Aware

Spring 1998

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

Inside Aware

From the Director's Corner

Results, Results, Results

When you contemplate buying a new house, the Realtor's emphatic remark is that the three most important aspects of a property are *location, location, and location.* Our new Director, John J. (Jack) Kelly, Jr., is just as emphatic when he states that, for the Weather Service, we will be measured by just three things—*results, results, and results.*

With Jack Kelly coming on board, we have seen a dramatic shift in how the National Weather Service (NWS) does business. The NWS is a multimillion dollar government agency that must continue to reinvent itself to ensure that it is responsive to customer needs. In fact, the NWS is one of the most customer focused agencies in the Federal government. We are also blessed with a network of field offices that allows us to be close to our customers. This is an opportunity and a strength that many other agencies lack. We must make the most of this opportunity.

Until now, all of our energy has been directed toward the Modernization. As we complete this massive effort, we can be proud of how we integrated new systems and a new field structure to serve our customers better. Now the big challenge begins: that is, for each of us to strive to improve our products and services. This must be an ever-questioning process. A sifting and winnowing of what we do to keep us at the forefront of service delivery.

We have a proud past, sparked with many accomplishments, but our vision now must be on the future. It is not what we have done, but what we will do that is important. As Jack Kelly has stated, ours is a "world class" Weather Service. Through continuous improvements, we will keep it that way. And to keep it that way, we all will be totally results-oriented and focused on our customers' needs. It is an exciting time, for us and for our Nation. We will continue to improve and deliver the high quality services that our Nation has grown to expect.

Louis W. Uccellini, Director, Office of Meteorology

CUSTOMER SERVICE

Timeline Adjusted for Convective Watch Decentralization Program

The Office of Meteorology (OM) has put a revised version of the Convective Watch Decentralization (CWD) Plan on the OM Internet Home Page. The update plan provides the latest information on delivery of required computer and communications technologies, staffing levels and training.

The NWS long has asserted that implementing the CWD will be based on availability of required technologies, computer capabilities, staff and training. This assertion remains constant today. *No Phase of the CWD will begin until all requirements for that Phase are fully met.* Recent changes to the timetable for delivering Advanced Weather Interactive Processing System (AWIPS) capabilities to future Weather Forecast Offices (WFOs) have meant adjusting the CWD timeline.

The timeline for CWD implementation was discussed at a recent NWS Directors' conference. The Directors agreed that Phase I should proceed, but that NWS must complete other elements of the modernization, e.g., AWIPS deployment, staffing of WFOs, training of forecasters, etc., before aggressively moving toward convective watches-by-WFO.

Phase I of the CWD introduces a WFO narrative product called the Watch County Notification (WCN), used to redefine and clear watches that are issued by the Storm Prediction Center (SPC). Phase I also includes hourly updates of convective watches by the SPC, as depicted on the national radar summary chart. Those updates are based on WCNs. To accomplish these tasks, the SPC and future WFOs need software to perform their respective tasks and voice coordination/communication capability that allows "party line" conversations—secure, yet flexible and intuitive. The *adjusted* schedule is as follows:

Spring 1998: National Centers for Environmental Prediction (NCEP) Service Centers and future WFOs receive voice coordination and communication capability that meets Phase I requirements. WFO Phase I software for non-AWIPS sites works on personal computers (PCs). This effort is being led by Herb White and Rainer Dombrowsky.

Summer 1999: Phase 1 Field Test. Using historical weather data on quiet weather days, SPC products are generated and WFOs respond with Phase I products. The Field Test will measure the usefulness of equipment, software, communications technologies, and products. Service evaluation will be performed internally and externally. Customer acceptance is needed before moving toward Phase I operations.

Winter 1999: Phase I implemented after customer notification. Offices doing watch redefines using product SLS (Severe Local Storms) and watch clearances using Special Weather Statements will switch to the WCN. Spin-up offices, NEXRAD Weather Service Offices (NWSO) with public forecast responsibility begin WCNs for their County Warning Forecast Area. As spin-up offices assume public forecast responsibility, they would pick up the WCN.

Service evaluation continues during Phase I operations to measure user acceptance of NWS convective watch products and to refine product formats and delivery capabilities. One key issue is whether customers can work with the many more WCNs issued during Phase I than predecessor redefines (SLS) and clearances (SPS).

While the consensus is to proceed with Phase I, Phases II, III and IV are on hold. One concern is the need to evaluate customers' abilities to receive and process what will be many more watches from WFOs in Phases II and beyond.

NWS management and most of our customers believe the watch decentralization is sound; however, our approach must be cautious. Service evaluation will be critical during Phase I and in measuring the quality, utility and acceptance of our products and services.

William Alexander, Mesoscale Manager

Aware

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Aware on-line—http://www.nws.noaa.gov/om/public.htm

NWS Now Using Short-Fuse Bullet-Style Warnings

On April 15, NWS began using a national standard bullet format for all short-fuse warning products including:

- Severe thunderstorms
- Tornadoes
- Flash floods
- Special marine.

The impetus to switch to a national standard bullet warning format is customer driven. During the past 2 years, two NWS Regions began experimenting with PC software that would create and disseminate warnings using terse, easy-to-read, bullet formats.

These field experiments proved successful, except that the formats differed causing compatibility problems for users. In fact, other offices began creating their own bullet warning formats. While the products are brief, logical, and clear, they caused problems for those who redistribute our critical information.

The new bullet format allows critical information to stand out in a standard sequential fashion on individual lines, with white space between bullets. The new appearance makes it easier to review and read the warning quickly.

No product identifier/header changes and no Universal Geographic Code changes are required by NOAA Weather Wire Service (NWWS), Family of Services (FOS), or other NWS customers. Some TV stations, however, possibly including cable, have to ensure equipment used to generate a crawl can accommodate the new warning format. The short-fuse warning products affected are illustrated in the box below.

Content of the warnings remains the same; only their appearance changes. In order of appearance, bullets contain the following information:

- Type of warning and location of area warned
- Valid time
- Time of event . . . basis for warning . . . movement
- Pathcast (optional)

A sample warning format follows:

ALBSVRALB
TTAA00 KALB 262118
NYC095-262200-

BULLETIN - EAS ACTIVATION REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE ALBANY NY
517 PM EDT SAT JUL 26 1997

THE NATIONAL WEATHER SERVICE IN ALBANY HAS ISSUED A

- SEVERE THUNDERSTORM WARNING FOR...
- SCHOHARIE COUNTY IN EASTERN NEW YORK
- UNTIL 600 PM EDT
- AT 515 PM EDT . . . NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED A SEVERE THUNDERSTORM 5 MILES WEST OF COBLESKILL . . . MOVING TO THE EAST AT 20 MPH.
- THE SEVERE THUNDERSTORM WILL BE NEAR...
- COBLESKILL AT 520 PM EDT
  SCHOHARIE AT 545 PM EDT

HAIL TO 2 INCHES IN DIAMETER AND WIND GUSTS TO 70 MPH ARE LIKELY. PERSONS IN OR NEAR THESE AREAS SHOULD TAKE SHELTER IN A STRONG BUILDING AWAY FROM WINDOWS

...END OF EXAMPLE...

If you have any questions, comments or suggestions, contact Bill Alexander at 301/713-0090 x 115.

William Alexander, Mesoscale Manager

Short-Fuse Warning Product	NWWS ID	WMO Header* for FOS
Severe Thunderstorm Warning	CCCSVRNNN	WUUS1 KNNN
Tornado Warning	CCCTORNNN	WFUS1 KNNN
Flash Flood Warning	CCCFFWNNN	WRUS1 KNNN
Special Marine Warning	CCCSMWNNN	WMUS1 KNNN

*Subject to change summer 1998

Changes Recommended for Severe Thunderstorm Warning Criteria

In response to a decade of concern about criteria for designating thunderstorms as "severe," recommendations for changes have been proposed.

During the past year, the large number of severe thunderstorm warnings has significantly impacted performance of the Emergency Alert System (EAS) in some areas. Because of this, some media outlets decided not to activate the EAS for Severe Thunderstorm Warnings.

In May 1997, OM assembled a team of NOAA employees and external customers to examine severe thunderstorm warning criteria, determine if changes are needed, and if changed, to what threshold of wind and/or hail size.

The Severe Thunderstorm Warning Criteria Team looked at science and service aspects of Severe Thunderstorm Warning thresholds. Since the team was large (30) and diverse, it was split into four subgroups:

- Emergency Management/Customer Service
- Science-Research/Training
- Science/Operations
- External Users.

The four subgroups cited both formal and informal studies performed by the NWS, insurance property loss groups and structural engineering firms, among others, addressing the problem. Informal surveys of emergency managers (EMs) also were part of the process.

Background and Recommendations

The wind criteria for a Severe Thunderstorm Warning (winds gusting 50 knots or greater) has been in effect since 1970. This standard was set when the Weather Bureau agreed to lower its criteria from 65 knots to be consistent with the requirements for the Aviation Severe Thunderstorm Watch. Hail criteria for a Severe Thunderstorm Warning (hail of 3/4 inch or greater) have been in effect since March 1954. This hail size was chosen as "the smallest size of hailstones that cause significant damage at airplane speeds between 200 and 300 mph."

The committee recommended adopting a new threshold of 1 inch as the minimum hail size for a Severe Thunderstorm Warning. Further, it recommended that the wind speed threshold be left at or near 50 knots.

Basis for Recommendation

This is the majority opinion of the Science/Research-Training, Science/Operations, and Customer Service Subgroups.

- Regarding **hail criteria**, from a science perspective various factors point to 1-inch hail as a minimum threshold of significant damage, if we are defining a Severe Thunderstorm as that "which poses a threat to life and property."

  - If a Severe Thunderstorm is defined in this way, we may need further definition by the Science/Research-Training Subgroup. This subgroup took a particularly close look at the property that could be moved to safety given sufficient lead time in a warning, especially automobiles. The Science/Research-Training Subgroup obtained data from engineering sources indicating hail begins damaging cars at around 1 inch.

  - Engineering data available to the External Users Subgroup indicated a 1-inch hail size to be the threshold of damage to residential glass skylights and single pane windows.

  - There are no instances of serious personal injury on record in *Storm Data* resulting from hail less than 1 inch in diameter. In fact, from 1986 to 1996, *Storm Data* has recorded only six instances of ANY injuries from hail less than 1 inch out of 23,697 reports! Of these, five appear to be questionable (coded incorrectly, injury actually due to wind blown debris, indirect injuries, etc.). Almost all accounts of serious personal injury or death are from hailstones at or larger than 1 inch, usually *much* larger than 1 inch.

- Aviation users rely on Convective SIGMETS and related products for information on thunderstorm related hazards, e.g., convective low-level wind shear, hail, turbulence, icing, etc. Criteria for issuing a Convective SIGMET includes:

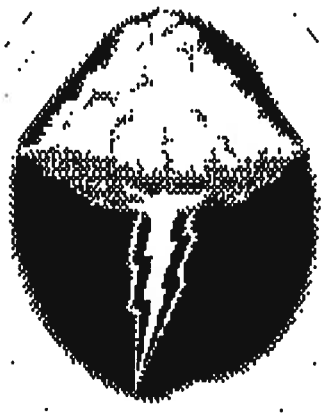
  - Severe thunderstorm
  - Embedded thunderstorms
  - Line of thunderstorms
  - An area of active thunderstorms affecting at least 3,000 square miles.

  Since issuing the Convective SIGMET relies on severe thunderstorm criteria, any change made to this criteria cascades into the aviation product suite.

- The **wind criteria** should be left essentially as it is; however, it is worth considering rounding the wind threshold to 60 MPH (52 knots) because it "would be easier for the public to grasp," according to EMs who work with Warning Coordination Meteorologist (WCM) Carl Weinbrecht, NWSO Boise, ID.

- There was some disagreement within the team, but most of the team was against changing the wind threshold. There are too many variables to be considered here, for tree damage: type, condition and age of tree, type and moisture content of soil, and season; for structures: regional building codes and practices. It was not that 50 knots/58 mph was a good threshold as much as that the team could not agree on a value that served all better.

- The Emergency Manager/Customer Service Subgroup (minority opinion) favors keeping the current criteria for wind (58 mph/50 knots) and hail (3/4 inch).



  - Emergency managers in favor of this threshold said, "The EMCs prefer to be appraised of ALL storms that pose even a minimal threat." Most favored the current threshold because of the *information* that flows in the warning. Many media customers agree. These customers tell of a *need* to know about hail *before* it becomes damaging.

  - There is no question that the need to know about 3/4 inch (and smaller) hail is real. What is at question is the need to know via a Severe Thunderstorm Warning product.

