficient power to operate all on-board equipment for the 5-year life of the satellite.

Representing the NWS at the GOES-I launch was Dr. Joe Friday, Director of the NWS; Dr. Bob Sheets, Director of the NHC; Ron Gird, NWS Satellite and Spaceflight Program Leader; Allen Eustis, Industrial Meteorology; and Frank LaPore, Public Affairs. Before the launch of GOES-I, Drs. Friday and Sheets participated in a 1-hour NASA Press Conference, television interviews from broadcasters nationwide, and a teacher's workshop organized by Dr. Paul Ruscher of Florida State University.

Several hundred people were at the special guest viewing site at Cape Canaveral AFB. The launch was right on schedule and with almost clear skies, you could visually see the launch vehicle for several minutes after launch. As expected, the launch lit up the night sky, and it was a very spectacular sight. NASA-Kennedy Space Center Office of Public Affairs has provided the NWS with a complete videotape of the event.

The GOES-8 spacecraft now begins a comprehensive 6-month check-out period. The first visible images for the engineers to inspect were transmitted from GOES-8 on May 9. The first infrared images were transmitted on May 31. A limited flow of visible and infrared data from the imager will be available to the engineers starting June 20. GOES-8 is expected to be operational for the NWS and the commercial weather companies in October 1994. The University of Wisconsin is making the GOES-8 digital data available on the Internet. GOES-J is scheduled to be launched on April 15, 1995. 

—Ron Gird, Marine and Applied Services Branch

Style and Punctuation on NWS Products


The following proposals are being considered for implementation by autumn. Please contact Ron Berger for questions or comments on these proposed changes.

Commas are proposed to replace the three dots (...) in the narrative text sections of products to represent pauses within sentences and phrases as appropriate. However, the three dots would continue to be used to bracket headlines (e.g., ...WINTER STORM WATCH FOR SOUTHERN ILLINOIS TONIGHT...), and follow forecast period designators in period-by-period forecast products (e.g., .TONIGHT...[text]).

Colons and semi-colons would be permissible for other pauses in the text, as appropriate, but the three dots may be used in lieu of colons or semi-colons (e.g., SYNOPSIS...[text] or SYNOPSIS:


[text]; HUMIDITY...[text] or HUMIDITY: [text]). Dashes shall not be used for pauses.

Regarding time, use of 1200 (AM or PM) should be avoided. Noon or midnight would be acceptable in the text portion of products but not in the Mass News Disseminator (MND) block. 1159 or 1201 should be used in the MND block instead of 1200.

For corrected or updated versions of any public product, the terms "UPDATED" or "CORRECTED" shall be appended to the first line of the MND block (e.g., SPECIAL WEATHER STATEMENT...UPDATED). A short (usually one line) reason for the update or correction should be added. When used, the line for the reason should always appear one blank line below the MND block. 


—Ron Berger, Warning and Forecast Branch

Frost/Freeze Warnings

As agreed at the MSD and DACFO meetings, frost and freeze warnings will primarily be issued under the non-precipitation watch/warning/advisory category (NPW) since these are transition season events for most of the country. However, we will still allow frost and freeze warnings to be issued under the winter weather category (WSW) in subtropical climates that experience very little winter weather (e.g., south Florida and south Texas). 

—Ron Berger, Warning and Forecast Branch

High Wind Warnings

It was expressed at the last hurricane conference that high wind warnings using current generic thresholds did not convey a high enough level of danger for inland hurricane effects. Accordingly, we asked for opinion from our regional and field offices on changing the generic high wind warning criteria to equal the severe thunderstorm threshold. The consensus was that the generic high wind warning criteria should essentially remain the same, allowing for local or regional variation. Special headlines will continue to be used in high wind warnings for inland hurricane effects to convey the threat of hurricane-force winds as needed. 

—Ron Berger, Warning and Forecast Branch

NOAA Weather Radio (NWR) Initiatives

NOAA Weather Radio

The current NWR broadcast system had its inception in the 1950s when the Weather Bureau operated two stations broadcasting aviation weather. In the early 1960s, stations were added for the marine community, and by 1976, there were 112 stations broadcasting weather information. Between 1976 and 1979, 220 additional transmitters were added to what eventually became the 386 transmitter system known as NOAA Weather Radio. In the early 1980s, funds for the second phase of the NWR program, that would have doubled the number of NWR transmitters in service, were eliminated from the budget. Many areas of the United States currently have no NWR coverage. Current funding levels for the

NWR program are only sufficient to do required maintenance on existing systems. The only additional transmitters that have been added to the system were those funded by private interest groups.

The NWS provides the fastest, most direct means of getting NWS information on impending severe weather to the public. Under a January 1975 White House policy statement, the NWR was also designated the sole Government operated radio system for providing direct warnings to private homes for both natural disasters and nuclear attack. This capability is to supplement warnings by sirens and commercial radio and television.

The NWR system currently consists of 386 transmitters in the continental United States, Alaska, Hawaii, Puerto Rico, the Virgin Islands, and former Pacific Trust Territories. Broadcasts are currently made on the following authorized frequencies in the VHF band: 162.400, 162.425, 162.450, 162.475, 162.500, 162.525, and 162.550 MHz.

An NWR station consists of an operator's console located at an NWS office, a transmitter and antenna that are frequently located at sites remote from these offices, and a telecommunications link between them.


Transmitters and antennas are typically located at non-NWS facilities and are tenants at radio transmitter and tower facilities operated by a wide variety of private sector and local, state, and Federal government organizations involved in radio, television, and communications. Maintenance is provided by NWS technicians, NWS contractors, or host organization technicians, depending on circumstances that exist at individual transmitter sites.

The NWS currently operates 309 NWR consoles at over 200 Weather Service offices. As a result of the NWS MAR, offices will be consolidated, reducing the number of offices having NWR consoles to the 115 WFOs, offices in Guam, and the Weather Service Headquarters.

The existing NWR consoles employ 1960s technology. They have reached their anticipated life expectancy and are becoming more difficult to maintain. Replacement parts are no longer available. Moreover, the operation of these 309 electromechanical consoles is highly labor intensive.

The NWS is currently engaged in a massive effort to improve the quality and timeliness of forecasts by replacing antiquated data collection, analysis, and dissemination tools and techniques with modern technology while improving productivity and cost effectiveness of the NWS by restructuring the architecture of its field operations. As part of the MAR, an effort is currently under way to upgrade and automate the NWR in order to overcome increasing maintenance and work load problems that exist with current console technology. The primary focus of the NWR automation effort is the replacement of the existing NWR audio consoles with programmable, computer-based systems capable of ingesting weather messages as electronic text from the AWIPS, converting the text to voice, and broadcasting messages under a dynamic scheduling system controlled by algorithms that utilize prioritization and coverage area coding imbedded in the message. Incorporated in this Console Replacement System (CRS) will be the capability to continuously provide individual broadcast programs for up to ten transmitters, a programmable speech synthesis capability and data base with an unlimited vocabulary that allows customization for the pronunciation of words unique to a given locale, the ability to append unique tones to individual broadcast messages that trigger specially

designed receivers, and the capability to automatically monitor the "health and welfare" of the remote transmitter/antenna systems.

The NWR automation and CRS will open the way for continued improvement of the NWR system. The flexibility by automated preparation of forecasts and implementation of programming and scheduling under computer control has the potential of allowing the NWS to deliver a much larger and more diverse suite of products to better define geographical areas at precisely scheduled times. It could simultaneously serve individual audiences with more narrow interests by providing alerts that would require the triggering of automated receivers equipped to recognize the special broadcast, at little or no increase in NWS cost or effort. The Weather Radio Specific Area Message Encoding (WRSAME) capability for triggering alarm functions on home receivers to alert listeners of impending severe weather or other life-threatening events will be available nationwide instead of current, limited availability. In addition, CRS could support over 1,000 NWR transmitters should funding for an NWR expansion become available. 

