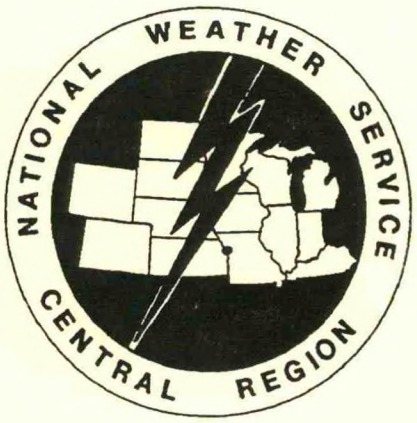

CENTRAL REGION
APPLIED SERVICES AND PROGRAMS TREATISES
VOLUME 1

December 1994

NATIONAL WEATHER SERVICE CENTRAL REGION SERIES OF CENTRAL REGION APPLIED SERVICES AND PROGRAMS TREATISES (CRASPT)

The NWS Central Region Applied Services and Programs Treatises (CRASPT) series is an informal medium to compile and distribute a small part of the on-station research efforts being performed by the operational personnel of the Central Region. As the National Weather Service becomes more involved in using high technology to sample, describe, and forecast the weather, this medium has been made available to encourage the transfer of useful knowledge and skills to other NWS offices. Many times on-station research efforts and case studies are only circulated locally due to the time and effort required to put the study into "publishable" form (both text and graphic). The following CRASPT compilations are a vehicle to distribute services and programs to other NWS offices.

TABLE OF CONTENTS

CENTRAL REGION
APPLIED SERVICES AND PROGRAMS TREATISES 1-01

MODERNIZATION IN SEVERE WEATHER COMMUNICATIONS

James Belles and Jeff Johnson
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1. Introduction

During the past few years, technological advances in communication have allowed National Weather Service (NWS) field offices the opportunity to improve the way information is gathered and disseminated to severe weather spotters and disaster preparedness officials. Modernization affects not only forecasting and radar interrogation of severe weather, but should also result in an improvement in communication and service to government agencies which are responsible for public safety.

In the aftermath of the Great Flood of 1993, and with the addition of WSR-88D, the NWS Warning and Forecast Office (WSFO) in Des Moines has reevaluated its reception of spotter information and its position among the emergency management community. The weather disasters experienced last year have taught emergency managers that communication among government agencies is critical in order to facilitate the decision-making process. In addition, acquisition of spotter reports needs to be more frequent, particularly when challenged with interpreting Doppler radar signatures for the first time.

This paper describes how technological advances in communication have improved warning preparedness at Des Moines. We have taken into account any of the problems which most offices face; for instance, communication with rural versus urban communities and small towns with limited budgets.

2. Communication in Rural Areas and Distant Locations from the Warning and Forecast Office

A traditional approach to preparedness activities involves extensive training of HAM radio groups, law enforcement agencies, and private citizens. In most cases, these spotters are mobile, and organized by county emergency management. Seminars are usually coordinated with emergency management at either the city or county level with generally less than 100 people in attendance. If an office's county warning responsibility is modest in size, then personnel from the NWS usually conduct a Skywarn seminar in each county at least once a year.

Skywarn has proven to be a successful program training thousands of storm spotters each year. Unfortunately, very few of these mobile spotter reports are communicated directly to the NWS. In many cases, when a report is passed on to the NWS by telephone, it fails to be timely. Occasionally spotter reports terminate at a county or city dispatch center. Timely severe weather reports are essential, otherwise forecasters are forced to make warning decisions without adequate information. Forecasters faced with issuing warnings based solely on radar, without timely ground truth, may become negatively reinforced to issue further warnings. This is problematic, because severe weather reports often become available over the area in question as much as two weeks after the event.

Communication should strive to come as close to instantaneous as possible. Telephone communication can prove to be unreliable during severe weather episodes. Offices which rely on this mode of communication risk the loss of vital spotter reports if telephone lines are downed. Also, coordination with emergency management in the aftermath of a storm is difficult at best. The difficulty originates with a profound lack of simultaneous interagency communication links, or communication links which rely heavily on telephones. The quandary many offices face is a county warning area that extends beyond the operational range of conventional radio communication. The solution to this problem involves integrating improvements to traditional methods with innovative new technology.

A. Packet radio

Packet radio combines computer technology and the amateur radio or HAM community. Packet radio's potential surpasses conventional HAM radio with the ability to access satellite technology for spotter positioning, and to establish private dedicated long-range communication on various VHF, UHF, and microwave frequencies. This technology allows instantaneous reception of spotter reports and coordination with emergency management, as well as law enforcement, without the vulnerability of telephones. Mobile spotters are possible with this system, which plots their movement on a computer terminal. Most importantly, Packet radio can access the most distant location of an office's county warning area.