Therefore, it is recommended that the NWS investigate the use of other products, such as the "headlined NOW" with appropriate Valid Time Event Code, currently being developed by OM. It is recommended that OM, in conjunction with Regional Headquarters and local WCMs work with national and local media and emergency management users to ensure this information gets to customers with a need to know. Information concerning thunderstorms with hail sizes below 1 inch should be headlined in the NOW.

  - A term such as "Strong Thunderstorm" could be used in the NOW to define storms containing hail 3/4 inch or larger, but less than 1 inch in diameter.

  - The Science/Research-Training Subgroup recommends that NWS provide information/guidance on winds of 35 to 50 knots, because winds of this strength can damage high-profile vehicles. This guidance also could be provided in the NOW.

  - Along these lines, the "routine" or scheduled fair-weather NOW detracts from the Short Term Forecast, reducing its use. ***Thus, it is also recommended that the NWS stop issuing "routine" or "scheduled" NOWs.*** NWS implemented this change nationwide on June 1.

    For example, in Oklahoma some emergency managers have said they only want to see the NOW for thunderstorms approaching severe limits. The Norman WFO was told by emergency responders that the routine NOW adds no value to the Zone Forecasts, and in fact, consumes unnecessary bandwidth on their telecommunications systems. As a result, WFO Norman has stopped issuing NOWs unless they add value to a Zone Forecast already issued. Other WFOs have done this as well.

The Team's report was well received when presented at the April 1998 NWS Customer Workshop. It was sent to the six NWS regions for comment and again received a favorable response.

The report is available on the OM Home Page. OM will continue to solicit input from the customer community regarding severe thunderstorm warning criteria, including the marine, aviation, and agricultural communities. OM will make a final recommendation to Assistant Administrator Jack Kelly late this summer. Changes would not be implemented sooner than spring 2000, when most of the NWS field offices will have been restructured.

James Purpura, WCM, NWSFO Norman, OK

OM Holds Semiannual Customer Service Workshop

On April 16, OM hosted the semiannual Customer Service Workshop at NWS Headquarters. These workshops began in 1995 to provide a dialog between the NWS and its customers on proposed products, product improvements and ways of strengthening the private sector/Federal partnership. Participants include private sector meteorologists, such as The Weather Channel and AccuWeather; the media, including print, wire services and television; emergency managers, and various Federal agencies such as the Federal Emergency Management Agency (FEMA) and the Federal

Aviation Administration (FAA). In addition, Regional Headquarters staff took part.

Customers drive the agenda by submitting topics to be discussed. Topics for the spring conference included:

- Update on the progress of dissemination systems
- Status of World Meteorological Organization (WMO) header changes
- Discussion of Valid Time Event Code
- Update on Watch Decentralization
- Proposed changes to severe thunderstorm warning criteria
- Presentation by The Weather Channel on the NOW forecasts.

NCEP held a similar workshop on April 14-15, its first such program. The Environmental Modeling Center reviewed product changes in the past year and discussed proposed changes. Discussions included modifying data assimilation and forecast models, as well as ensemble forecasting for regional, global, hurricane, coastal ocean, waves, and coupled atmosphere-ocean (climate). The Space Environment Center offered a special presentation. Staff from other NCEP Service Centers were present to answer questions on model performance.

Scott Kiser, Constituent Affairs Program Leader

Emergency Managers Group Takes New Names, Tackles New Issues

To reflect its broader scope, the National Coordination Council of Emergency Managers has changed its name to the International Association of Emergency Managers (IAEM). As part of NWS's continuing commitment to customer outreach, OM Customer Service staff serve on four IAEM committees: Government Information, Communication, Science and Technology, and the National Workshop.

To ensure a balance in workshop topics, Customer Service invited WCM Ted Buehner, NWSFO Seattle, WA, to speak on field topics. Some of the more important issues discussed by the various committees follow.

Conference/Workshop Committee

- Expressed desire to have Assistant Administrator Jack Kelly address the conference and meet with the IAEM Board of Directors at the November conference, schedule permitting
- Stated need for NWS to conduct interactive workshops for emergency managers dealing with new and existing technologies
- Requested that NWS participate in the proposed Poster session.

Governmental Information Committee

- Concern expressed over efforts to privatize portions of the NWS. Specifics will be expressed in a white paper.
- Are NWS budget problems resolved and what IAEM could do if the budget remained an issue.

Science and Technology Committee

- Expressed concern over the lack of information being provided on the Emergency Managers Weather Information Network (EMWIN) in some portions of the country; cited eastern United States as example
- Expressed concern over lack of information about the Local Data Acquisition and Dissemination System, which NWS will start deploying this fall.

OM presented these issues at the Emergency Management Session at the Directors Spring Conference.

Rainer Dombrowsky, WCM Program Mgr., FEMA Liaison

Refocus on Short Term Forecast: "Nowcast" or "NOW"

OM and the regions developed the Short Term Forecast (NOW) to provide NWS customers with more specific information on an event-driven basis. This vision aimed to take advantage of the technologies and capabilities provided by the modernization and provide more detailed information than the ongoing forecast. Stated simply, the concept is to tell people what's going to happen in the next few hours, particularly in significant or fast-changing weather conditions, and provide these timely updates until the conditions have subsided.

Under Assistant Administrator Jack Kelly's direction, the NWS is emphasizing the following policy guidelines for uniform application from all field offices. The NOW should:

- Be an event-driven product for significant (customer-defined) weather and flood conditions for the affected counties/zones

- Focus on events in the next few hours
- Be highly specific with respect to location, time and type of event
- Maximize use of WSR-88D Doppler radars and other advanced observing technologies
- Be no more than 8 lines for any forecast grouping; Use clear, concise, nontechnical terms
- Contain headlines that are used for the most significant events to capture the "screaming message"
- Provide a short-term forecast of the most important information first
- Not be used in benign or fair weather, i.e., conditions already covered in the first-period zone forecast
- Avoid mentioning past weather conditions, except as they reinforce the forecast.

The regions recently have provided detailed plans, based on these guidelines, for field office implementation, including rigorous quality control and customer feedback. Because most offices are now issuing the improved NOWs, OM has discontinued bi-weekly briefings to Assistant Administrator Jack Kelly on efforts to bring all offices into compliance.

Rod Becker, Dissemination Service Program Manager

Exercise RESPONSE 98 Activities Rapidly Approaching

Exercise RESPONSE 98 and preliminary review was conducted April 20-24. As in Exercise RESPONSE 95, this approach received high praise.

RESPONSE 98 was a FEMA-sponsored no-fault exercise designed to assess adequacy and feasibility of Federal, state, and local plans, policies, and procedures for responding to a hurricane landfall event.

OM has supported this effort through its Customer Service Core staff. The WCM element of Customer Service has been the point of contact for NWS interaction with exercise design. The exercise scenario was developed and orchestrated by a team consisting of representatives from Customer Service, the Hydrologic Prediction Center, the Tropical Prediction Center (TPC), the Techniques Development Laboratory (TDL), Eastern Region Headquarters, and affected Eastern Region field offices. As in Exercise RESPONSE 95, OM worked with FEMA and The Weather Channel to develop video footage for the exercise.

A full review of Exercise RESPONSE 98 will be conducted in May, and these results will be published by FEMA's Preparedness, Training, and Exercise Directorate.

Rainer Dombrowsky, WCM Program Mgr., FEMA Liaison

Hurricane Liaison Team Meets With Reps from Impacted States

On March 24, TPC, OM and FEMA Regions 4 and 6 met with representatives of hurricane-prone states to discuss Hurricane Liaison Team (HLT) support. The HLT provides timely exchange of critical information between the NWS and emergency management. The workshop addressed the following issues:

- How the team helps the National Hurricane Center (NHC) meet the increasing needs of emergency management officials
- How the team operates from the NHC and assists its staff
- The makeup of the HLT, how and when it is activated and deployed, how it is staged down, and what post-event responsibilities team member have.

FEMA also conducted an Earthquake/Hurricane summit May 11-14 at FEMA's Mount Weather Facility near Berryville, VA. OM took part in this conference, which brought together Federal and state program managers to review and discuss policy and procedural issues.

Rainer Dombrowsky, WCM Program Mgr., FEMA Liaison

Emergency Management Association Reps Meet with Jack Kelly

On April 22, representatives of FEMA, the National Emergency Management Association (NEMA), and IAEM joined Assistant Administrator Jack Kelly at a meeting of NWS Regional and Line Office directors. Jack Kelly has made customer dialog and service adjustment an NWS priority. As a first step, he invited the emergency management community to this conference. The Director's goal is to provide these managers with opportunities to discuss problem areas and programs and to develop solutions with senior NWS managers. Jack Kelly hopes to develop a committee of Federal, state and local emergency managers with whom he would meet routinely.

Rainer Dombrowsky, WCM Program Mgr., FEMA Liaison

Reducing Losses from Natural Disasters

The Subcommittee on Natural Disasters hosted its fifth forum on reducing the impacts of natural disasters, *"A Global Perspective on Reducing Losses from Natural Disasters,"* April 14, in Washington, DC.

Presenters discussed the benefits of mitigation, and explored ways to improve international partnerships in the natural disaster community. Participants included experts in many areas, including the Federal government, nonprofit organizations, international organizations, business, research, and academia. The subcommittee will hold two forums in June. The June 9 forum focused on the Disaster Business Recovery Alliance and how community-based recovery alliances can bring the full resources of society to help with natural disaster recovery. The June 30 forum will address "Real-Time Monitoring and Warning for Natural Hazards."

For more information or summaries from previous forums, contact **Donna.Franklin@noaa.gov**.

Donna Franklin, Constituent Affairs Program Analyst

Report Available on Possible Impacts of El Niño on the Insurance Industry

In November, the NWS and the Institute for Business and Home Safety held a workshop in Washington, DC, on El Niño and the potential impacts on the insurance sector. More than 100 government, private sector, and academic representatives attended. Dr. James Baker was the luncheon speaker; Dr. Susan Zevin gave the keynote address.

The Cooperative Institute for Mesoscale Meteorological Studies at the University of Oklahoma presented their findings from a study on "The 1997-98 El Niño: Possible Impacts on the Property Insurance Industry." Limited copies are available. Contact **Donna.Franklin@noaa.gov**.

Donna Franklin, Constituent Affairs Program Analyst

OM Home Page Gets Hit Hard

The OM Home Page continues to grow in content and in number of hits. In May, it averaged about 30,000 hits per week, more than 4,500 per day. After the deadly tornadoes in May and June, there were more than 6,000 requests for our full color Tornado Preparedness Guide. Also popular was the notification page, which displays changes in NWS products, and the disaster page, with data on recent significant weather events.

Joan VonAhn, Meteorologist

Status of Implementing NWS Valid Time Event Code (VTEC)

The six NWS regions have reviewed all draft versions of the VTEC Plan, have been formally briefed in a Meteorological Service Division Chiefs Conference, and have recently provided OM with specific written approval of the basic VTEC concept. The Office of the Federal Coordinator for Meteorological Services and Supporting Research, after being formally briefed, has also approved of the NWS's efforts to work toward implementation of VTEC, as has the Office of Hydrology (OH). As a critical part of the coordination process, participants at the last several Customer Service Workshops have been briefed on VTEC and many of their suggestions incorporated into the latest draft VTEC Plan. One minor technical issue to be worked out revolves around the "watch numbering" field of the code. We expect to reach consensus on this point shortly.

Senior level management has approved the decision to include VTEC in AWIPS Build 4.2, slated for implementation in the spring of 1999. The Plan requires automation before implementation. This would allow limited VTEC implementation beginning the summer of 1999 in non-precipitation watch/warning/advisory (W/W/A) products and in the fall in winter storm W/W/A products, as well as in future watch guidance products from NCEP's Storm Prediction Center.

Rod Becker, Dissemination Service Program Manager

INTEGRATED HYDROMETEOROLOGICAL SERVICES

Great Lakes Marine Zones Updated

OM is reconfiguring the Great Lakes marine zones to accommodate the Emergency Alert System. NWS Central and Eastern Region Headquarters have sent field offices the latest draft of the Great Lakes Basic Marine Warning and Forecast Zones for comment. The final version, to be in place by December 1998, will replace OML 1-96 filed with WSOM D-52.

Changes include partitioning the open lakes into smaller zones, each with a unique Universal Geographic Code. In addition, the revised marine zones will identify both near shore **and** open lake by lake instead of state, consistent with the process used for other seacoasts.

Richard May, Assistant Manager, Marine Weather Services

NWS Works to Improve Nearshore Weather Reports

The NWS is working with the U.S. Coast Guard (USCG) in the Northeast to obtain nearshore observations from search and rescue (SAR) boats, patrol boats, and commercial ferries. The observations support coastal warning and forecast operations. The observations also are used to support SAR operations, heavily influenced by weather and sea conditions.