—Ken Putkovich, *Office of Systems Operations*

National NOAA Weather Radio Initiative

While visiting the tornado damage sites in Alabama, Vice President Gore expressed regret that a comprehensive National Warning System was not available to the people of the United States. On March 31, 1994, he announced that the government was going to undertake the development of a system that would not only warn those in danger but would also provide emergency life-saving information both before and after the event.

There are systems in the United States capable of providing warnings and emergency information to people of the United States. However, there is not one system that is distinctly designed to provide warnings and emergency information such as was needed in Alabama, in Florida during Hurricane Andrew, and for the March 1993 storm. A system is needed that will:

- reach into homes, businesses, and areas of public assembly of everyone who is in danger.
- provide warnings to everyone in an area which is being threatened.
- provide required information prior to and after the issuance of warnings, such as preparatory steps that should be taken by those threatened, and information as to where medical attention and other services can be found following the incident.
- be compatible with other systems, such as the Emergency Broadcast System (EBS) and NAWAS to accomplish complete and comprehensive dissemination of warnings and information.
- be affordable to both emergency management agencies and the general populace.


In response to this Vice Presidential initiative, an Interagency Task Force comprised of FEMA, NOAA/NWS, and the U.S.

Department of Agriculture has been established. The task force will work with state and local emergency management agencies and private industry to form public/private partnerships to develop, fund, and implement this backbone system.

Task force representatives met on April 21, 1994, to formulate the creation of a National Warning and Information System. A primary element within the scope of this program is the conducting of pilot projects.

Our Nation's greatly improved weather warning and forecast capabilities cannot help people who don't have the capability to receive this information. The Vice President has said that, "the weak link in the chain is the inability to get warning information to all of the people in the threatened area." He also made the following commitment, "...it is that weak link in the chain that we are fixing with this initiative."

In late May, the Department of Commerce, NOAA, and NWS Public Affairs sections developed and distributed Public Service Announcements detailing the capabilities of NOAA Weather Radio. Additional promotional spots involving the Vice President are being considered for later this summer.

The NWS NWR Task Force completed work on a documentation package for the National Upgrade and Enhancement of NWR under the Gore NWS Initiative and distributed it in late May. It contained material that is intended for use by Regional and state NWS focal points in implementing the Upgrade and Enhancement in cooperation with state/county/local private/public sector partners. This is a result of the activities and attendant publicity from the establishment of NWS Federal partnerships with FEMA and the U.S. Department of Agriculture. It included a Plan of Action, a National Plan, and a State Plan; proposed locations for new NWR stations and maps and data base of existing NWR stations; a Special Interest Group Brochure and Agreement; press releases, etc. 


—Rainer Dombrowsky, *Warning and Forecast Branch*

Florida Demonstration Project

Well before the recent weather-related fatalities and destruction in Alabama, the NWS, FEMA, and the Florida's Division of Emergency Management began meeting on similar issues. A meeting was held in Tallahassee, Florida, on August 6, 1993, among Florida Division of Emergency Management, the NWS, and FEMA. The purpose of the meeting was to finalize plans for the all-hazards emergency information distribution system utilizing NWR and NWWS. If successful, the Florida Demonstration Pilot could lead to the implementation of a national approach toward serving the pre- and post-warning information and communications needs of the hazards community and public.

The State of Florida and NWS have formulated and will soon enter into an agreement to demonstrate an all hazards emergency information distribution capability. The goal of this pilot is to test the effectiveness of Florida's existing dissemination capabilities in preparation for the installation of its new satellite based two-way communication capability. This new satellite-based system will effectively link the State Emergency Operations Center with all 67 Florida county level emergency management offices, Florida's three

nuclear power plants, Florida's six modernized Weather Service offices, and the primary EBS subscribers.

In addition, the Florida Division of Emergency Management is working with the NWS and FEMA to improve communications to the public before, during, and after emergencies. As part of the overall plan to convert NWR to an all hazards communications system, efforts are being focused on filling of gaps within the Florida NWR broadcast service area. The goal is to install the needed NWR transmitters so that NWR can reach 95 percent of the State's population. The National Task Force is working with Florida's Division of Emergency Management in securing the required complement of transmitters. Consoles driving NWR transmitters would also be equipped with WRSAME. These devices provide the NWS with the capability to transmit a code that can identify up to 60 separate weather-related or civil emergency messages. It can specify one or up to 31 counties in any combination that are affected by the event. 

—Rainer Dombrowsky, Warning and Forecast Branch

NOAA Weather Radio for the Deaf (Status of the WEATHERCOPY Test)

As noted in the Winter 1993-94 issue of the *Aware Report*, the NWS Western Region recently began testing a new technology to provide warning and forecast service to the deaf. This technology can enable the NWS to provide lower-cost, printed weather information in near real-time to more users, including the deaf community. To evaluate the effectiveness of digital data transfer over NWR, an operational test is underway in Salt Lake City, Utah.

The technology being evaluated, called WEATHERCOPY, was developed by Dataradio, Inc., of Montreal in collaboration with Environment Canada. Using packet radio technology and radio modem data compression techniques, text and simple graphics are transmitted over the standard weather radio frequencies. Data transmission occurs once per broadcast voice cycle.

Transmission is accomplished via a short, audible data burst. This data burst is modulated to achieve high performance and to be less obtrusive to voice-only listeners. Data transfer rates are between 10,000 and 40,000 bits per second. This allows transmission of a one-page text product in about one second! The audible data burst does not activate weather radio warning alarms. For the NWS operational test, a brief message precedes each data burst on NWR informing listeners, "*The following sound is digital data that allows the deaf to receive printed weather information.*"

To maximize the audience of test participants, five WEATHERCOPY receivers were rotated among members of the deaf community. A meeting was held to redistribute the first group of receivers at Utah Comprehensive Emergency Management (CEM) Headquarters on April 4. Three test participants attended the meeting and returned their receivers. One of the participants, the President of the Utah Association for the Deaf, has written two articles about the WEATHERCOPY test, one of which was published in *Silent News*, a national newsletter for the deaf. Based on the meeting and returned surveys, WEATHERCOPY is an extremely valuable and popular service to the deaf; test participants did not want to relinquish their receivers!

The other two operational test receivers will remain at their present locations since they expose WEATHERCOPY technology and service to a large audience. One of the receivers is at the Utah Community Center for the Deaf. This center often hosts events that draw 200 to 300 deaf and hearing-impaired persons. The second receiver will remain at Utah CEM Headquarters, the central contact point for County Coordinators for the Deaf. CEM Headquarters also employs an interpreter for the deaf, who was responsible for developing the Deaf Coordinator Program in Utah.


During the April 4 meeting at CEM Headquarters, WEATHERCOPY was demonstrated for Michael Armstrong, Director of FEMA Region VIII. Mr. Armstrong was in Salt Lake City to evaluate Utah CEM Headquarters' performance during the recent "Response '94," a multiagency disaster drill that occurred on March 31. He was impressed with WEATHERCOPY's value to the deaf and its other potential service applications.

Utah CEM Headquarters used WEATHERCOPY as its primary source for weather information during the "Response '94" drill. They also used this technology to test the response of deaf participants during the "staged" disaster. Deaf participants were instructed to contact CEM Headquarters upon receipt of an appropriate message and then contact other deaf persons. One of the participants contacted more than 50 other deaf persons via the Utah Relay Service (TDD).