Packet radio operates from any PC. Messages or data can be sent or received automatically or interactively to any participant. Communication is much like any computer based bulletin board network, however the frequency is only available to those licensed to operate a HAM radio. Currently, an Automated Packet Radio System (APRS) is deployed at the WSFO in Des Moines. This system allows spotters to automatically send weather data, such as temperature and wind velocity. Additional weather data, disseminated automatically (in some cases at least once an hour) to the NWS, has allowed for better

data resolution and mesoscale interpretation during severe weather episodes. Implementation is just beginning, therefore interactive communication with Packet radio users across Iowa is unfortunately not yet possible.

Fiber optics communication technology can be combined with Packet radio. In Iowa, a state-of-the-art fiber optics systemlinks each county Emergency Operation Center (EOC) with the state Division of Emergency Management EOC. Within the next year a packet radio link will be established between the NWS and the state EOC, thus enabling secure and instantaneous communication between the NWS and each county in Iowa. Spotter reports, disaster recovery coordination, and product dissemination from AFOS will comprise a bulk of the message transfer. AFOS products disseminated could include the radar coded message (RCM) generated by the WSR-88D. Computer software is currently available which converts the RCM to a displayable product. Each county in Iowa would receive WSR-88D data at the establishment of these communication links. The NWS in Missouri is currently implementing this technology. Product dissemination in this manner could result in significant financial savings to state and local government.

B. 800 Telephone communication

Although severe weather communication is advancing toward instantaneous links, telephones can still be utilized for augmentation. In locations where distance prohibits conventional radio communication, and Packet radio has yet to be implemented, a toll-free 800 telephone line is an effective and inexpensive way to obtain spotter reports directly from government agencies or private citizens. Even in areas where efficient radio communication is established, a massive recruitment of private citizens linked through a toll-free 800 line can supplement new communication technology by adding an additional tier of spotters known as point spotters.

Point spotters are managed directly by the NWS. Over a two year period nearly 1,200 point spotters were recruited and organized across Des Moines' 52 county area of warning responsibility. Point spotters simply report severe weather at their location via a toll-free line. Coordination with these individuals is painstaking, with addresses and commitments to the program constantly changing. These spotters prove useful for verification, real-time reports of hail, winds and heavy rain; however, their lack of mobility limits tornado reports.

During the severe weather season of 1994, the 800 point spotter network was utilized for verification up to 24 hours after a severe weather event. Although deployment of the WSR-88D was the most overwhelming reason for improved verification scores at Des Moines, the 800 point spotter network, at least in part, contributed to an improvement in our warning program. Data from Des Moines for 1994 through June indicated the lowest False Alarm Ratio

(FAR) and the highest Critical Success Index (CSI) in ten years. Since the network occasionally produces a timely severe weather report, as well as numerous reports up to 24 hours after an event, it has proved its usefulness.

3. Communication in Urban Areas

Many Central Region offices are located in metropolitan areas. Coordination in densely populated areas creates unique problems given the demands of servicing multiple government agencies. In order to facilitate communication between many agencies which require weather information, dedicated and secure modes of contact are essential. Radio communication accomplishes this task. Point-to-point radio allows rapid communication with multiple agencies simultaneously. The overwhelming demands of coordinating with various state and local governments within the Des Moines metro area, during the Great Flood of 1993, taught agencies that permanent communication links must be established. For Des Moines, this meant the implementation of an 800 MHz radio network (known as Metro Incident Command Radio Network, MICRN) for use as an incident command network by local officials during civil emergencies ranging from tornadoes to hazardous material spills. The network frequency is commercially leased allowing for a very reasonably priced system with no maintenance. Figure 1 displays the network's participants.