Since data are scarce from many nearshore areas, the observations have been critical. In some areas, the SAR and patrol boat observations are the only surface data available. These boats operate from shore out to about 40 miles. The reports are similar to Mariner Reports (MAREPs) obtained from commercial and recreational boaters.

The program has operated off the coasts of New York, Massachusetts and Maine since October 1996. The reports are accurate, however, like other MAREP reports, the observations are not available regularly. They are provided on a voluntary, "not to interfere with operations" basis.

The program depends upon the cooperation of the Telecommunications Officer of The Watch (TCOW) at USCG Group offices, who normally has regular contact with the boats. The officer obtains weather data from the boats and appends the reports to the 3-hourly collective of USCG plain language coastal reports sent to NWS. The USCG Group Offices we've worked with have been cooperative.

Martin Baron, Physical Scientist

Revamped Fire Weather Forecaster's Course Builds Steam

A newly revamped Fire Weather Forecaster's Course was held March 16-20 at the National Interagency Fire Center (NIFC) in Boise, ID. A group of veteran NWS and Forest Service fire weather forecasters delved into critical fire weather situations, applications of meso-models, and exercises in routine fire weather and site-specific forecast preparation. The course emphasized developing and modernizing the fire weather program on station, working with the fire management user community, and training other forecasters on the complexities of fire weather.

The class drew 60 NWS and two Canadian forecasters. It was led by Rick Ochoa, staff meteorologist at NIFC, with the assistance from the Boise Forecast Office. Speakers from the Department of Interior and the Forest Service discussed:

- NIFC operations
- Fire behavior
- Fuel models
- National Fire Danger Rating System
- Smoke management
- Weather Information Management System.

NWS Western and Central regions held follow-up workshops in April to train Incident Meteorologists on how to deliver on-site meteorological support. All forecasters who have not completed the Cooperative Program for Operational Meteorology, Education and Training (COMET) Fire Weather Computer Based Learning are urged to do so.

Fire Weather Team Formed

Assistant Administrator Jack Kelly has announced the formation of a special team that will address fire weather issues related to resource allocations, staffing, transition, modernized operations and national policy. The team, mainly composed of field personnel, presented a final report on June 11.

Paul Stokols, Fire Weather Program Manager

Updated METAR/TAF Booklet in Stock

The FAA Booklet "Aviation Weather Formats: METAR/TAF," July 1997, is in stock at the National Logistic Supply Center. This 8-page booklet is a quick overview and guide to reading the METAR and TAF codes, implemented July 1996. The National Stock Number is: 7610-PB-000-0868. As of this spring, there were approximately 9,000 copies in stock. The new version corrects a number of errors included in the May 1996 version.

Christine Alex, Assistant Manager for Aviation Weather

International Workshop On Volcanic Ash Held in May

The WMO and the International Civil Aviation Organization (ICAO) sponsored a Workshop on Volcanic Ash, May 11-15, 1998. The workshop was hosted by MeteoFrance at their offices in Toulouse, France.

Representatives from the Volcanic Ash Advisory Centers (VAACs) in Anchorage, Washington, DC, Montreal, London, Toulouse, Tokyo, and Darwin (Australia) took part in this very successful workshop. Representatives from the NWS, National Environmental Satellite Data and Information Service (NESDIS), Office of Oceanic and Atmospheric Research (OAR), FAA, National Aeronautic and Space Administration (NASA), and U.S. Geological Survey (USGS) attended the workshop. In addition, a number of airlines actively participated. A final report of the workshop will be published later this year.

The NWS representatives were Christine Alex from NWS Headquarters, David Weinbrenner of the Washington VAAC and Elliott Barske, Manager in Charge of the Anchorage VAAC.

The workshop objective was to "...provide a forum for interaction between providers and users of volcanic ash advisories and warnings with the aim to optimize the activities of VAACs and contribute to improved standardization, accuracy, and timeliness of information provided to users."

Christine Alex, Assistant Manager for Aviation Weather

Format for Winter Storm and Non-Precipitation Weather Warnings

This fall, NWS forecast offices will adopt a new format for Winter Storm (WSW) and Non-Precipitation Weather Warnings (NPW) hazard messages. These products will be issued in a segmented style format instead of the current paragraph style.

This format allows for short, specific forecasts for multiple areas/zones/counties under one message headline, versus the present format of relatively lengthy products with multiple headlines. With this new format, each segment is separated by universal generic code strings. The format lends itself to automation, allowing it to be easily displayed or manipulated by customers.

The WSW/NPW segmented style format is defined in NWS OML 4-98, issued March 23, 1998, and filed with WSOM C-42 and C-44.

Jannie Gibson, Assistant Manager Public Weather Program

NWS Forms CWSU Team

Assistant Administrator Jack Kell y has formed a special team to address the management structure of the Central Weather Service Units (CWSU) and the role they play in modernizing the NWS end-to-end forecast process. The team, composed of representatives from the Aviation Weather Center, CWSUs, NWS Regions, WFOs, and the NWS Employee Organization met in Kansas City in early May and has numerous teleconferences in the last two months. On June 1, Team Leader Fred Foss, AWC, briefed Jack Kelly on the teams recommendations and findings. The regional directors were briefed on June 5. The report was well received; many tough questions were asked. The team's recommendations are being evaluated.

Dorothy Haldeman, Aviation Weather Program Manager

TECHNOLOGY AND FORECAST SYSTEMS

Committee Denies Guam World Wind Speed Record for Typhoon Paka

A multiagency assessment team has rejected as unreliable a potential world record wind gust reported from Guam during the passage of Typhoon Paka in December 1997.

As Typhoon Paka ravaged the island of Guam on December 16, 1997, Anderson AFB reported a peak gust of 236 mph. If valid, this report would have exceeded the world record of 231 mph recorded at Mt. Washington, NH, in April 1934.

Following the typhoon, multiagency assessment teams comprised of NOAA personnel from TPC, the Operational Support Facility, and Pacific Region Headquarters; FEMA staff; and university researchers visited the island to assess data collected and warnings issued during the typhoon and also to assess damage incurred.

Their findings, after reviewing the wind record at the site, the Guam WSR-88D radar data, a site survey and ground and aerial damage assessments, concluded that the peak gust report was unreliable. Through the Office of the Federal Coordinator for Meteorological Services, the U.S. Air Force evaluated the performance of the reporting anemometer and concluded that the combination of high winds and heavy rain on the special "hot-wire" anemometer produced an unrealistically high wind speed.

In addition, the post-storm evaluation, the Joint Typhoon Warning Center on Guam, led by the U.S. Navy, reached a similar conclusion.

Based on the multiagency assessments, the National Climate Extremes Committee has determined that the reported wind gust from Typhoon Paka was not accurate and cannot be accepted as a world record wind speed.

Wind speeds higher than the world record of 231 mph likely have occurred during extreme tropical systems and tornadoes; however, instrumentation have not survived to provide a documented record of these extremes. The current 231 mph was undoubtedly topped during severe hurricanes and tornadoes; however, reporting instrumentation have not survived to provide a documented record of these extremes.

This summary of the team and agency findings was issued by the National Climate Extremes Committee comprised of representatives from the National Climatic Data Center, NWS and the American Association of State Climatologists. The Committee serves as coordinator and final arbiter concerning national extremes of climatological data.

Andy Horvitz, Surface Observation Program Manager

UV Radiation Brochure: Ray of Sunshine

The Environmental Protection Agency (EPA) has just published a new brochure, *Stay Healthy in the Sun: Information About UV Radiation for Meteorologists*. It discusses the health effects of ultraviolet radiation, the UV Index, and simple steps broadcast meteorologists can recommend to viewers to prevent overexposure. The brochure may be of interest to other groups since it focuses on basic sun-protection tips. The health messages in the brochure were developed with help from the EPA, NWS, the American Academy of Dermatology, and broadcast meteorologists.

For free copies of the brochure, contact EPA's Stratospheric Ozone Information Hotline at (800) 296-1996 or (301) 614-3396.

Andy Horvitz, Surface Observation Program Manager

GOES-10 Captures Tornado Data; Starts Check-Out Tests

NOAA and NASA have completed the 30-day GOES-10 Science and Operations Test check-out started March 16. For this test, GOES-10 provided continuous 5-minute imagery from all 5-Imager channels over the United States and coastal regions.

The data are shipped in real-time to more than 50 NWS forecast offices and to national centers. The new AWIPS workstations are successfully ingesting and displaying the data. The data are also available to outside users via the NOAAPORT broadcast system and directly from the GOES-10 spacecraft. The GOES-10 Sounder provided real-time data during this test, mainly to the university community.

Results in the first 2 weeks of testing included data sets capturing the Gainesville, GA, and St. Peter, MN, tornadoes, as well as gravity waves impacting low-level cloud fields around the Great Lakes. SOO Dan Baumgardt, NWSO LaCrosse, WI, reported during the St. Peter tornado, "Seeing convective initiation and storm growth PRIOR to reflectivity information being detected by the radar." NOAA will publish a report on the test's findings this summer. NWS had three main goals for the test period, to develop:

- GOES/AWIPS requirements for operations at the local forecast office
- GOES Sounder needs for numerical models and to provide high resolution sounder products to field offices
- NWS requirements for a third GOES spacecraft (STORMSAT) to improve NWS mesoscale forecasting.

NOAA/NASA expects to complete the GOES-10 on-orbit checkout by early summer, then place the spacecraft in a "on-orbit" storage mode.

Ron Gird, Satellite Program Manager

SCIENCE AND TRAINING

Training Plan for Convective Watch Decentralization Now On-Line

For the past 2 years, a team of Science and Operations Officers (SOOs), National Training Facility representatives and severe weather experts have been developing an outline for a CWD Training Plan. This plan is now available at **http://www.comet.ucar.edu/pds**.

The CWD Training Plan represents the first in a series of efforts to summarize available training via the Web. The Web-based program includes computer-based and printed materials, Audiographics training sessions and interactive lessons. No in-residence classes are scheduled.

The NWS will not distribute a paper version of the plan, but will adjust training requirements/activities on the Web as needed. NWS is still developing many of the training activities for the CWD. As materials are completed or Audiographics sessions are scheduled, OM will update the Web page. Users should consult the "What's New" section for the latest updates.

Eli Jacks, Training Program Leader

NWS Training Facilities Join Forces To Create New Website

OM is pleased to announce the newly established meteorology education and training (Meted) Web site at **http://meted.ucar.edu**.

This Web site will become the principal location for all Web-based materials produced by the three training facilities: NWS Training Center in Kansas City, the Operations Training Branch (OTB) in Norman, and the COMET Program in Boulder. Information and schedules of other training and education activities will also be posted. Current Web site offerings include modules on:

- Mesoscale convective systems
- Storm type and prognostic soundings
- Forecasting aviation icing
- Hydrology for the meteorologist
- Remote sensing using the GOES sounder.

LeRoy Spayd, Chief, Science and Training

NWS Releases New, Improved GARP Data Display Software for SOO/SACs

NWS released version 2.0 of the GEMPAK Analysis and Rendering Package (GARP) in mid-February. GARP is an integrated meteorological data program that displays satellite, radar, model grid, upper-air, and point observation data, all from an easy-to-use graphical user interface. This new version incorporates major improvements to the software, such as:

- Time matching
- Auto-update
- Grid macros
- Graphic toggling
- Map and latitude/longitude grid backgrounds
- On-line help

Although the COMET program originally developed GARP for use in its classroom, the package is now used extensively at NWS forecast offices in the Science Applications Computer (SAC) and in university meteorology departments.

The COMET Information Systems group, headed by Susan Jesuroga, developed GARP. David Himes, Steve Drake and Jim Cowie wrote the software. Peggy Bruehl, the SOO/SAC coordinator, provides user support. More information can be found on the GARP information page at **http://www.comet.ucar.edu/garp**.

Peggy Bruehl, SOO/SAC Program Leader, COMET
Jim Cowie, Software Engineer, COMET

New Professional Development Workstations Purchased

To enhance on-station training and support of Audiographics teletraining efforts, Regional Headquarters offices have received funds to purchase new Pentium Professional Development Workstations. Audiographics already has been used to support large-scale teletraining lessons featuring instructor voice and pre-stored graphics for WSR-88D Operations, Hydrometeorological Technician training and other seminars.

As the amount of on-station teletraining increases, the capacity of existing equipment to store the associated text and image files will quickly be reached. In addition, the complexity and size of these files will increase. In view of this rapid growth, it was determined that funds for these upgrades should be provided as soon as possible.

COMET has provided a list of suggested specifications for these systems to the Regional Scientific Services Division staff, who are procuring this equipment regionally. Direct questions to your Regional Headquarters office.

OM continues to work with the Training Facilities and the Regions to determine how to proceed with the next generation of teletraining, with the ultimate goal of providing live lessons with partial- or full-motion video.