A meeting to evaluate WEATHERCOPY technology was held April 12-13 at NWS WRH in Salt Lake City. Members of WSH and several NWS Regional representatives attended the 2-day conference.

The conference group visited Utah's CEM Headquarters where they met with several "County Coordinators for the Deaf." The coordinators are volunteers for Utah CEM who are themselves deaf. These people were ideal as test participants since they could readily evaluate the effectiveness of real-time printed weather warnings to the deaf. Through an interpreter, the deaf test participants relayed their unanimous approval of the WEATHERCOPY service to WSH representatives.

The deaf in attendance were also pleased to learn of Dataradio's efforts to develop a modified, lower-cost (\$200-\$300) WEATHERCOPY receiver specifically designed to serve the deaf. The strobe-alert feature of these modified receivers was demonstrated during the meeting. Based on the initial response of the deaf community in Salt Lake City, Environment Canada and Dataradio are investigating WEATHERCOPY's potential service to the deaf in Canada.

The operational test of WEATHERCOPY is now in its fifth month with receivers distributed to the second group of test participants. This technology excels as a potential method to provide low-cost, real-time warning service to the deaf. WEATHERCOPY is designed to utilize the present NWR network. It operates parallel to the audio portion of NWR, transmitting text versions of warnings and forecasts as they are issued. 

—Mike Campbell, Western Region MSD

(Editor's Note: For updates on the Weather Service Operations Manual (WSOM) chapters, see attachment A.)

Hazards Community Forum

1994 Gulf Coast Hurricane Preparedness Tour

Dr. Robert Sheets, Director of NHC, recently completed the hurricane preparedness tour along the Gulf of Mexico coast. Coordination assistance for the tour was provided by me, Gary Woodall, Southern Region WCM, and Chris Smith, Southern Region Public Affairs Officer. The tour began in Harlingen, Texas, on May 15, and ended in Sarasota, Florida, on May 20 with eight additional stops in between. Speakers at the tour stops included Dr. Sheets, Dr. Richard Pasch of NHC, Dr. Rocky Lopes of the American Red Cross, representatives from the NWS and FEMA, and local emergency management officials. Presentation topics included hurricane climatology, family preparedness, and the performance of various building construction methods in the winds of Hurricane Andrew. Over 3,500 people attended the presentations, with literally millions more receiving valuable hurricane preparedness information from television, radio, and newspaper stories concerning the tour. ☐

—Gary Woodall, Southern Region WCM, Fort Worth, Texas

Florida Statewide Hurricane Exercise—June 15-16, 1994

The State of Florida's Department of Community Affairs, Division of Emergency Management, will be conducting a real-time statewide exercise on June 15 and 16. June 15 has been designated as a response day and June 16 as a recovery day.

The NHC has prepared complete forecast packages dated to begin on June 10 at 5 a.m. with a once per day advisory at 5 a.m. through June 14. These packages will include the public advisory, the marine advisory, the tropical cyclone discussion, and the probabilities. On June 15, in addition to the complete package at 5 a.m., 11 a.m., and 5 p.m., intermediate public advisories have been prepared.

The NWS offices throughout the state have prepared Hurricane Local Statements to go with each advisory as specified in C-41.

The advisories and HLSs, as well as other messages, will be facsimile blasted by the State of Florida to some, or all, of the 67 counties in real-time.

Emergency management officials in almost all of the 67 counties in Florida will participate to varying degrees in the exercise. NWS offices have been encouraged to participate as much as possible. At a minimum, the NWS offices will be available for consultation with their CWA emergency management officials and the State of Florida during the exercise. ☐

—Paul Hebert, Meteorologist in Charge, WSFO Miami, Florida

Warning Dissemination

Many significant changes have occurred at the Des Moines forecast office during the last 8 months, especially with the arrival of Doppler radar, Automated Surface Observing System (ASOS), and our office move to Johnston. Modernization is immediately impacting the way we forecast and issue warnings. However, technological advances in radar and recording surface observations are not the only areas we have modernized. After last summer's devastating floods, the preparedness community, as well as the forecast office, has sought to create innovative ways to communicate.

A major disaster has taught us that communication between municipalities within our metropolitan area, the Corps of Engineers, NWS, and other relevant agencies, such as utility companies and the Red Cross, is essential. Information dissemination between city and emergency managers and agency supervisors is critical for mobilizing disaster resources.

Many communities in the central United States already employ a concept of mutual aid between relevant government agencies and emergency management; unfortunately, some communities do not. The lessons of this past summer have taught our community that instantaneous radio communication is crucial in order to accomplish this goal. This spring, implementation of an 800 MHz radio network will allow emergency managers and government agencies the opportunity to communicate on an instantaneous basis. If major flooding is repeated in Iowa, then communication between preparedness groups will flow more quickly, thus facilitating the decision-making process.

The floods of 1993 have not only mobilized the emergency management community but have also changed the process of warning dissemination. In order to increase public response to NWS warnings, the Des Moines forecast office is working with Des Moines city administrators to bring an advanced warning system to the metropolitan area. Integration of WRSAME technology into the existing NWR broadcast will improve warning capability by directing severe weather warnings to those areas most affected.

Since the warning system works through cable TV, city officials are negotiating with the local cable company to increase cable availability. Distribution of the warning units will begin this spring on a limited basis, targeting flood-prone areas in the city. ☐

—Jim Belles and Jean Kallman, Meteorologists, WSFO Des Moines, Iowa

FEMA Workshop

From April 17-21, 1994, I attended a disaster preparedness workshop sponsored by FEMA. The workshop was held at the Emergency Management Institute in Emmitsburg, Maryland. I was there along with the Cuyahoga County and Cleveland area emergency management personnel. I enjoyed instructor status during my stay in Emmitsburg and taught the meteorological hazards portion of the

course. I was able to go through the services provided by the NWS and also touch on MAR activities even though my audience was primarily interested in NEXRAD.

I was fortunate to be able to attend other sessions from experts around the country dealing with disaster response and law enforcement. This gave me a broader perspective on what is happening during a disaster situation. The Bameveld, Wisconsin, tornado and Oakland Hills fire were particularly interesting.

The highlight of the workshop was a disaster scenario for the Cleveland area. It was designed to see how various officials in the community would react to a disaster situation. The scenario consisted of two devastating tornadoes with one on the west side and the other on the east side of town. My task was to issue all the various NWS products that officials would see from the watch, through the various warnings and statements. They also had a closed circuit television station with a news program that simulated the media response during a crisis. I also provided the NWS response to the media via interviews.

The workshop was worthwhile and I recommend that other WCM's attend similar sessions, especially if they can attend with a group of EMA personnel from their county warning area. It was beneficial in that new contacts were initiated, and I was able to convey what services the NWS provides.

—Larry Gabric, WCM, WSFO Cleveland, Ohio

Fermi Lab Tornado Seminars

The annual Severe Storm and Tornado Seminars were held at the Ramsey Auditorium at Fermi National Laboratory in Batavia, Illinois, Saturday, April 9, 1994. Two 4-hour seminars were set up for 1 p.m. and 7 p.m. The 950-seat auditorium was filled to capacity for both programs. Another 150 people viewed the program on television monitors in an overflow room. Total attendance was about 2,200. This is the largest program of its kind in the country. Most of the audience were from the Chicago area, but people come from all over Illinois and the Midwest. Attendees were weather spotters, emergency management personnel, weather enthusiasts, students, and the general public.

Tom Skilling, meteorologist for superstation WGN-TV, Chicago, was the emcee. This year's speakers included Tom Grazulis of "The Tornado Project;" Brian Smith and Bill Hirt of the NSSFC; Jim Allsopp and Richard Koeneman of the local Chicago/Romeoville NEXRAD WSFO; and Dr. Lance Bosart and Anton Seimon of the State University of New York at Albany.

Topics included television weather presentations, modernization and new technologies, tornado history and risk, operations of NSSFC, tornado spotting, gravity waves, tornado damage, thunderstorm and tornado safety, and relationships between severe weather and unusual electrical activity in storms. Between speakers, video clips of tornadoes and severe storms were shown.

Outside the auditorium, booths were set up for Chicago Area SKYWARN Association, ALERT (A Laymen's Enlistment Researching Tornadoes), American Association of Weather Observers, and a NEXRAD display. The NEXRAD display was put together by Susan Moran, a weather enthusiast and storm chaser from

Rockford. She used materials provided by UNISYS and NWS. Also, the NWS handed out over 1,000 copies of the Red Cross/NWS pamphlet, "Tornadoes...Nature's Most Violent Storms."

This was an excellent forum to educate the public on severe weather hazards and modernization as well as to recruit new spotters.

—Jim Allsopp, WCM, WSFO Chicago, Illinois

Support for the World Cup Soccer Tournament Games at Foxboro Stadium, Massachusetts

Foxboro is one of nine sites in the United States that will host the playoff games of the World Cup Soccer Tournament. This is a big event with between 300,000 and 480,000 live viewers expected during the games in Foxboro alone, in addition to the millions of television viewers across the world. Representatives from the World Cup, the Secret Service, the Bomb Squad, U.S. Customs, the State Department, FAA, State Police, Massachusetts Emergency Management Agency (MEMA), FEMA, Fire Departments, Department of Corrections, County Sheriffs, stadium security, MBTA authorities, public relations, etc., all were in attendance at a March 22 planning meeting. The "political eyes" of the world will be on the United States and the agencies charged with the responsibility of hosting these games.

The Taunton WSFO will provide weather support for the 6 days in which the games will be played in Foxboro. The scheduled games are:

- 6/21/94 at 12:30 pm — Argentina vs. Greece
- 6/23/94 at 7:30 pm — South Korea vs. Bolivia
- 6/25/94 at 2:00 pm — Argentina vs. Nigeria
- 6/30/94 at 7:30 pm — Greece vs. Nigeria
- 7/5/94 at 1:00 pm — Winners of previous games
- 7/9/94 at 12:00 pm — Quarterfinal game (winner from 7/5/94 playoff vs. winner from 7/2/94 game at RFK Stadium in Washington, DC)

Foxboro Stadium has metal bleachers/seats and they are very concerned with lightning strikes. (Last year during the U.S. Cup games, there was a severe thunderstorm warning issued; the storm passed to the south of the stadium.) Also, big concerns are heat and humidity levels.

Although the plans are not entirely finalized, we will be prepared to issue a Public Information Statement several hours prior to game time detailing the expected heat/humidity values and potential for thunderstorms. We will fax this to Tom Rodger (from MEMA Area II), who will be present at the Command Post, which will be set up at the Foxboro State Police barracks. As the day does on and any thunderstorms develop, we will verbally notify Tom Rodger at the Command Post (via a phone line dedicated for our use). He will fan out the information to the World Cup people, fire department, police, stadium security, etc. They need details on thunderstorms as early as 3 or 4 hours before game time. The games typically last only 2 to 2-1/2 hours, shorter than a football game. Support will be needed a little while after the game, too. In the worst case, they will evacuate the stadium and cancel the game. But, if a

non-severe thunderstorm is approaching, it may be possible for them to have everyone move to a position in the main concourse (beneath the seating)...that's for them to decide. [E]

—Glenn Field, WCM, WSFO Taunton, Massachusetts

Mobile Home Tornado Fatalities: Some Observations

Recently, representatives of the Manufactured Housing Association of Oklahoma visited the WSFO in Norman, Oklahoma, in an effort to convince the office to change its statements about the safety of mobile homes in tornadoes. They claimed that the NWS is "unfairly" singling out mobile homes in warnings. Their position is that new manufacturing procedures and tie-down regulations have resulted in improved safety. While it is possible that the improvements in construction and installation may lead to a reduction in fatalities in mobile homes, such a reduction has not occurred yet. Since it appears that this visit is part of a larger, national campaign to change warning statements and safety advisories about tornadoes, we wanted to share some information about the current state of mobile home safety in tornadoes.

Since 1975, fatalities in mobile homes have accounted for almost one-third of all tornado deaths in the United States (Table 1). A 5-year running mean of fatalities indicates that, while non-mobile home fatalities have decreased on average by about 10-15 per year since the late 1970s, mobile home deaths have actually gone up slightly from approximately 12 in the late 1970's to about 15 currently (Table 2).

To normalize the risk by population in mobile homes and other kinds of residences, we've looked at residential fatalities since 1985. From 1985-93, there have been 156 mobile home deaths and 110 in other kinds of residences. Since only 7.1 percent of the United States population lives in mobile homes, this represents a much greater risk than for residents of "permanent" housing. During that time period, the average number of annual deaths per 10 million mobile home residents was 9.8, while it was only .5 in other housing.

It is possible that, in the future, as a result of modern building techniques, mobile homes may become safer in severe convective weather. However, that day has not arrived yet, and it would be imprudent for the NWS or its local offices to de-emphasize the dangers of mobile homes in tornado and severe thunderstorm warnings and in its preparedness work. [E]

—Harold Brooks, NOAA/Environmental Research Laboratory/
National Severe Storms Laboratory, Norman, Oklahoma

—James Purpura, WCM, WSFO Norman, Oklahoma


Table 1: Annual mobile home tornado fatalities (MH), non-mobile homes fatalities (Non-MH), total tornado fatalities and percentage of fatalities in mobile homes for United States from 1975-1993.

| Year | MH | Non-MH | Total | Percent Mobile |
|------|----|--------|-------|----------------|
| 1975 | 13 | 47 | 60 | 21.7% |
| 1976 | 18 | 26 | 44 | 40.9% |
| 1977 | 7 | 36 | 43 | 16.3% |
| 1978 | 15 | 38 | 53 | 28.3% |
| 1979 | 9 | 75 | 84 | 10.7% |
| 1980 | 11 | 17 | 28 | 39.3% |
| 1981 | 14 | 10 | 24 | 58.3% |
| 1982 | 20 | 44 | 64 | 31.3% |
| 1983 | 20 | 14 | 34 | 58.8% |
| 1984 | 43 | 79 | 122 | 35.2% |
| 1985 | 28 | 66 | 94 | 29.8% |
| 1986 | 9 | 6 | 15 | 60.0% |
| 1987 | 25 | 34 | 59 | 42.4% |
| 1988 | 15 | 17 | 32 | 46.9% |
| 1989 | 8 | 42 | 50 | 16.0% |
| 1990 | 9 | 44 | 53 | 17.0% |
| 1991 | 23 | 16 | 39 | 59.0% |
| 1992 | 21 | 18 | 39 | 53.8% |
| 1993 | 13 | 20 | 33 | 39.4% |

Table 2: 5-year running means of data shown in Table 1. "Year" indicates central year for mean, e.g., 1977 is mean of 1975-79.