Eli Jacks, Training Program Leader

COMET Case Study Library Boosts Resources by Two

Two new case studies have been added to the COMET Case Study Library at **http://www.comet.ucar.edu/resources/cases/**. The two new cases are as follows:

Case 008 focuses on the "California Flood" that occurred from December 31, 1996, to January 3, 1997. This case was presented as a laboratory exercise during the COMET Hydrometeorology residence course in April 1997. It explores the complex interactions between synoptic and mesoscale meteorology, geography, and human activity during this major West Coast precipitation event.

Case 009 provides data from a widespread "Severe Icing Event" that took place on March 6, 1996. Aircraft icing was observed in regions extending from the Midwest to the Northeast and over the Northwest. This case was presented during the COMET 1997 Managers Mesoscale Course for Atmospheric Environment Service (AES) in Canada to supplement course material on forecasting aircraft icing.

The case studies include data from the WSR-88D radars, GOES-8 and -9, NCEP models, NWS Family of Services, and surface and upper-air observations. In addition, users can access training support materials, including lab exercises, additional data, and references. These cases may be downloaded using the CODIAC system. More information is available about COMET Cases at **http://www.joss.ucar.edu/cometCases/**. The cases available through the Web interface are COMET Case Study:

- 001 The Storm of the Century, March 11-13, 1993
- 002 Midwest Snow Event, December 6, 1995
- 003 Hurricane Erin, August 1-3, 1995
- 004 Bow Echo, May 5, 1996
- 005 Lake Effect Snow, January 4-5, 1995
- 006 Chicago Flood/Oakfield Tornado, July 17-19, 1996
- 007 High Plains Snow, March 13-14, 1996
- 008 California Flood, December 31, 1996-January 3, 1997
- 009 Severe Icing Event, March 6, 1996

For the latest developments in the COMET case-study project, subscribe to our mailing list by accessing:

http://www.joss.ucar.edu/cometCases/mailList.html.

Elizabeth Page, Case Study Program Leader, COMET

COMET Completes Phase 1 Of Satellite Meteorology Training

The first phase of COMET's Satellite Meteorology (Satmet) training is nearly complete. The program offered training to more than 70 NWS SOOs and focal points via four Satmet courses between October 1997 and April 1998. For more information, go to **http://www.comet. ucar.edu/class/satmet/**. In addition, two computer-based learning modules have been released to date:

- **Satellite Meteorology 1:** Remote Sensing Using the New GOES Imager was reissued to provide better performance running under Windows 95.

- **Satellite Meteorology 2:** Case Studies Using GOES Imager Data provides more cases that continue the training started in SatMet1. The three cases are on Outflow Boundaries, Tropical Storms and Lake Effect Snow.

The next phase of Satmet training is called the Virtual Institute for Satellite Integration Training (VISIT). VISIT's mission is to begin Phase 2, integrated satellite meteorology training, using teletraining and Web-based instruction. VISIT will work with COMET, NESDIS and the Cooperative Institutes.

Tony Mostek, Satellite Training Program Leader

CSTAR Workshop Spotlights Successful Research Programs

On October 7-9, 1997, NOAA/NWS held the Collaborative Science, Technology, and Applied Research (CSTAR) Program Workshop in Silver Spring, MD. An Executive Session was held on October 10 for NWS principals.

The CSTAR program encompasses the NWS's collaborative research activities through programs such as COMET Outreach, NOAA Cooperative Institutes (CIs), government labs, and smaller projects at local WFOs. The workshop offered NWS, NOAA, and university participants the chance to review collaborative activities and focus on the service-science linkages of these activities for NWS warnings and forecasts.

Presentations at the workshop, attended by more than 60 representatives from the university community, NWS, and NOAA research laboratories, focused on the significant amount of high quality, low-cost, applied research projects underway addressing local forecast problems. This work is being done at a time when NWS is shifting its science program from a national centers focus to one including SOOs and staff at all WFOs.

Applied research projects funded by COMET ($5K - $30K per year on average) and conducted by CIs ($150K per year on average) have proved beneficial to the NWS and its customers.

All CIs involve multiple WFOs and highly leverage NWS funds with other sources to address high-priority research topics and training issues directly relevant to WFOs.

The universities benefit by making their research relevant to real forecast problems, which helps attract and retain top academic talent while gaining better access to NWS data and information. The NWS benefits by gaining a better understanding of hydrometeorological phenomena and enhanced training case studies that are focused directly on improving warnings and forecasts. These results are achieved through a relatively small investment by the NWS and contribute toward the continued successful implementation of the NWS modernization.

In addition, special service/science issue sessions on the following topics were held at the CSTAR Workshop:

- Aviation Weather Program
- Fire Weather Program
- Quantitative Precipitation Forecast (QPF) Program
- Jarrell, TX, tornado.

Information gained from these presentations helped the NWS fine-tune its science priorities and familiarize the university community with areas that may need significant research focus.

During the CSTAR Workshop Executive Session, a general CI policy (e.g., establishing and funding CIs) was approved, and NWS Science Priorities were tentatively revised. The group determined that future CSTAR Workshops should be held biennially. The next workshop has been tentatively scheduled for September 21-24, 1999. For a more detailed description of the workshop, see **http:www.nws.noaa.gov/om/cstar97.htm**.

Sam Contorno, CSTAR Program Manager

First National QPE Workshop Covers Ambitious Agenda

The First National Quantitative Precipitation Estimation (QPE) Workshop sponsored by OM was held at COMET in Boulder, CO, November 18-20, 1997. The 40 participants included representatives from OM, OH, NCEP, NWS Regions, Office of Systems Development, and Office of Systems Operations. Also attending were representatives from The National Center for Atmospheric Research (NCAR), Office of Research Applications Program; the NESDIS Research and Applications and the Office of Satellite Data Processing and Distribution; NASA; COMET; OAR; National Severe Storms Laboratory (NSSL), and the Forecast Systems Laboratory.

The participants reviewed and updated the NWS QPE requirements for hydrologic forecasting, issuing flood warnings, quantitative precipitation forecasting (QPF), numerical modeling, statistical guidance, verification and climate applications. They also reviewed current and applied research and product development activities underway to satisfy QPE requirements. The group recommended developers collaborate to meet future QPE requirements. Specific recommendations included:

- Ensuring unbiased satellite, radar, and multi-sensor QPEs, critical for operations at NCEP Service Centers, River Forecast Centers and WFOs
- Mitigating radar deficiencies (e.g., range limitations, anomalous propagation, beam blockage, hail contamination and varying Z-R relationships) and satellite (infrared only) based algorithms
- Focusing resources to accelerate development, testing and implementation of improved satellite and radar-based algorithms for precipitation estimates
- Automating satellite-derived precipitation estimates
- Focusing future applied research on the integration of satellite, radar and rain gauge data
- Determining the most effective means of accessing, disseminating, and ensuring quality control of all sources of rainfall data/estimates within AWIPS.

Another major discussion point, with regard to the application of high resolution rainfall estimates, was the operational assessment and forecasting of flash flooding conditions. This discussion stemmed primarily from the three presentations summarized below.

Areal Mean Basin Estimated Rainfall (AMBER) Program

Presented by Bob Davis/NWSFO Pittsburgh, PA: AMBER software uses the WSR-88D 1 km x 1 deg Digital Hybrid Scan Reflectivity (DHR) product to compute radar rainfall estimates in flash flood watersheds every volume scan. A single rainfall estimate is computed for each 1 km range bin. All range bins whose center point falls in a stream watershed are averaged to compute the Average Basin Rainfall (ABR) for that watershed.

The small DHR rainfall grid enables AMBER to compute ABR in watersheds as small as 1 square mile in area. The likelihood of flooding is established by comparing the ABR with Flash Flood Guidance, i.e., the ABR needed to bring a stream to bankfull. More information about AMBER software can be found at **http://www.nws.noaa.gov/er/pit/tamber.htm**.

WFO Hydrologic Forecast System (WHFS)

Presented by D.J. Seo, OH: WHFS is a collection of applications developed in the OH Hydrologic Research Lab (HRL). WHFS collects, manages and displays data, does hydrometeorologic modeling and manages products. WHFS is being tested at a number of WFOs.

The hydrometeorologic modeling component includes the Area Wide Hydrologic Prediction System, which provides analysis and display of the Hydrologic Rainfall Analysis Project—gridded precipitation analyses and flash flood guidance that offers an areal assessment of flash flood potential. WHFS will also offer the Site Specific Hydrologic Prediction System, a local hydrologic model that evaluates and generates hydrologic forecasts for fast-response and headwater stream basins. A full description of WHFS can be found at **http://hsp.nws.noaa.gov/hrl/general/whfs.htm**.

System for Convection Analysis and Nowcasting (SCAN)

Presented by Stephan Smith, Office of Systems Development (OSD): SCAN is a collaborative effort between NWS, NSSL, and NCAR. SCAN's focus is to improve the accuracy and timeliness of warnings (severe thunderstorm, tornado, flash flood, etc.) issued by NWS forecasters. The goals of SCAN are:

- Detect, analyze, and monitor convection
- Generate short-term probabilistic warning and forecast guidance automatically within AWIPS
- Combine previous research and development efforts (e.g., the Warning Decision Support System, Autonowcaster, AWIPS Thunderstorm Product, WHFS) into one integrated approach to forecasting convection.

The primary motivation for SCAN is to provide operational forecasters a more efficient, effective, and consistent means of issuing timely and accurate warnings through automated and warning guidance a forecaster can edit. SCAN supports the modernized End-to-End Forecast Process by providing a framework to integrate and make optimal use of the enormous volume and broad spectrum of advanced observational data, model output, and value-added guidance within AWIPS. The functionality to be incrementally implemented in SCAN includes automated storm detection, phenomenon classification, severity and flash flood monitoring, and Nowcasting. These functions will allow the forecaster to make better informed watch and warning decisions.

Version 1.0 of SCAN includes the NWS AWIPS Thunderstorm Product and 0-1 hour WSR-88D based extrapolative-statistical probabilistic QPF guidance. This version is scheduled for initial field implementation with AWIPS Build 4.1 this fall. Version 2.0, which incorporates WDSS functionality, is scheduled for field implementation with AWIPS build 5.0. A complete description of SCAN can be found at **http://www.nws.noaa.gov/tdl/scan/scan2.html**.

Conclusions

Regional Scientific Services Division (SSD) chiefs and other participants were impressed by the AMBER flash flood application and expressed a desire to see similar functionality included in future releases/upgrades of the hydrometeorologic modeling component of WHFS. Although the flash flood modeling component represents only one of a broad spectrum of robust WHFS applications, this component was recognized as critical given the significant economic/human impact of flash flooding. Furthermore, participants were interested in SCAN, its potential to improve the watch/warning capability at the WFO, its possible role as a vehicle for implementing nationally and locally developed applications within AWIPS, and its relationship to WHFS.

In response, the group decided that national managers, developers, and regional representatives should discuss the future development/implementation of hydrometeorologic applications within AWIPS and their integration/coordination with the rapidly evolving SCAN effort.

Jim Gurka, QPE Program Leader
Tom Graziano, QPF Program Leader

National Workshop on WHFS, AMBER, and SCAN

OM sponsored a 1-day workshop to discuss the current status and the future design and integration of hydrologic software applications to improve NWS operational flash flood assessment, prediction, and warning within AWIPS. These software applications include the WHFS, the AMBER Program, and SCAN. The meeting, held February 11, at NWS Headquarters in Silver Spring, MD, was organized and chaired by Thomas Graziano, OM; Stephan Smith, OSD; and Chuck Hoffeditz, OH. Attendees included representatives from OM, OH, OSD, NWS Regions, OSO, the Modernization Systems Management Office, NSSL, and the University of Oklahoma.

The primary objectives of the workshop were:

- Identify key operational AWIPS requirements and capabilities necessary to improve NWS flash flood operations
- Define data, software, hardware, and human resource requirements to implement and test AMBER outside the NWSFO in Pittsburgh, PA
- Define a future operational relationship between WHFS and SCAN in AWIPS which optimizes resources for the assessment, prediction, and warning of flash flooding
- Discuss NSSL and cooperative NSSL/OU efforts to develop hydrometeorological applications and the potential for collaboration with the NWS.

Background

The National Workshop on WHFS, AMBER, and SCAN was designed to further address high priority flash flood issues raised at the NWS-sponsored First National QPE Workshop at COMET in Boulder, CO, last fall (see Page 14). The provision of high resolution rainfall estimates and forecasts, coupled with high resolution watershed definitions and software applications to assess and predict flash flood conditions, was identified as a top priority by NWS Regional representatives.