| Year | MH | Non-MH | Total | Percent Mobile |
|------|------|--------|-------|----------------|
| 1977 | 12.4 | 44.4 | 56.8 | 23.6% |
| 1978 | 12.0 | 38.4 | 50.4 | 27.1% |
| 1979 | 11.2 | 35.2 | 46.4 | 30.6% |
| 1980 | 13.8 | 36.8 | 50.6 | 33.6% |
| 1981 | 14.8 | 32.0 | 46.8 | 39.7% |
| 1982 | 21.6 | 32.8 | 54.4 | 44.6% |
| 1983 | 25.0 | 42.6 | 67.6 | 42.7% |
| 1984 | 24.0 | 41.8 | 65.8 | 43.0% |
| 1985 | 25.0 | 39.8 | 64.8 | 45.2% |
| 1986 | 24.0 | 40.4 | 64.4 | 42.9% |
| 1987 | 17.0 | 33.0 | 50.0 | 39.0% |
| 1988 | 13.2 | 28.6 | 41.8 | 36.4% |
| 1989 | 16.0 | 30.6 | 46.6 | 36.2% |
| 1990 | 15.2 | 27.4 | 42.6 | 38.5% |
| 1991 | 14.8 | 28.0 | 42.8 | 37.0% |

Carson City Emergency Planning Guide and Calendar

The Carson City Local Emergency Planning Committee recently published a local 2-year calendar and family emergency planning guide for public distribution in the Carson City area. One of the sections in this calendar was devoted to weather. Over 9,000 copies of the calendar have been printed. Initial distribution of 4,000 calendars was made through the Carson City School District. School children were required to return a receipt signed by their parents ensuring that the calendars were taken home. Additional distribution is planned via public meetings, local businesses, and government offices. Inclusion of a weather section is another example of the benefits obtained by the NWS when a strong working relationship exists with the emergency management community. 

—Roger Lamoni, WCM, WSFO Reno, Nevada

NWS and the Otter Tail Power Company's "Tornadoes, Nature's Most Violent Storms"

Last year, I coordinated with the Otter Tail Power Company in designing and printing 5,000 copies of a new pamphlet entitled "Winter Storms...The Deceptive Killers." The information was taken from the NWS's publication of the same name. This spring, we once again developed a small, but very well-written pamphlet using the information from the NWS brochure "Tornadoes...Nature's Most Violent Storms." This pamphlet provides answers to many of the questions asked about tornado safety. The size makes it convenient to keep handy in homes or vehicles. Otter Tail Power provided the WSO Fargo office with 10,000 copies. I am currently working with them to get a version of the thunderstorm and lightning brochure published. 


—Lou Bennett, Official in Charge, WSO Fargo, North Dakota

Sky Awareness Week 1994 Wrap-up and Plans for 1995

Sky Awareness Week (SAW) 1994 netted 30 proclamations (29 states and one from the District of Columbia). Since SAW began in 1991, 36 states have proclaimed Sky Awareness Week at least once. While many proclamations were obtained through the efforts of meteorologists and weather broadcasters, four state proclamations belong to teachers. In Delaware, a librarian, working with an English teacher, used the event as a writing assignment. One hundred students wrote letters to the governor requesting that a proclamation be issued.

In addition to some cloud photography displays and local science or weather days, many schools involved students in a suite of sky watching activities. One West Virginia school was highlighted in a local newspaper story. There were also interviews and spots on radio and television shows, and several NWS offices issued press releases and broadcast information on NWR.

But 1994 marked the first year that the Internet was used to bring schools from the United States, Canada, and New Zealand together in a sky and cloud observation program. Data was collected daily by students during the school week of April 24-29 and transmitted via the Internet. A compiled message was then retransmitted back to the schools. In addition to weather watching, schools exchanged information about local climatology and geography, the lunar cycle, and even some local weather folklore. Some schools created innovative activities, centered around the project, for their students. This pilot project (only involving 15 schools this year) will be expanded in 1995.

We are working on obtaining state proclamations, planning local and national activities, and expanding the program beyond the classroom setting. We welcome involvement from anyone with an interest in the fostering sky awareness and literacy. 

—Barbara Levine, President, THINK WEATHER, Inc., 1522 Baylor Avenue, Rockville, Maryland, 20850 (301-762-SNOW; Internet: FOURCLOUDS@AOL.COM)



Publications and Audiovisuals

Update on New Publications

The NWS is proud to announce the release of two new brochures. They are:

- "Thunderstorms and Lightning...The Underrated Killers!" (NOAA PA 92053)
- "Hurricanes...The Greatest Storms on Earth" (NOAA PA 94050).

These are the fourth and fifth in a series of multicolored, 12-page brochures produced by the NWS in cooperation with the American Red Cross and FEMA.

The thunderstorms and lightning publication features particulars about the development of thunderstorms, their offspring, and the dangers of lightning. Provided also are safety messages, watch/warning terminology, and steps to create a family disaster plan.

The hurricane brochure focuses on hurricanes and how they form and their resulting hazards, i.e., storm surge/tide, winds, heavy rains, floods, and tornadoes. It also discusses areas at risk; surveillance and forecasting; information for local decision makers; watch/warning terminology; personal and community preparedness before, during and after a hurricane; and family disaster planning.


Of the 150,000 copies printed of each of the two brochures, 10,000 copies were given to the American Red Cross for initial distribution to selected chapters. As per our agreement with the American Red Cross and FEMA, they both received a set of negatives for these two brochures. In turn, the ARC will use their negatives to print greater quantities of both in-depth brochures.

Also, the American Red Cross has made available a 2-sided, tri-fold pamphlet **Are You Ready for a Hurricane?** (NOAA PA 94053). Approximately, 50,000 copies of this pamphlet have been shipped from the American Red Cross to NLSC in Kansas City, Missouri. This pamphlet is for distribution to the general public and contains safety rules, watch/warning terminology, and information on developing a family disaster plan. If someone requests additional information concerning hurricanes, then the NWS 12-page, in-depth brochure should be provided. This NWS brochure is an excellent resource for emergency managers, the media, schools and teachers, and local decision makers who need more detailed information on hurricanes. The ARC will provide copies of the Spanish version of the hurricane pamphlet (NOAA PA 94054) and the poster (NOAA PA 94055) at a later date.

The pamphlet, **Are You Ready for a Thunderstorm?** (NOAA PA 93051), has been available for some time now from NLSC. The Spanish version (NOAA PA 93052) and the Poster (NOAA PA 93053) in English and Spanish can also be obtained from NLSC.

Many thanks go to Bill Bunting (WSO Pleasant Hill, Missouri) and Rainer Dombrowsky (WSH) for their excellent contributions in producing the in-depth thunderstorms and lightning brochure for the NWS.

Also, our special thanks goes to Max Mayfield from the National Hurricane Center and Mary Jo Parker, WCM, Wilmington, Ohio, who provided their time and expertise in the monumental task of developing the hurricane publication. Without the outstanding assistance from these field people, these publications would not have been possible. Furthermore, the NWS is especially grateful to Rocky Lopes and the American Red Cross for their support in these efforts!

All these publications can be ordered from the NLSC in Kansas City, Missouri. 

—Linda Kremkau, Warning and Forecast Branch

New Awareness Brochure on "Heat Wave" Available

The American Red Cross is pleased to announce that a new brochure called "Are You Ready for a Heat Wave?" is now available from both local Red Cross chapters as well as the NOAA NLSC warehouse in Kansas City. The stock numbers are: NOAA PA 94052 (from NOAA NLSC) and ARC 5032 (from the Red Cross.) They are available by the copy from the NLSC and in packages of 25 from the Red Cross.

This 2-page, four-color brochure gives information on heat wave terminology, updated and accurate information on health and medical information for treating heat-related emergencies, and provides an interactive way for families to plan and prepare for dealing with hot weather.