Flash floods are widely recognized as one of the most devastating and deadly weather-related hazards and a challenging operational forecast problem. Flash flooding occurs in all 50 states at all times of the year. Over the past 30 years, the average annual number of lives claimed by flash and river floods exceeds tornadoes, lightning or hurricanes. Beginning in 1988, data for flash and river floods were archived independently. These data reveal that for the 8-year period ending in 1995, 72 percent of the flood-related deaths (471 of a total 655) have been caused by flash flooding.

In light of this and our limited capability to assess, predict, and warn for flash flood events, NWS Regional representatives deem critical and strongly support the rapid implementation of hydrometeorological applications to enhance our operational flash flood capability.

Oral Presentations

Five morning presentations preceded an afternoon open discussion that addressed the aforementioned primary workshop objectives. These presentations included:

- *The WFO Hydrologic Forecast System* by Jon Roe, OH
- *The System for Convection Analysis and Nowcasting* by Stephan Smith, PhD, OSD
- *The Areal Mean Basin Estimated Rainfall Program* by Bob Davis, Eastern Region
- *AMBER Basin Requirements* by Paul Jendrowski, NWSFO Honolulu

- *NSSL/University of OK Plans for Hydrologic Forecast Applications* by Mike Eilts, NSSL, and Baxter Vieux, PhD, University of Oklahoma.

Primary Issues and Recommendations

Issue: What AWIPS capabilities are necessary to improve NWS flash flood operations?

General Recommendation: The NWS should support a sustained and aggressive effort to develop and implement within AWIPS, applications that enhance operational flash flood capability.

Specific Recommendations:

- Provide field offices with a high resolution DHR product to compute rainfall estimates within AWIPS
- Include AMBER capabilities in future versions of the WHFS Area-Wide Hydrologic Prediction System (AWHPS) of WHFS (i.e., map DHR-based rainfall estimates in locally defined high resolution basins and use ABR to compute flash flood threat)
- Provide WFOs with the procedures, software, and training needed to specify and/or modify local basin definitions using the OH Integrated Hydrologic Automated Basin Boundary System (IHABBS), ArcView, or other nationally supported Commercial Off-The-Shelf Geographic Information System application
- Provide the capability to create, edit, and display spatial reference data such as parent and sub-basins, stream locations and names, reservoirs and dam locations, counties (name, state, code, zone, etc.), transportation routes (e.g., streets, highways, railways, etc.), and important landmarks (towns, schools, hospitals, etc.) to help forecasters issue flash flood watches and warnings
- Provide the capability to display and store AWHPS flash flood guidance products within the AWIPS Display 2-Dimensions, making these products accessible to SCAN algorithms
- Provide modernized River Forecast Center (RFC)-generated, high resolution, GIS-based threshold-runoff Flash Flood Guidance to WFOs in AWIPS
- Provide WFOs gridded high resolution (i.e., 1 km, 8-bit, every volume scan) regional radar mosaics (e.g., DHR) in near real-time to mitigate the impact of range degradation and other known radar deficiencies.
- Store the high temporal and spatial resolution QPF/PQPF output of SCAN algorithms, e.g., TDL extrapolative-statistical precipitation algorithm within the AWIPS Thunderstorm Product and NCAR Thunderstorm Auto-Nowcaster) in the AWIPS data structure. This would make these products accessible to WHFS to use in AWHPS to compute forecast ABR and predict flash flood threat, and in the Site-Specific Hydrologic Prediction System to produce site-specific forecast time series for selected points in small, fast-responding stream basins.

Issue: What must be accomplished to implement and test AMBER outside NWSFO Pittsburgh?

General Recommendation: Facilitate OSF, NSSL, and NWS Region near-term, limited, interim testing of AMBER.

Specific Recommendations:

- Provide field offices immediate access to the WSR-88D DHR product (AWIPS sites fitted with an A/B switch on the 56 Kbs line from the RPG, and WDSS sites currently have access to the DHR product; availability at limited number of other sites may require the submission of a WSR-88D Change Request by OM.
- Use ArcView or IHABBS for local basin delineation. WFOs opting to use IHABBS should contact their RFC focal point for assistance.
- Collaborate with NSSL to develop and field test a Graphical User Interface for AMBER.
- Conduct concurrent testing of AMBER and AWHPS at the NWSFO in Sterling, VA, during the 1998 SCAN field test.

Tom Graziano, QPF Program Leader
Stephan Smith, TDL

NOAA Weather Radio Initiatives

NWS Starts Deploying NWR Console Replacement System

On February 23, NWS began nationwide deployment of the Console Replacement System (CRS) with the delivery of the first two systems to Portland, OR, and Bismarck, ND. The name CRS was deemed too technical for outreach and educational purposes. For these audiences, CRS and other NWR improvements will be referred to as "NOAA Weather Radio 2000," a term coined by the NWSO Sterling, VA, staff (see next article). Deployment is expected to continue on or ahead of schedule with 12 to 16 systems shipped per month. NWS should complete deployment by November 1998. Key West, FL, and Caribou, ME, are being added to the deployment list in accordance with their change to WFO status.

Voice Quality Team

Assistant Administrator Jack Kelly has formed a team to look at the synthesized voice quality of CRS. Team members include representatives from the field, regions, the union, headquarters and the emergency management community. Their report and recommendations are due in July.

Training Status

CommPower Engineering has completed hardware maintenance and installation training for regional focal points. Only two classes remain to complete operations training for selected regional and site personnel. Regional offices continue to offer specialized operations training.

New Outreach Products Available

Outreach to promote CRS includes an update and additions to the original fact sheet, questions and answers, news releases and talking points. The additions include material on the DECTalk synthesized speech-system technology and its use in the Text-To-Speech industry, and a comparison of DECTalk to other technologies.

Outreach tapes have been produced for offices notifying emergency managers, media and the public. The proposed CRS name change to NOAA Weather Radio 2000: The Voice of the Modernized Weather Service, is also intended to increase visibility and enhance outreach efforts.

Operational Implementation Guidelines

OM and OSO have developed guidelines outlining four stages of site use leading to CRS commissioning. The guidelines offer an operationally focused plan for transferring the NWR function to the new technology and incorporate outreach activities with local media and the public.

Staff gain system familiarity by generating routine manual recordings, then stepping through the process of automating routine products, and finally by generating test and live warnings manually and with full CRS automation. These steps are logically tied to familiarity with any formatters that support the function, either AWIPS-resident or legacy-system dependent. The guidelines allow each office to automate at its own pace. The ultimate goal is complete automation of the NWR function, with AWIPS providing the CRS formatter support.

Technical Support Available On-Line

Comprehensive national technical support is provided for sites for setup, installation, training and outreach at **http://www.nws.noaa.gov/oso/oso1/oso12/crs.htm**.

The CRS manager hosts monthly conference calls with sites scheduled to receive CRS in that month or in the next cluster of deliveries. Participants in these calls include National, Regional and field focal points as well as field site managers. During the calls, program staff respond to questions and concerns from the site and provide information on specifics, such as outreach. Central Region has set up a separate Web site specifically to support its offices.

The following Headquarters' CRS personnel are offering support:

- Jerry Stephens, CRS Program Manager, 301-713-0191 x140
- Joel Nathan, Software, 301-713-0191 x144
- Jae Lee, Software, 301-713-0191 x145
- Chung Wu, Hardware/Installation, 301-713-0191 x147
- Terry Prajsner, Hardware/Installation, 301-713-0191 x166
- Harvey Iwamoto, Interactive Database Utility, 301-713-0191 x146
- Larry Lehmann, CRS Program, 301-713-1842 x133
- Joanne Swanson, CRS Program, 301-713-0462 x130.

The first line of contact for system help remains the appropriate regional point of contact.

Program Management Briefing Highlights

Topics at the third CRS Program Management Briefing, on March 11, included allowing an office to stop the automated path of a CRS product (warning) at the system. This function would alert an operator when a product produced by a formatter and already containing all appropriate county codes is received at the CRS system. The operator could then decide to use voice synthesis or add voice manually. Other proposed changes include functionality changes and fixes emphasizing priority set by the prototype sites.

Improving CRS Voice

Investigations continue into outlining the best approaches for short and long term improvements to the CRS automated voice. Currently, concatenated speech technology is being considered for use in the broadcast of watches and warnings. Concatenated speech is the recording of a human voice for subsequent automation, lending a true human quality to these products.

Joanne Swanson, OM CRS Program Focal Point

NWR Modernization Gains Media Value With New Promotional Theme

The term "NOAA Weather Radio 2000" has been approved as a promotional slogan for an initiative that encompasses the overall modernization of the NWR Program. OM is working with the regions, Public Affairs and other groups to implement simple strategies for public outreach. These would probably include using the slogan in:

- Announcements on NWR broadcasts
- Public Information Statements, press releases and other written materials
- Appropriate forums to expand the term to "NOAA Weather Radio—The Voice of the Modernized NWS."

This new slogan has media and public appeal. It is forward-moving and points toward the new millennium; however it is not intended to be an "official" name replacement for NWR. The term does not replace "NOAA Weather Radio" or "NWR" on receivers, logos, etc. It would be used until the year 2000. By then, the new system should be known and the promotional slogan would be dropped.

In addition to adding snap to the program, "NOAA Weather Radio 2000" would refer to the entire modernized NWR Program. The term includes:

- CRS and all its automated advantages, delivery speed, and enhanced scheduling techniques
- NWR entry into the EAS for delivery of NWS warnings to commercial radio and TV, and next year, cable TV
- NWR Specific Area Message Encoding (SAME) technology and the new NWR SAME-capable public receivers that allow users to receive alerts for selected areas, avoiding the perception of being over warned
- Vice President Gore's initiative for continuing the expansion of NWR coverage nationwide to reach 95 percent of the population
- State-of-the-art technical enhancements to NWR transmitters, including the Remote Off-Air Monitoring System, which checks the operational health of the system and automatically reports problems.

Rod Becker, Dissemination Service Program Manager

National NWR Web Site Offers County-by-County Coverage List

The national NWR Web site is receiving around 20,000-30,000 hits per week from about 3000-4,000 individuals. Traffic has increased due to the numerous episodes of severe weather this spring.

The Web site explains the SAME used on NWR alert messages. SAME activates SAME-decodible NWR receivers set to a "standby" or "alert" mode. Owners can use the SAME codes to limit warnings to specific counties. The Web site contains SAME codes for all U.S. counties (or equivalent areas). It also has an up-to-date list of NWR stations and displays which NWR station(s), if any, cover a specific county. Thanks to Vice President Gore's initiative the number of counties without coverage is shrinking steadily.

The county-by-county coverage information is useful for both SAME-decodable receivers and receivers activated by the analog 1050 Hz warning alarm tone. The NWR Web site also contains:

- General information on purchasing an NWR receiver
- NWS policy regarding which messages are alerted by SAME and the 1050 Hz tone on NWR
- The NWR brochure in full color or text-only
- A link to information on the NWR BROADCAST AUTOMATION PROJECT—CONSOLE REPLACEMENT SYSTEM.

For more information, go to **http://www.nws.noaa.gov/nwr**.

Ron Berger, Special Program Meteorologist

Hazards Community Forum

AWIPS Training Take Giant Step Forward

Completing the first WFO Hydrologic Forecast System course clears a significant AWIPS training milestone. The course, taught at the NWSTC in Kansas City from February 24-27, was enthusiastically received by eight NWS hydrologists and meteorologists. This core will offer on-site training to co-workers on the new AWIPS hydrologic forecast system.

NWSTC will offer one or two WHFS courses per month, increasing to three courses per month when AWIPS deliveries are accelerated. System experts from the NWS regions, OH, and NWSTC all contributed to this successful class.

The OH Hydrologic Operations Division has spun up a team to provide field support for the WHFS. This team will:

- Help new sites convert existing SHIMS databases to the new system
- Coordinate the production of map backgrounds
- Develop training and documentation materials
- Respond to field requests for assistance.

Support team members are collecting requests for program enhancements and reports of software bugs. The team also is working with the software developers in OH's Hydrologic Research Laboratory (HRL) to document and track bug fixes, and prioritize new functions needed in future builds.

The current capabilities of the WHFS include tools allowing the Service Hydrologist/Hydrologic Focal Point to manage the vast amounts of reference data (e.g. E-19 information), data analysis and monitoring tools which allow the forecasters to monitor existing river conditions, and a product formatter. Major new WHFS functionality expected to be delivered with AWIPS version 4.1, due to be released in the fall of 1998, include an Area Wide Hydrologic Prediction System (AWHPS) and a database and display system for dams (DAMCAT). Additional enhancements to existing applications will also be included in the release.

Glenn S. Austin, Deputy Chief, Hydrologic Operations Division, OH

Introducing Incident Command System With Multimedia Software

After taking the Incident Command System (IC-100) course recently, I put together a multimedia presentation that graphically follows Module 1—the ICS Orientation section. You can use the presentation program as a stand-alone application to support a local ICS course. For copies of the program and training module, please contact Todd Shea at NWS La Crosse: 608/784-8275 or **Todd.Shea@noaa.gov**

Todd Shea, NWSO La Crosse, WI

NWS Marks 50 Years of Tornado Forecasts

On March 25, 1948, two Air Force officers at Tinker Air Force Base, OK, issued the first tornado warning, establishing the NWS watch and warning program that protects the Nation today. NOAA, Tinker Air Force Base, and the University of Oklahoma celebrated this historic forecast.

In the last 50 years, the science community has significantly improved watch and warning lead times. Because of investments in research, observing systems such as Doppler radar, interactive computer systems, forecasting technology, and a vigilant spotter network, the lead time for tornadoes has nearly doubled from a national average of 5 minutes in the early 1990s to nearly 10 minutes today. This extra time, coupled with an improved NWR network that gets out the word more efficiently, allows those in the path of danger to take steps to protect themselves from these powerful storms. More information on the 50th anniversary can be found at **http://www.nssl.noaa.gov/GoldenAnniversary**.

Stephanie Kenitzer, NOAA Public Affairs

Tuna and Tornadoes: 50+ Million Take Tips With Groceries

Last fall, I noticed safety tips for Halloween printed on the grocery bags at Eagle Discount Foods in Montgomery, IL. I met with the store manager, provided him with our color brochures and asked if they would consider printing Tornado Safety Tips on their bags during the spring. The manager took the brochures and met with his district manager. They agreed that this would be a great public service, and the rest is history. Eagle now wants something covering safety tips on flash floods and is considering Winter Safety Tips next fall.

The Eagle bags arrived in its 96 northern Illinois stores in early March. Eagle will print over *one million* paper bags with a Tornado picture (courtesy of Gregg Stumpf) and safety information.

Based on that success, I approached Jewel, with 189 stores. The chain planned to provide more than *40 million* plastic and paper tornado warning bags from May 1 to 31. According to their estimates, they will print roughly *10 million bags per week* for 4 weeks.

Dominicks has 109 grocery stores and will be printing bags with our safety tips in April or May.

Robert Collins, DAPM, NWSFO Chicago, IL

Severe Weather Message Promoted Via Millions of Grocery Flyers

NWSO Nashville completed an agreement with Kroger Grocery Corporation to print the NWS Severe Weather Safety Tips on its grocery fliers from March through June. Kroger printed 1.2 million fliers with NWS safety tips *each week*. The tips were distributed in stores across southern Kentucky, all of middle and into eastern Tennessee and northern Alabama. These fliers also were distributed through the local newspaper each Sunday.

We completed this agreement by contacting Kroger's advertising department. We hope this agreement will serve as a good way for other NWS offices to do similar public outreach work with their local communities. For help, call Jerry Orchanian or Tim Troutman at 615-754-8506.

Jerry Orchanian, Tim Troutman
NWSFO Nashville, WV

Big Pay Off for Channel 7 Weather Almanac Team

WHDH-TV 7 in Boston, MA, working in conjunction with NWS Taunton, MA, and several private companies, has recently completed an extremely comprehensive 62-page Weather Almanac for New Englanders. It was modeled after Bob Ryan's Weather Almanac, published in the Washington, D.C. area, but was taken much further. This product is also available interactively on the Internet with links to weather-related issues around the globe (**http://www.7almanac.com**). The Almanac was sponsored by Bank Boston, Jiffy Lube, and the Children's Museum of Boston. It is available to the public at no charge at those locations. As of mid-December, 175,000 copies had been given out to the public and a second printing was underway.

SOO Jim Lee, NWSFO Taunton, was responsible for planting the original seed for the Almanac. Meteorologist Intern Neal Strauss provided comprehensive daily data regarding high/low temperature averages and extremes, moon phases, tides, etc. WCM Glenn Field wrote articles on thunderstorms and the SKYWARN program and provided photos for use throughout the Almanac. He and Forecaster Eleanor Vallier-Talbot provided a succinct listing of NWS Advisory/Warning criteria . . . important for the public to know!

Service Hydrologist David Vallee wrote an article on New England hurricanes. DAPM Alan Dunham wrote a brief summary of NWR availability in southern New England. Jim Lee also helped ensure that proper credit was given and that an appropriate disclaimer statement was added stating that references to any commercial company do not imply endorsement by the NWS. He and all of the aforementioned people edited the many articles that appeared in the Almanac for scientific accuracy and grammar. Other articles in the *Almanac* included topics such as El Niño, gardening in New England, twisters, Wind Chill, TV broadcasting techniques (chroma-key), fall foliage, the Blue Hill Observatory, weather atop Mt. Washington, ice safety, best educational weather books, a glossary of weather terms, blizzard comparisons, etc.

Needless to say, this collaborative effort gave the NWS a lot of favorable publicity. Yearly updates of the Almanac are planned. If you would like a copy, please e:mail **glenn.field@noaa.gov** at NWSFO Taunton.

Glenn Field, WCM, NWSFO Taunton, MA

Improved NWR SAME Scores High in Local Survey

NWSFO Lubbock, TX, conducted a Specific Area Message Encoding (SAME) evaluation project with key users. Lubbock staff conducted this successful project, made possible by Southern Region Headquarters, to expose users to SAME technology and to evaluate NWSFO Lubbock's NWR service.

SAME decoders were distributed to selected key users, who agreed to answer brief monthly surveys and occasional post-storm surveys. Survey questions, which were frequently updated, assessed user satisfaction with SAME and with specific NWR broadcast information and format.

The analyzed surveys showed a high level of satisfaction with the improved product.

- Users enjoyed the ability to screen out warnings from counties outside their area of interest.
- The ability to screen unwanted warnings resulted in a perception of fewer "false alarms." Users knew that when the alarm sounded, the warning would apply to their area of interest.
- These key users were very pleased with the content and format of NWSFO Lubbock's NWR service.

The project was conducted by WCM Larry Vannozzi, Forecaster Jody James, and Intern Greg Shelton over an 8-month period from December 1996 through July 1997.

Larry Vannozzi, WCM, NWSFO Lubbock, TX

Free Cell Phone Number Boosts Spotter Land and Marine Reports

Land and marine spotters in the Eureka, CA, area can call in reports using their cell phone at no charge. Thanks to the efforts of Heath Hockenberry, Met Intern NWSO Eureka. U.S. cellular customers can dial #NWS on their phones and be connected with the NWSO at no cost to the caller or NWS.

The only telephone service for some spotters in the more remote areas is through cellular. Routine weather questions will be handled through the standard telephone number. Mariners on fishing vessels or pleasure craft also can use the number to call in Mariner's Reports from sea. NWSO Eureka has VHF and SSB marine radios, however, some mariners have been reluctant to call in reports over the airways because they don't want to identify their location. When the NWSO makes its twice daily call for reports on VHF Channel 16, the mariner can now call in via the cell phone, offering more privacy. We hope to expand the service to all cell phone customers in the area.

John Lovegrove, WCM, NWSO Eureka, CA

NWR in All Florida Schools— Reality in the Making

The Florida Division of Emergency Management (DEM) office has struck a deal with Tandy Corporation to buy 3,022 weather radios with the SAME decoder for $56.97 per unit.

DEM will give the NWRs to all Florida public schools, including elementary, middle, other secondary, vocational, etc., as listed by the Department of Education.

The purchase price has been extended to all other Florida county offices wishing to purchase the SAME decoder weather radios. For more information, contact Dorann Wright at: 850/413-9972 or send e:mail to **dorann.wright @edu.state.fl.us**.

Walt Zaleski, WCM, NWSO Tampa Bay Area, FL

International "Twister" Tour At NWSFO Des Moines, IA

On May 23, 1997, NWSFO Des Moines hosted 25 international visitors eager to see a tornado hotbed. Why Iowa? The cornfields of Iowa, home to many of the tornado scenes in the movie "'Twister," intrigued Performance Entertainment Unlimited, an English company. The company sponsored a contest after "Twister" premiered overseas last fall. One of its representatives contacted our office almost a year ago to arrange the visit to one of Iowa's "Tornado Tracking Centers."

NWSFO Des Moines was proud to host the group and to educate visitors about NWS technology and warning detection systems. The tour group was in Iowa for about a week and besides visiting our office, saw the "Twister" farm house movie site (the house spared at the end of the movie),

a Des Moines area amusement park, and the Iowa Great Lakes area. Visitors came from the following countries:

- England, 2
- Cyprus, 1
- Singapore, 2
- South Africa, 2
- United Kingdom, 4
- Belgium, 4
- Holland, 4
- Slovenia, 2
- Switzerland, 4

Karl Jungbluth and I hosted the group. Rob Deroy took photos. After a tour of the operations area, weather radio booth and the rest of the building, we presented tornado videos, offered a basic explanation of how severe weather and tornadoes develop, and answered some interesting questions. They told us that after "Twister," TV screens worldwide have been filled with U.S. tornado videos.

Karl demonstrated the electrifying radar images from central Iowa's last tornado outbreak, May 27-28, 1995. We gave everyone a weather safety packet that included information about NOAA/NWS, Doppler radar and AWIPS and a flier directing them to our NWS Web site. Performance Entertainment Unlimited plans to send a group of Dutch residents to our office in September.

Andy Kula, Journey-Forecaster,
Karl Jungbluth, SOO, NWSO Des Moines, IA

Marquette, MI, Hold First NWR Awareness Week

From March 29-April 4, 1997, NWSO Marquette initiated the first, statewide NWR Awareness Week in Michigan. This year, Met Intern Eugene Derner developed the seven Public Information Statements for the event. Staff took part in interviews with two of the major daily newspapers and with two radio stations, including Northern Michigan University's Public Radio. NWR also was featured at the NWS Marquette booth at the Upper Peninsula amateur radio swap meet. NWR was a major focus of a 2-hour office tour for senior citizens and a reporter from the *Mining Journal,* Upper Michigan's major daily newspaper.

NWSO Marquette staff is having a wonderful time instructing a seven-class weather series for Northern Michigan University's Northern Center for Lifelong Learning. Meteorologist Dave Guenther's classes on Weather Folklore and Marine Weather were timely and of particular local interest. Met Intern Greg Forrester gave a superb presentation on Upper Michigan Climatology and Lake Effect Snow. SOO Ed Fenelon engrossed his audience with a two-hour "Forecasting as a Science" tour of the NWSO. Classes on "Weather on the Internet," "El Niño," "Global Warming," and "Winter Safety" round out the curriculum. The Center Coordinator is already talking about another weather series next year.

Jack Pellett, WCM, NWSO Marquette, MI

Michigan Governor Designates Severe Weather Awareness Week

This spring, Michigan Governor John Engler signed legislation mandating tornado drills in schools. That legislation, combined with an active 1997 tornado season, the recent deadly tornadoes in the South, and the Governor's proclamation naming March 29–April 4 Severe Weather Awareness Week in Michigan, signals high interest in this year's tornado exercise.

During Severe Weather Week, NWSO Marquette sent severe weather awareness packets to the schools and media, and conducted daily media interviews. We also sent meteorologists to two schools during the March 31 tornado exercise. The meteorologists were joined by a county emergency management coordinator, a police chief, and reporters from at least two TV stations. NWSO Marquette's programs are helping the schools prepare for successful drills. NWR and the schools' effective responses to the watch and warning were prominent on the evening news, setting an example for Upper Michigan.

Jack Pellett, WCM, NWSO Marquette, MI

NWSO Milwaukee Helps Train 911 Dispatchers

NWSFO Milwaukee/Sullivan, WI, staff has been teaching a 4-hour severe weather class to new and experienced 911 dispatchers at the Moraine Technical College at Beaver Dam, WI. The four classes run from February to April. MIC Kenneth Rizzo and I share the teaching duties. The severe weather portion is only a small part of the 3-day "In-Service" class taught at the College.

Originally, Moraine Technical College contacted WCM Rusty Kapela in December 1997 about possible NWS involvement. It was quickly recognized that this class offered

a golden opportunity for the NWS to explain its mission and role in severe weather and how the 911 dispatchers fit into the warning process. Staff also have taught basic severe weather spotting techniques. So far, the classes have been a huge success! Hopefully this endeavor will be continued next winter.

Rusty Kapela, WCM, Milwaukee, WI

Tips on Teaching Hazardous Weather and Flooding Preparedness

In early March, the Colorado Office of Emergency Management hosted the FEMA/NWS course "Hazardous Weather and Flooding Preparedness" in Fort Morgan, CO. The class was taught by myself, WCM Joe Sullivan, Cheyenne, WY, and our emergency management director from Fort Morgan.