The brochure was developed by the American Red Cross in cooperation with the Warning and Forecast Branch, WSH. While the former brochure on Heat Wave (NOAA PA 85001) is still available from the NWS, some health and medical information in it is incorrect. The new Red Cross brochure reflects the most recently, technically accurate, medical information available on treatment of heat emergencies.

The new Red Cross brochure does not provide a "heat index" scale or other more technical information. It was found that the scale was difficult for some people to interpret. However, we realize that some people still find this information useful, depending on the audience. We recommend, however, since health and medical information in the former brochure is different from the information in the Red Cross brochure, that you not distribute both brochures to the public, particularly at the same time. People will notice the discrepancies and question your credibility and the sponsoring organizations. To avoid that, use one or the other brochures, but not both.

This new "Are You Ready?" brochure is part of a continuing series. Other brochures are available from the Red Cross and NOAA/NLSC (see table below). Please note that all Red Cross brochures in this series come in packages of 25. When placing orders through your local Red Cross chapter, be aware that the chapter is charged for shipping. Anything you can do to help offset shipping charges would be appreciated.

—Rocky Lopes, American Red Cross National Headquarters Disaster Services

| Subject | Red Cross | | NOAA PA # | |
|------------------|-----------|-----------|-----------|----------|
| | English | Spanish | English | Spanish |
| Hurricane | ARC 4454 | ARC 4454S | 94053 | 94054 |
| Earthquake | ARC 4455 | ARC 4455S | N/A | N/A |
| Residential fire | ARC 4456 | ARC 4456S | N/A | N/A |
| Tornado | ARC 4457 | ARC 4457S | 92057 | 92058 |
| Flood | ARC 4458 | ARC 4458S | 92059 | 92060 |
| Winter Storm | ARC 4464 | ARC 4464S | 91003 | 91004 |
| Thunderstorm | ARC 5009 | ARC 5009S | 93051 | 93052 |
| Heat Wave | ARC 5032 | (coming) | 94052 | (coming) |

forwarded to the Regions for distribution. Neither of these lists will be stocked at NLSC. Anyone interested in obtaining a single copy can contact the Warning and Forecast Branch.

Remember, the maximum number of copies one can order is 300. For NWS offices only, please fill out NOAA Form 24-12 and send to NLSC. NLSC will ship only the maximum quantity of 300. Any requests for over the 300 limit **must** be submitted to WSH, Warning and Forecast Branch. If approved, we will submit the request directly to NLSC. For those individuals outside the Weather Service who are interested in acquiring quantities of NWS brochures, please write to:

National Weather Service, NOAA
Warning and Forecast Branch, W/OM11
1325 East West Highway, Rm. 14370
Silver Spring, Maryland 20910

The pamphlet, "Tornado Safety Rules in Schools" (NOAA PA 74025), is out of stock and will not be reprinted. Much of the information contained in this publication is included in the new in-depth brochure "Tornadoes...Nature's Most Violent Storms" (NOAA PA 92052).

If you have any questions concerning these brochures and/or their availability, please contact Linda Kremkau or Rainer Dombrowsky at (301) 713-0090.

Other NWS Hazard Awareness Materials

- **Todd Heitkamp**, WCM, WSFO Sioux Falls, South Dakota, has completed the "Thunderstorms and Lightning...The Underrated Killers" Presenter's Guide and Slide Resource Library. The American Red Cross and FEMA will be given an opportunity to review this package in the near future. Also, a copy of the script will be sent to the regions for comment. Because of limited funding this year, this package will be printed using FY 95 funds and distributed by early 1995 before the spring severe weather season begins.
- The following NWS brochures were printed this spring.

| Name | NOAA PA | Copies |
|---|---------|--------|
| Heat Wave, A Major Summer Killer | 85001 | 75,000 |
| Natural Hazard Watch and Warning Poster | 86001 | 25,000 |
| Hurricane! A Familiarization Booklet | 91001 | 30,000 |

Even though the **Hurricane! A Familiarization Booklet** was reprinted this spring, it is once again out of print. Anyone interested in obtaining a single copy can contact the Warning and Forecast Branch at (301) 713-0090.

The brochure, **Advanced Spotter's Field Guide** (NOAA PA 92055), is out of stock at the NLSC in Kansas City, Missouri. Plans to print more copies are scheduled for FY 95.

- Copies of the Atlantic hurricane names entitled, "Naming of Hurricanes" (NOAA PA 79017), will be shipped directly to the Regions for distribution to local NWS offices. In addition, the latest list of Eastern Pacific Tropical Cyclone names is being

- The National Audiovisual Center (NAC) will no longer have available for sale/rent "The Safest Places in Schools" slide set. It will be replaced with the new "Tornadoes...Nature's Most Violent Storms" Slide Set and Presenter's Guide which has been submitted to NAC for reproduction. The cost and the order number have not been established as yet but should be available by late June 1994. Anyone interested in purchasing this slide set and presenter's guide, please contact NAC's Customer Services Section at (301) 763-1896.

- Attachment B is the latest list of NWS publications which includes the new heat wave and hurricane brochures.

- For information on upcoming NWS hazardous weather awareness weeks, see attachment C.

—Linda Kremkau, Warning and Forecast Branch

Aware Report Roster

Attachment D is the *Aware Report* Roster. Please note that most individuals on this list are now WCMs. The WCM will no longer appear after the station. Those offices that have not made the WCM selection yet will continue to have either WPM or Focal Point after the station. Please notify me at 301-713-0090 if there are any changes. Also, if you know of someone who would like to be placed on the *Aware Report* distribution list, please have him/her contact the Warning and Forecast Branch at the phone number above.

—Linda Kremkau, Warning and Forecast Branch



Update on the Office of Meteorology's WSOM Chapters

| WSOM Chapters | Status |
|--|--|
| OML to C-01, Style and Punctuation in NWS Products | A draft was reviewed by regional and field offices. Distribution is expected this fall. |
| C-11, Zone and Local Forecasts (main section) | Work will begin on a draft revision late in 1994. |
| C-12, 6- to 10-Day, 30-Day, and 90-Day Outlooks | Distribution of the new chapter occurred in February 1994. |
| OML to C-20, National Public Weather Products | An OML will be issued this summer to include Canadian Urban Forecasts and additions to the Foreign Temperature and Weather Table. |
| C-40, Severe Local Storm Warnings | C-40 is out for a full field review. The review is due back to WSH by the end of June. Look for implementation by late summer/early fall 1994. The new chapter: (1) incorporates Universal Generic Codes (UGC) into all appropriate C-40 products; (2) provides all new examples of watches, warnings, statements, and short-term forecasts reflecting philosophies of the NWS MAR; (3) incorporates conveniences associated with SRWARN; (4) eliminates the use of contractions (except for computer model contractions) but not acronyms in all products. This version does not include any changes associated with the severe local storms watch decentralization plan. Those changes will be integrated into the next chapter revision scheduled for 1995. |
| C-41, Hurricane Warnings | The NWSEO had concerns over portions of C-41. These should be resolved by mid-May 1994. These delays will push the printing and distribution of C-41 to late June or early July. We will provide the Regions with signed copies for reproduction and distribution to field offices. |
| C-45, Meteorological Discussions and Forecast Coordination | Late revisions were sent to the union in May 1994. Distribution is expected this summer. |
| C-47, County Warning Areas | The revised chapter was distributed in late September. Necessary changes to the appendix for current and modernization era county warning area (CWA) changes will be issued as needed. |
| OML to C-49, Warning Coordination and Hazard Awareness Program | An OML will be issued this summer to update Section 6, Coordination During Transition to a Modernized NWS, and Section 7.2, Non-NWS Material Requests. |
| C-60, Radio/TV Dissemination; C-61 Telephone Dissemination; C-62, Newspaper Dissemination; C-66 Dissemination of Public Warnings; and C-67, News Wire Dissemination | Work will begin on updating and probably consolidating these chapters late in 1994. |

WSOM Chapters

Status

D-20, Aviation Area Forecasts
D-22, In-flight Aviation Weather Advisories

In June 1994, OMLs will be filed with these chapters making the current Aviation Area Forecast test procedures permanent and adjusting AIRMET procedures. A revised portion of D-20 has been mailed to the Regions. This mailed exhibit replaces petroleum grid names. Significant meteorological conditions in the Gulf of Mexico area forecast are now described using one or more of the following: (1) latitude/longitude; (2) selected airports; (3) Supplemental Aviation Weather Reporting Station platforms; and (4) data buoy locations.