The class was attended by 32 individuals from across Colorado, including emergency managers, dispatchers, sheriffs deputies, safety officers at school districts, and Red Cross representatives.

This is a good course. I would recommend it as long as you take the time to apply the material to your local area. It is a lot of material so we found it effective to have two WCMs from adjacent WFOs teach the class. Be prepared to spend a lot of time preparing.

Bob Glancy, WCM, NWSFO Denver, CO

Colorado State University Creates Flash Flood Research Laboratory

To address the physical and social problem of flash flooding, Colorado State University has created the Flash Flood Laboratory. This lab focuses the attention of faculty, researchers, and students on social, scientific, and economic problems of this threat.

This lab addresses flash flooding in an end-to-end process by drawing from academic disciplines such as atmospheric science, hydrology, geology, geography, sociology, public administration, economics, and natural resources. Projects will include:

- Atmospheric modeling of heavy rain storms
- Hydrologic run off modeling
- Application of geographic information systems in analysis, warnings and recovery
- Hazard mitigation, emergency planning, and warning decision-making
- Developing tools for Federal, state and local officials.

The lab will explore interaction between the numerous social and physical processes. Our research goals are to:

- Enhance scientific understanding of the dynamic interrelated atmospheric, hydrologic, geographic, and social conditions that produce disastrous flash floods
- Improve integrated scientific models to predict and describe the causes and dynamics of flash floods
- Combine physical and social science research to produce useful decision-support tools for Federal, state and local officials
- Increase understanding of effective flash flood education, warning and response behavior and to take best advantage of technological innovations
- Develop flash flood hazard analysis models for local communities based on storm climatology, topography, flood experience, and factors of the built environment.

The complex end-to-end functional process focuses on how organizations predict and warn for flash floods. The lab will address how communities can better identify and understand local vulnerabilities. It will help develop tools that allow local communities to identify the precursors of flash flooding. This ability will enable officials to proactively respond to flash flood threats, allowing for mitigation and planning efforts tailored to community risks. In addition, the lab is focusing on developing more effective community preparedness and warning response activities to maximize community emergency response.

This exciting and ambitious undertaking focuses attention on reducing the losses from flash floods through applied interdisciplinary research. For further information, contact:

Chris Adams at 970-491-3899, **adams@cira.colostate.edu**
Ken Eis at 970-491-8397, **eis@cira.colostate.edu**
Eve Gruntfest at 970-491-8448, **gruntfest@cira.colo state.edu.**

Or write to CIRA, Foothills Research Campus, Colorado State University, Fort Collins, CO, 80523.

Chris Adams, Research Associate,
Colorado State University, CIRA, Ft. Collins, CO

Publications and Audiovisuals

OM Presents First *Annual Report of Programs and Services*

In February, OM released its first *Annual Report of Programs and Services*. The theme of this review is "Linking Service and Science." The black and white, illustrated report presents a snapshot of OM broken down into the following components:

- Structure and Roles
- Organization Chart
- Director's staff
- Customer Service Core
- Integrated Hydrometeorological Service Core
- Science and Training Core
- Technology and Forecast Systems Core
- Conferences and Meetings
- Publications and Reports.

Single copies are available by contacting **Linda.Kremkau@noaa.gov**.

Melody Magnus, Editor

New NWS Training Guide—"Basic Spotters' Field Guide"

OM is pleased to announce the arrival of the new *Basic Spotters' Field Guide* (NOAA PA 97050). This 16-page, four-color training guide is similar to the 28-page *Advanced Spotters' Field Guide* (NOAA PA 92055) developed in the early 90s. The guide was developed to train tornado spotters on how to observe and report hazardous weather situations.

More than 22,000 copies have been printed and sent to the National Logistics Supply Center (NLSC) in Kansas City, MO. The maximum quantity NWS field offices can request at one time is 100 copies. These guides are to be used primarily for tornado spotter training, not for the general public.

Our thanks go to Gary Woodall, Regional WCM Program Manager, Southern Region Headquarters, and to Newton Skiles, Lead Forecaster, NWSFO Little Rock, AR, for undertaking such a monumental task. Also our thanks to those who contributed the many slides and reviewed the document. It can be accessed on OM's Home Page at **http://www.nws.noaa.gov/om/basicspot.pdf**.

Linda Kremkau, Managing Editor

NWR Brochure Now Available in Braille; Four More Coming

Braille copies of the pamphlet, *NOAA Weather Radio, The Voice of the National Weather Service,* are being distributed to all NWS offices. There was a slight delay in obtaining the special paper needed to print them. The remaining four pieces in the set are in production and will be shipped soon:

- Thunderstorms and Lightning—the Underrated Killers
- Flash Floods and Floods—the Awesome Power
- Winter Storms—The Deceptive Killers
- Tornadoes—Natures Most Violent Storms

When distribution is complete, all NWS offices will have two sets of each of the five pamphlets. Others interested in obtaining copies of the pamphlets may contact Carolyn Guerney at NWS Office, 2170 Overland Avenue, Billings, MT 59102, or call 406-652-0851 x246.

Carolyn Guerney, HMT, NWSFO Billings, MT

Eight Marine Weather Service Charts (MSC) Now in Stock

The following eight Marine Weather Service Charts (MSC) are now available at the NLSC in Kansas City:

- MSC1 - Eastport, ME to Montauk Pt, NY NOAA/PA 96054
- MSC4 - Cape Hatteras, NC to Savannah, GA NOAA/PA 96057
- MSC5 - Savannah, GA to Apalachicola, FL NOAA/PA 96058

- MSC8 - Mexican Border to Point Conception, CA NOAA/PA 96061
- MSC9 - Point Conception, CA to Point St. George, CA NOAA/PA 96062
- MSC10 - Point St. George, CA to Canadian Border NOAA/PA 96063
- MSC11/12 - Great Lakes; NOAA/PA 96064
- MSC15 - Alaska Waters; NOAA/PA 96067

The remaining charts are being revised and will soon be available at NLSC, including a Spanish version of MSC-14 (Puerto Rico and the Virgin Islands).

Richard May, Marine Weather Services, Assistant Manager

CD-ROM for Disaster Educators Now Available

With a click of a mouse, emergency managers, fire safety educators and community volunteers now have instant access to brochures, fact sheets, activity guides and other resources for raising awareness and educating the public about disasters. Now available is the ***FEMA Disaster Preparedness & Mitigation Library on CD-ROM***. FEMA's CD-ROM library offers:

- Ready-to-print materials on floods, earthquakes, hurricanes, winter storms, wildland fires and other disasters —many are co-logoed by the American Red Cross and the National Oceanic and Atmospheric Administration
- Information on disaster preparedness, mitigation, response and recovery, including new brochures on how to reduce financial hardships caused by disasters
- Emergency planning guidance for businesses and manufacturers
- ***FEMA's Good Ideas Book*** with activities, case studies and resources for educating children, homeowners and others.

In addition to PDF files, which look like images printed from the Internet, the ***FEMA Disaster Preparedness & Mitigation Library on CD-ROM*** includes high resolution printer files and instructions for producing high-quality color brochures at a professional print shop. PC and Mac computer discs are included in the package.

The FEMA CD-ROM Library is specifically designed for disaster educators who provide information about multiple hazards, and who want to produce high-quality educational materials at a professional print shop. People wanting single copies of materials can obtain them from the FEMA web site at ***http://www.fema.gov***.

To order the ***FEMA Disaster Preparedness & Mitigation Library on CD-ROM***, call 202-736-1648 or e-mail ***valca_valentine@oar-wash.com***. For program information, e-mail CFP Program Manager Ralph Swisher at ***ralph.swisher@fema.gov***.

Ralph Swisher, FEMA

New Evacuation Plan Brochure Available from Red Cross Chapters

The American Red Cross has published a new Community Disaster Education brochure called, *Your Evacuation Plan*. This brochure provides information on what families and individuals should do when faced with imminent or possible evacuation due to a hurricane, flood, mudslide, landslide, or other disaster.

This 3-color, four-panel brochure is designed to use in public presentations or in cases where evacuation may be called for by local officials. The brochure provides information about what to if people have to evacuate on a moment's notice, or if there's a long warning time, like for a hurricane.

The brochure is printed on paper that accepts a rubber stamp for localization. A blank back panel allows groups to distribute it as a self-mailer. The brochure also fits into a regular business-sized envelope.

For questions or to order, contact your local Red Cross chapter. The stock number is ARC 5003. The brochure comes in packages of 25 at $3.60 per package.

It is also posted on the Red Cross web site at: **http://www.redcross.org/disaster/safety/tips.html** in HTML format and as a PDF file.

Rocky Lopes, American Red Cross

Weather Channel "Classroom"

The Weather Channel airs a series of programs offering insights into how weather happens. These commercial-free shows are 8 minutes long; they air from 4:00 a.m. to 4:30 a.m. The shows offers breaks for classroom discussion. For on-line weather education, see **http://www.weather.com/education**.

June 15, 18	Sun, Seasons and the Sky
June 22, 25	Water: Oceans to Air
June 29, July 2	Air in Motion
July 6, 9	Look Up! Sky Awareness
July 13, 16	Thunderstorms: The Weather Machine
July 20, 23	Tornadoes
July 27, 30	Hurricanes
August 3, 6	Extremes in Water Cycle
August 10, 13	Snow, Ice, Wind & Cold
August 17, 20	Forecasting: Then & Now
August 24, 27	Climate: A World of Weather
September 7, 10	Sun, Seasons and Sky
September 14, 17	Water: Oceans to Air
September 21, 24	Air in Motion

Laura Buss, Education Department, The Weather Channel

NWS Publications On-Line

The following is a list of NWS publications with their URL addresses.

NOAA PA#	Name/URL address
70027	Survival in a Hurricane: **http://www.nws.noaa.gov/om/hurricne.htm**
77014	Flash Flood: **http://www.nws.noaa.gov/om/flashfld.htm**
81011	Spotter's Guide for Identifying and Reporting Severe Local Storms **http://www.nws.noaa.gov/om/spotguid.htm**
82002	Dust Storm Driving Safety **http://www.nws.noaa.gov/om/duststrm.htm**
82004	Watch Out Storms Ahead **http://www.coastalnet.com/weather/nwsmhx/owlie.htm**
85001	Heat Wave **http://www.coastalnet.com/weather/nwsmhx/heatwv.htm**
85006	Survival in a Hurricane (Como Sobrevivir En Un Huracan) (Spanish 70027) **http://www.nws.noaa.gov/om/hurrspan.htm**
86001	Natural Hazard Watch & Warning Poster (English/Spanish) **http://www.nws.noaa.gov/om/nh-mastr.htm (English)** **http://www.nws.noaa.gov/om/nh-massp.htm (Spanish)**
91001	Hurricane! A Familiarization Booklet **http://www.nws.noaa.gov/om/hurfam.pdf**
91002	Winter Storms...The Deceptive Killers **http://www.nws.noaa.gov/om/wntrstm.htm**
92050	Flash Floods and Floods...The Awesome Power **http://www.nws.noaa.gov/om/ffbro.htm**
92052	Tornadoes...Nature's Most Violent Storms **http://www.nws.noaa.gov/om/tornado.htm**
92053	Thunderstorms and Lightning...The Underrated Killers **http://www.nws.noaa.gov/om/trwbro.htm**
92055	Advanced Spotters' Field Guide **http://www.nws.noaa.gov/om/advspg.pdf**
92056	Mariner's Guide to Marine Weather Services **http://www.nws.noaa.gov/om/marine2.htm**
93056	A Pilot's Guide to Aviation Weather Services (replaces PA 71005) (Booklet) **http://www.nws.noaa.gov/om/pilot.htm**
94050	Hurricanes...Unleashing Nature's Fury (Revised March 1996) **http://www.nws.noaa.gov/om/hurrbro.htm**
96052	Key to Aerodrome Forecast (TAF) and Aviation Routine Weather Report (METAR) **http://www.nws.noaa.gov/oso/oso1/oso12/document/guide.shtml**
94058	Safe Boating Weather Tips **http://www.nws.noaa.gov/om/safeboat.htm**
96070	NOAA Weather Radio Brochure **http://www.nws.noaa.gov/om/nwrbro.htm**
96074	The Hidden Danger—Low Water Crossing **http://www.nws.noaa.gov/oh/tt/xwater/index.shtml**
96076	ASOS Guide for Pilots (Booklet) **http://www.nws.noaa.gov/om/asosbook.htm**
97050	Basic Spotters' Field Guide **http://www.nws.noaa.gov/om/basicspot.pdf**
	Tsunami: The Great Wave **http://www.nws.noaa.gov/tsunami.htm**
	Atlantic Hurricane Names **http://www.nws.noaa.gov/om/atlhurr.pdf**
	Pacific Hurricane Names **http://www.nws.noaa.gov/om/pachurr.pdf**

Linda Kremkau, Managing Editor

WSOM Chapter Updates and Roster

Attachment A is the WSOM Chapter updates. Attachment B is the *Aware Report* Roster that now includes WCMs and SOOs in each NWS Region. Telephone numbers are *listed* numbers for that office, *NOT* the direct number. If a name or telephone number has changed, please notify me at 301/713-0217. If you know someone who would like to receive the *Aware Report*, please have him or her contact Linda Kremkau at 301/713-0090 x118.

Melody Magnus, Editor

Attachment A—Update on OM's WSOM Chapters

WSOM Chapters: Status

B-16 **Marine Reporting Station**
To be updated in 1998.

B-19 **Fire Weather Stations**
Will be updated and consolidated with D-06 in 1998.

B-30 **Voluntary Observing Ship Program**
Due in 1998.

B-55 **Distribution and Use of Satellite Data**
Requires a total update; earliest draft 1998

B-90 **Special Warning Program Observations**
To be updated in 1998.

C-11 **Zone and Local Forecasts** (main section)
To be updated in 1999.

C-11 **Zone and Local Forecasts, Appendix A**
(Zone Forecast Maps)
Page updates to be issued fall 1998.

C-40 **Severe Local Storm Watches, Warnings and Statements.**
An Operations Manual Letter (OML) was issued February 1997 to update the format for the public watch narrative and conduct products to EAS. Late in the year, an OML will be issued to integrate products and services associated with Phase I of the convective watch decentralization.

C-41 **Tropical Cyclone Program**
Page changes to be sent in spring 1998.

C-42 **Combined Winter Storm and Non Precip Hazards**

C-44 OML to be distributed April 1998. Effective date, June 2, 1998

C-45 **Meteorological Discussions and Forecast Coordination**
An OML to C-45 defining the state liaison office policy is being drafted for field review for fall 1998.

C-47 **County Warning Areas, Appendix A.**
Update to be issued in fall 1998.

C-49 **Warning Coordination and Hazard Awareness**
Review and update began in early June 1997. Still in OM for review. The first draft will not reach the field until early 1999.

C-60 **Radio/TV Dissemination;**

C-61 **Telephone Dissemination;**

C-62 **Newspaper Dissemination;**
Work will begin updating and probably consolidating these chapters late 1998.

C-64 **NOAA Weather Radio Program**
Appendix to be issued documenting service areas and SAME codes in fall 1998.

C-67 **News Wire Dissemination**
Work will begin on updating and probably consolidating this chapter late in 1998.

C-66 **Dissemination of Public Warnings**
Will consolidate into chapter C-49 by late 1998.

C-72 **National Watch/Warning Verification Program;**

C-73 **Public/Aviation Forecast Verification**
These chapters will be updated and consolidated into a single chapter in FY 98.

WSOM Chapters: Status

D-06 **Fire Weather Services**
Will be updated in 1998 and consolidated with B-19, OML to D-06: Duties of IR Mets Requiring Exposure to Hazardous Situations.

D-07 **Marine Weather Services**
To be updated in 1999.

D-20 **Aviation Area Forecasts**
Will be combined with D-35; timing to be determined.

D-20 **Aviation Area Forecasts (OML)**
OML issued September 1997.

D-22 **Domestic SIGMET**
Will be consolidated with D-38; timing to be determined.

D-22 **Domestic SIGMET (OML)**
OML issued September 15, 1997.

D-23 **Special Aviation Forecasts and Events**

D-24 **Wind and Temperature Aloft Forecasts**
Should be combined with D-36; timing to be determined.

D-25 **Air Traffic Operations Support**
OML due in FY 1998.

D-30 **Transcribed Weather Broadcast Text Products**
Chapter issued July 8, 1997.

D-31 **Aviation Terminal Forecasts**
Chapter issued June 6, 1997.

D-35 **International Area Forecasts**
Should be combined with D-20; timing to be determined.

D-36 **International/Aviation Service Arrangements**
Should be combined with D-24; timing to be determined.

D-38 **International SIGMET**
Will be consolidated with D-22; timing to be determined.

D-51 **Marine Services for Coastal Offshore and High Seas Appendices B**
Replaced December 1997.

D-52 **Marine Services for the Great Lakes**
Finalized OML due fall 1998.

D-80 **Familiarization Flights**
OML to be issued spring 1998.

D-90 **Support for Accident Investigation and Litigation**
Transmittal Memo issued July 15, 1997, #97-8.

D-91 **Aviation Liaison and User Support Program**
Preliminary work to update, adjust, and reassign the contents of these chapters has been completed. Awaiting resources to complete the job.

F-42 ***Storm Data* and Related Reports**
An OML has been released to accommodate changes associated with Paradox II the new software for *Storm Data*. Other minor changes also have been included.

F-60 **Tsunami Warning Service**
OML issued effective April 1998.

F-61 **Earthquake Reporting Program**
Chapter issued March 6, 1996.

Attachment B–WCM/SOO Roster

WCM	SOO	Location	Telephone

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Rainer Dombrowsky, National WCM Program Manager			301-713-0090 x116
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Stephan Kuhl	Jeff Waldstreicher	Binghamton, NY	607-770-9531
Glenn Field	James Lee	Boston, MA	508-823-1900
Stan Levine	Ed Mahoney	Buffalo, NY	716-565-0204
Steve Hogan	Paul Sisson	Burlington, VT	802-862-2475
Tom Dunham	Rich Grumm	Central Pennsylvania, PA	814-234-9412
Jerry Harrison	Steven Brueske	Charleston, SC	803-744-3207
Mike Washington	Dan Luna	Charleston, WV	304-746-0173
Mary Jo Parker	John DiStefano	Cincinnati, OH	937-383-0031
Larry Gabric	Robert LaPlante	Cleveland, OH	216-265-2370
Steve Naglic	Michael Cammarata	Columbia, SC	803-765-5501
Vince DiCarlo	Larry Lee	Greenville-Spartanburg, SC	864-848-1332
Dan Bartholf	Carin Goodall	Morehead City, NC	919-223-5122
Gary Conte	Jeff Tongue	New York City, NY	516-924-0037
Joe Miketta	Alan Cope	Philadelphia, PA	609-261-6600
Rich Kane	Josh Korotky	Pittsburgh, PA	412-262-1591
John Jensenius	Joseph Fred Ronco	Portland, ME	207-688-3210
George Lemons	Kermit Keeter	Raleigh/Durham, NC	252-515-8209
Mike Emlaw	Steve Keighton	Roanoke, VA	540-552-0084
Bill Sammler	Hugh Cobb	Wakefield, VA	757-899-4200
Tom Matheson	Reid Hawkins	Wilmington, NC	910-762-4289

Southern Region

Gary Woodall, Regional WCM Program Manager			**817-978-2812**
Bernard Meisner, Regional SOO Program Manager			**817-978-2671**
Ed May, HSD Chief			817-978-2674
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Douglas Crowley	Richard Wynne	Amarillo, TX	806-335-1121
Barry Gooden	Gary Beeley	Atlanta, GA	770-486-1333
Larry Eblen	Jim Ward	Austin/San Antonio, TX	830-629-0130
Brian Peters	Kevin Pence	Birmingham, AL	205-664-3010
Don Ocker	Mark Jackson	Brownsville, TX	210-504-3354
John Cole	Andy Patrick	Corpus Christi, TX	512-289-0959
Jim Stefkovich	Mike Foster	Dallas/Fort Worth, TX	817-429-2631
Jack Mercer	Val MacBlain	El Paso, TX	505-589-4088
Gene Hafele	Steve Allen	Houston/Galveston, TX	713-337-5074
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Fred Johnson	Pat Welsh	Jacksonville, FL	904-741-4370
Howard Waldron	Steve Hunter	Knoxville/Tri-Cities, TN	423-586-9040
Roger Erickson	Felix Navejar	Lake Charles, LA	318-477-5285
Vacant	George Wilken	Little Rock, AR	501-834-9102

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Jim Lushine	Jack Gross	Miami, FL	305-229-4522
George Mathews	Brian Francis	Midland/Odessa, TX	915-563-5006
Gary Beeler	Jeff Medlin	Mobile, AL	334-633-6443
Jerry Orchanian	Henry Steigerwalt	Nashville, TN	615-754-8506
Frank Revitte	Mike Koziara	New Orleans/Baton Rouge, LA	504-522-7330
Jim Purpura	Dave Andra	Oklahoma City, OK	405-366-6583
Buddy McIntyre	Greg Jackson	San Angelo, TX	915-944-9445
Rafael Mojica	Shawn Bennett	San Juan, PR	809-253-4586
Bruce Burkman	Ken Falk	Shreveport, LA	318-631-3669
Bob Goree	Irv Watson	Tallahassee, FL	904-942-8999
Walt Zaleski	Charles Paxton	Tampa Bay Area, FL	813-645-2323
Steve Piltz	Steve Amburn	Tulsa, OK	918-832-4115

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Daniel Noah	Viggo Jensen	Bismarck, ND,	701-250-4224
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James Meyer	Ray Wolf	Davenport, IA	319-391-6729
Robert Glancy	Eric Thaler	Denver/Boulder, CO	303-361-0661
Jeffrey Johnson	Karl Jungbluth	Des Moines, IA,	515-270-4501
Darin Figurskey	Dick Wagenmaker	Detroit, MI	248-625-3309
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Carol Christenson	Gary Austin	Duluth, MN	218-729-0651
Jim Belles	Phillip Schumacher	Eastern North Dakota, ND	701-772-0720
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Shawn Harley	Michael Lewis	Jackson, KY	606-666-4856
Bill Bunting	Peter Browning	Kansas City/Pleasant Hill, MO	816-540-5147
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Norman Reitmeyer	Ted Funk	Louisville, KY	502-969-8842
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Jane Hollingsworth	Julie Adolphson	Northern Indiana	219-834-5178
Brian Smith	Steve Byrd	Omaha, NE	402-359-2394
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Tom Magnuson	Paul Wolyn	Pueblo, CO	719-948-9429
Susan Anderson	Brian Klimowski	Rapid City, SD	605-341-9271
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Todd Heitkamp	Ron Holmes	Sioux Falls, SD	605-330-4247
Steve Runnels	David Gaede	Springfield, MO	417-863-1456
Jim Kramper	Ron Przybylinski	St. Louis, MO	314-447-1876
Mike Akulow	George Phillips	Topeka, KS	913-232-1493
John Ogren	Michael Stewart	Wichita, KS	316-942-8483

WCM	SOO	Location	Telephone

Western Region

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Ed Clark	Steve Apfel	Elko, NV	702-738-3018
John Lovegrove	Mel Nordquist	Eureka, CA	707-443-6484
Chris Cuoco	Michael Staudenmaier	Flagstaff, AZ	520-556-9161
Kimberly Bailey	Greg Gust	Glasgow, MT	406-228-2850
Lynn Valtinson	David Bernhardt	Great Falls, MT	406-453-2081
Ron McQueen	Kim Runk	Las Vegas, NV	702-263-9744
Tim McClung	Dave Danielson	Los Angeles, CA	805-988-6610
John Casad	Dennis Gettman	Medford, OR	503-773-1067
Peter Felsch	Tim Barker	Missoula, MT	406-329-4841
Rob Doherty	Mike Johnson	Pendleton, OR	541-276-7832
Vacant	Doug Green	Phoenix, AZ	602-379-4611
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Roger Lamoni	Mary Cairns	Reno, NV	702-673-8107
Roger Pappas	Scott Cunningham	Sacramento, CA	916-979-3041
Dave Toronto	Larry Dunn	Salt Lake City, UT	801-524-5113
Ed Clark	Ivory Small	San Diego, CA	619-297-2107
Charles Morrill	Dave Reynolds	San Francisco Bay Area, CA	408-656-1725
Dan Gudgel	Larry Greiss	San Joaquin Valley	209-584-0583
Ted Buehner	Brad Colman	Seattle/Tacoma, WA	206-526-6095
Ken Holmes	Ron Miller	Spokane, WA	509-244-0110
Paul Flatt	David Bright	Tucson, AZ	520-670-5156

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Dan Keeton	Bill Schneider	Portland, OR	503-261-9247
Roger Lamoni	Mary Cairns	Reno, NV	702-673-8107
Kathy Hoxie	Scott Cunningham	Sacramento, CA	916-979-3041
Dave Toronto	Larry Dunn	Salt Lake City, UT	801-524-5113
Ed Clark	Ivory Small	San Diego, CA	619-297-2107
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Ted Buehner	Brad Colman	Seattle/Tacoma, WA	206-526-6095
Ken Holmes	Ron Miller	Spokane, WA	509-244-0110
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Bruce Turner	*(no SOO position)*	Palmer (ATWC)	907-745-4212

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