D-21, Aviation Terminal Forecasts

Adjudication of the comments regarding the draft chapter has been accomplished and the redraft has been sent to the union for review as of May 1994. The chapter is expected to be finalized and distributed to the field by July 1994.

D-23, Special Aviation Forecasts and Events
D-91, Aviation Liaison and User Support Program

Work is underway on updating and adjusting the contents of these two chapters. Drafts are expected to be sent to the regions for review in September 1994.

D-25, Support to Air Traffic Facilities

The chapter is currently under redraft. NWS regions and FAA comments are being incorporated and/or adjudicated. The completed redraft is expected to be sent for union review in June 1994. Projected distribution of the new chapter is expected in August 1994.

D-30, Transcribed Weather Broadcast Text Products

Aviation Services Branch is awaiting information regarding route forecast revalidation from the FAA. Upon receipt of that information, an OML is scheduled to be drafted in August 1994 regarding the changes.

D-79, NWS Flight Operations

The chapter redraft has been completed and sent to the union for review. The new chapter is expected to be distributed in June 1994.

F-42, Storm Data and Related Reports

By the time you read this, F-42 should be signed off by Dr. Friday and be at the printer. The new chapter is due for implementation July 1, 1994. It uses the Paradox "Storm" software script to create, edit, and upload the Storm Data product. Paradox "Storm" should require the user (WCM, WPM, et al.) only a few hours of use to acclimate. The User's Guide, an Appendix to F-42, is easy to follow. The word processing, although not fully intuitive, is sufficient for this purpose.

G-52, Local Emergency Communications Planning

The OML to this chapter is under review by the Union as of this writing. This is the OML to allow NWS warning offices to purchase amateur radio equipment and peripherals. It has long been awaited by the Regions and warning offices alike. Expect its implementation no later than June 1994.

| NOAA PA | NAME |
|---------|--|
| 70027 | Survival in a Hurricane (Wallet Card) |
| 76015 | NOAA Weather Radio |
| 77014 | Flash Flood (Wallet Card) |
| 77020 | Hurricane Tracking Chart (Atlantic) |
| 77021 | Hurricane Tracking Chart (Eastern and Central Pacific) |
| 78019 | Storm Surge and Hurricane Safety with North Atlantic Tracking Chart |
| 81011 | Spotter's Guide for Identifying and Reporting Severe Local Storms |
| 82002 | Dust Storm Driving Safety (Wallet Card) |
| 82004 | Watch Out Storms Ahead |
| 85001 | Heat Wave |
| 85002 | Hawaiian Hurricane Safety Measures with Central Pacific Tracking Chart |
| 85005 | Tornado Safety Tips (Como Protegerse En Caso De Tornado) (WC) |
| 85006 | Survival in a Hurricane (Como Sobrevivir En Un Huracan) (Spanish 70027) (WC) |
| 86001 | Natural Hazard Watch & Warning Poster (English/Spanish) |
| 91001* | Hurricane! A Familiarization Booklet |
| 91002 | Winter Storms...The Deceptive Killers |
| 91003 | Red Cross - Are You Ready for a Winter Storm? |
| 91004 | Red Cross - Are You Ready for a Winter Storm? (Spanish Version) |
| 91005 | Red Cross Poster - Are You Ready for a Winter Storm? (English/Spanish) |
| 92050 | Flash Floods and Floods...The Awesome Power! |
| 92051 | SKYWARN Decal |
| 92052 | Tornadoes...Nature's Most Violent Storms |
| 92053 | Thunderstorms and Lightning...The Underrated Killers! |
| 92054 | FEMA's Emergency Preparedness Materials Catalog |
| 92055** | Advanced Spotter's Field Guide |
| 92056 | Mariner's Guide to Marine Weather Services |
| 92057 | Red Cross - Are You Ready for a Tornado? |
| 92058 | Red Cross - Are You Ready for a Tornado? (Spanish) |
| 92059 | Red Cross - Are You Ready for a Flood or a Flash Flood? |
| 92060 | Red Cross - Are You Ready for a Flood or a Flash Flood? (Spanish) |
| 92061 | Red Cross Poster - Are You Ready for a Tornado? (English/Spanish) |
| 92062 | Red Cross Poster - Are You Ready for a Flood or a Flash Flood? (E/S) |
| 92501 | NOAA Brochure |
| 93051 | Are You Ready for a Thunderstorm? |
| 93052 | Are You Ready for a Thunderstorm? (Spanish) |
| 93053 | Are You Ready for a Thunderstorm? (Poster) (E/S) |
| 93054 | Key to New International Aerodrome Forecast (TAF) and New Aviation Routine Weather Report (METAR) (Card) |
| 93055 | Key to Manual Weather Observations and Forecasts (Card) |
| 93056 | A Pilot's Guide to Aviation Weather Services (replaces PA 71005) (Booklet) |
| 93057 | Key to ASOS (Automated Surface Observing System) Weather Observations (Card) and AWOS (Automated Weather Observing System) Observations (FAA Card) |
| 93058 | ASOS Guide for Pilots (Booklet) |
| 93059 | A Change in the National Weather Service |
| 93060 | Spotter ID Card (replaces 84001) |
| 94050 | Hurricanes...The Greatest Storms on Earth |
| 94051 | Aviation Modernization |
| 94052 | Are You Ready for a Heat Wave? |
| 94053 | Are You Ready for a Hurricane? |
| 94054 | Are You Ready for a Hurricane? (Spanish) |
| 94055 | Are You Ready for a Hurricane? (Poster) (English/Spanish) |

* Out of print.

** Out of print at this time--will be available by winter 1994/95.

Hazardous Weather Awareness Weeks

| <u>State</u> | <u>Campaign</u> | <u>Date</u> | <u>Drills</u> |
|-----------------------|--------------------------------|----------------|---------------|
| <u>Eastern Region</u> | | | |
| Massachusetts | Severe Weather | May 8-14, 1994 | May 10 |
| Connecticut | Severe Weather | May 8-14 | May 10 |
| Rhode Island | Severe Weather | May 8-14 | May 10 |
| Maryland | Hurricane | May 29-June 4 | |
| Virginia | Hurricane | July 17-23 | |
| <u>Central Region</u> | | | |
| Wyoming | Hazardous Weather | May 2-6, 1994 | May 4 |
| North Dakota | Hazardous Weather | May 5 | |
| <u>Western Region</u> | | | |
| Idaho | Severe Weather Media Workshops | May 1994 | |
| N. California | Warning Dissemination Test | May | |
| S. California | Thunderstorm | June | |
| Arizona | Flash Flood | June 5-11 | |
| Nevada | Flash Flood | June | |
| Utah | Lightning Awareness Week | June | |

ATTACHMENT **D** *Aware Report Roster*

Spring 1994

NWS Headquarters Staff, W/OM11

301-713-0090

| | | | |
|-------------------|--|----------------|--|
| Donald Wernly | Chief, Warning & Forecast Br. | Ron Berger | Synoptic and Dissemination Meteorologist |
| Linda Kremkau | Editor | Chris Adams | Senior Social Scientist |
| Bill Alexander | Mesoscale Meteorologist | Estella Speaks | Secretary |
| Rainer Dombrowsky | Warning Coordination and Tropical Met. | LaShone Darden | Office Automation Clerk |
| Rod Becker | Public Weather Program Meteorologist | Kina Wallace | Student Aide |

Eastern Region

| | | | | | |
|---------------------|----------------------|--------------|------------------|----------------------------|--------------|
| <u>Rick Watling</u> | Regional (Focal) | 516-244-0123 | Wayne Jones | Greenville-Spartanburg, SC | 803-439-6605 |
| Solomon Summer | Regional Hydrologist | 516-244-0111 | Joe Miketta | Mount Holly, NJ | 609-261-6600 |
| Dick Westergard | Albany, NY | 518-869-6394 | Dan Bartholf | Newport, NC | 919-223-5122 |
| Herb White | Binghamton, NY | 607-729-7629 | James Weyman | Pittsburgh, PA | 412-262-2170 |
| Harry McIntosh | Blacksburg, VA | 703-857-2622 | Al Wheeler | Portland (Gray), ME | 207-775-7781 |
| Gary Conte | Brookhaven, NY | 516-924-0037 | George Lemons | Raleigh, NC | 919-860-1234 |
| Judy Levan | Buffalo, NY (Focal) | 716-632-1319 | Tom Dunham | State College, PA | 814-234-9412 |
| Steve Hogan | Burlington, VT | 802-862-2475 | Glenn Field | Taunton, MA | 508-823-1900 |
| Jerry Harrison | Charleston, SC | 803-744-3207 | Bill Sammler | Wakefield, VA | 804-899-4200 |
| Mike Washington | Charleston, WV | 304-342-7771 | Barbara McNaught | Washington, DC | 703-260-0107 |
| Larry Gabric | Cleveland, OH | 216-265-2370 | Mary Jo Parker | Wilmington, OH | 513-383-0031 |
| Steve Naglic | Columbia, SC | 803-822-8135 | Tom Matheson | Wilmington, NC | 910-762-4289 |

Southern Region

| | | | | | |
|---------------------|----------------------|--------------|----------------|--------------------|--------------|
| <u>Gary Woodall</u> | Regional | 817-334-2812 | Renee Fair | Little Rock, AR | 501-834-0308 |
| Dave Smith | Regional Hydrologist | 817-334-2674 | Larry Vannozzi | Lubbock, TX | 806-743-7361 |
| Keith Hayes | Albuquerque, NM | 505-766-2170 | Dennis Decker | Melbourne, FL | 407-259-7589 |
| Douglas Crowley | Amarillo, TX | 806-376-2360 | John White | Memphis, TN | 901-757-6441 |
| Barry Gooden | Atlanta, GA | 404-763-7886 | Jim Lushine | Miami, FL | 305-536-4303 |
| Brian Peters | Birmingham, AL | 205-290-7305 | Frank Revitte | New Orleans, LA | 504-589-6891 |
| Bob Goree | Tallahassee, FL | 904-942-9637 | Jim Purpura | Norman, OK | 405-366-6583 |
| Jim Stefkovich | Fort Worth, TX | 817-334-3884 | Robert Garcia | San Juan, PR (WPM) | 809-253-4586 |
| Gene Hafele | Houston, TX | 713-534-5625 | Larry Eblen | San Antonio, TX | 210-826-4679 |
| James Butch | Jackson, MS | 601-965-4639 | Rob Balfour | Tampa, FL | 813-225-7747 |
| Vacant | Lake Charles, LA | 318-477-5285 | Steve Piltz | Tulsa, OK | 918-581-7748 |

Central Region

| | | | | | |
|---------------------|------------------------|--------------|------------------|-------------------------|--------------|
| <u>David Runyan</u> | Regional | 816-426-3239 | David Tucek | Indianapolis, IN | 317-856-0362 |
| Lee Larson | Regional Hydrologist | 816-426-3220 | Bill Bunting | Kansas City, MO | 816-987-5147 |
| Richard May | Bismarck, ND (Focal) | 701-250-4224 | Norman Reitmeyer | Louisville, KY | 502-969-8842 |
| Joseph Sullivan | Cheyenne, WY | 307-772-2468 | Anton Kapella | Milwaukee/Sullivan, WI | 414-297-3243 |
| Jim Allsopp | Chicago, IL | 815-834-0600 | Todd Krause | Minneapolis, MN (Focal) | 612-725-3741 |
| Robert Glancy | Denver, CO | 303-361-0661 | Brian Smith | Omaha, NE | 402-359-2394 |
| Jeffrey Johnson | Des Moines, IA | 515-270-4501 | Todd Heitkamp | Sioux Falls, SD | 605-330-4244 |
| John Kottke | Detroit/White Lake, MI | 313-625-3309 | Jim Krampfer | St. Louis, MO | 314-447-1876 |
| Brian Francis | Dodge City, KS | 316-227-7140 | Mike Akulow | Topeka, KS | 913-232-1493 |
| Dennis Hull | Goodland, KS | 913-899-2360 | Gary Campbell | Wichita, KS | 316-943-5893 |
| Vacant | Hastings, NE | 402-462-2127 | | | |

Western Region

| | | | | | |
|------------------------|----------------------|--------------|------------------------|-------------------------------|--------------|
| Richard Douglas | Regional (WPM) | 801-524-4000 | Tom Ainsworth | Portland, OR (Focal) | 503-326-2340 |
| Bob Tibi | Regional Hydrologist | 801-524-5137 | Roger Lamoni | Reno, NV | 702-784-5794 |
| Carl Weinbrecht | Boise, ID | 208-334-9860 | Roger Pappas | Sacramento, CA | 916-551-1419 |
| John Lovegrove | Eureka, CA | | Dave Toronto | Salt Lake City, UT | 801-524-5133 |
| Lynn Valtinson | Great Falls, MT | 406-453-9957 | Charles Morrill | San Francisco, CA | 408-291-7767 |
| Tim McClung | Los Angeles, CA | 805-988-6610 | Ted Buehner | Seattle, WA | 206-526-6098 |
| Mike Franjevic | Phoenix, AZ | 602-379-4607 | | | |

Alaska Region

| | | |
|------------------------|-------------------------|--------------|
| Robert Robinson | Regional (WPM) | 907-271-3507 |
| David Goldstein | Anchorage | 907-271-5102 |
| John Lingass | Fairbanks | 907-456-0247 |
| Robert Mosley | Juneau (Focal) | 907-586-7493 |
| George Carte | Palmer (ATWC) | 907-745-4212 |

Pacific Region

| | | |
|-----------------------|----------------------------|--------------------|
| James Partain | Regional (WPM) | 808-541-1671 |
| Thomas Heffner | Honolulu, HI | 808-541-1698 |
| Thomas Yoshida | Guam (Focal) | 705-344-4160 |
| Akapo Akapo | Pago Pago (Focal) | (011) 684-699-9130 |

NCDC - Storm Data

| | | |
|----------------------|---------------|--------------|
| Lanny Dimmick | Asheville, NC | 704-271-4458 |
|----------------------|---------------|--------------|