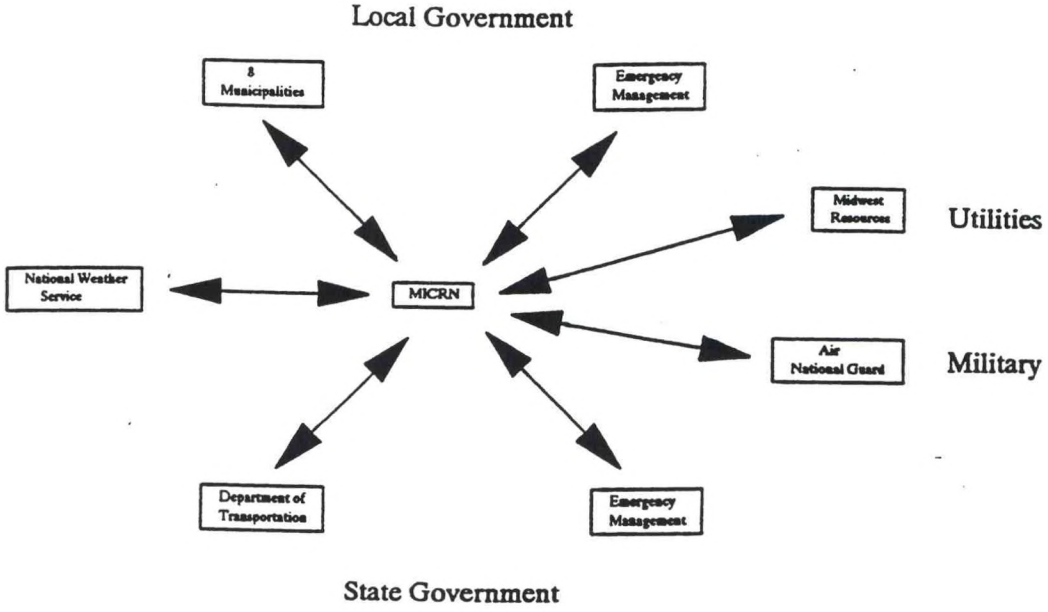

Figure 1. Participants of the Metro Incident Command Radio Network (MICRN) in Des Moines.

The NWS disseminates severe weather watches and warnings over the MICRN, as well as periodic weather updates. Spotter reports are also requested from the participants. If a disaster strikes, government agencies can coordinate with one another in an instantaneous and simultaneous manner, regardless of telephone status.

4. Conclusion

The concept of mutual aid among government agencies is fundamental in order to improve disaster preparedness. The first step in establishing cooperation among agencies is to improve communication. Secure and instantaneous links between emergency managers, spotters, and law enforcement will insure the importance of the NWS to the community. Our agency must be aggressive in attempting to implement new technologies that make coordination simple. Figure 2 is a flow chart describing how the Des Moines Warning and Forecast Office is attempting to complete the communication link between the various communities that we serve. The concept considers the need to diversify the type of communication systems depending on the population.

Figure 2. Flow chart describing the communication link between the various communities that we serve.

5. Acknowledgements and Suggested Reading

The authors would like to thank Brian Smith and Mike Akulow for their review. Also, thanks to Jean Kallman for drafting the figures. A more through review of Packet radio can be obtained from the book "Your Packet Companion" by Steve Ford, published by "The American Radio Relay League".

CENTRAL REGION
APPLIED SERVICES AND PROGRAMS TREATISES 1-02

RESULTS OF THE OMAHA NOAA WEATHER RADIO MEDIA SURVEY

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1. Introduction

In April of 1994, a media survey was conducted to evaluate the NOAA Weather Radio (NWR) program at the National Weather Service (NWS) in Omaha, Nebraska. The media are a significant target of the NWR, as they serve as a primary link between the NWS and the general public. The media may rebroadcast NWR, or use the information for newspaper articles or television and radio broadcasts. A cooperative relationship between the NWS and the media will enhance the effectiveness of products broadcast on NWR and further the success of the NWS's mission; to reduce loss of lives and property.

The media survey had two primary objectives. The first objective was to gain demographic information about various media organizations and to identify actual NWR users. Secondly, an evaluation of the current program was completed to measure program quality and the effectiveness of modifications made to Omaha's NWR program during 1993.

2. Methodology

A list of media organizations was compiled for the Omaha NWR coverage area. The organizations were then grouped into three primary market segments; television stations (including cable), radio stations, and newspapers. Twelve surveys were mailed to television stations, 23 surveys were mailed to radio stations, and 34 surveys were mailed to both daily and weekly newspapers.

Several steps were taken to increase the probability of survey response. For each organization, a point of contact was identified. This point of contact was generally the "on-air" meteorologist, the radio news director or program director, or the newspaper editor. The survey was designed to be short and semi-structured with a mixture of fill-in-the-blank questions and free response questions (Attachment 1). It was requested that the survey be returned by May 1, 1994 and each survey included a business reply envelope to ensure that the survey was mailed to the proper address.

The survey was partitioned into four sections. The first section was demographic; it identified the organization as a user or non-user, location of use, and the three most important sources of weather information. The second section included a series of equipment and reception questions. The third and fourth sections detailed broadcast use and evaluated NWR programming.

3. Results

Of the 69 surveys mailed, 33 were returned (48%). The return rate for each market segment was as follows: Radio-65%, Television-42%, and Newspaper-38% (Figure 1). Even though the respondents were given one month to mail back the survey, 85% were returned were received within the first week.

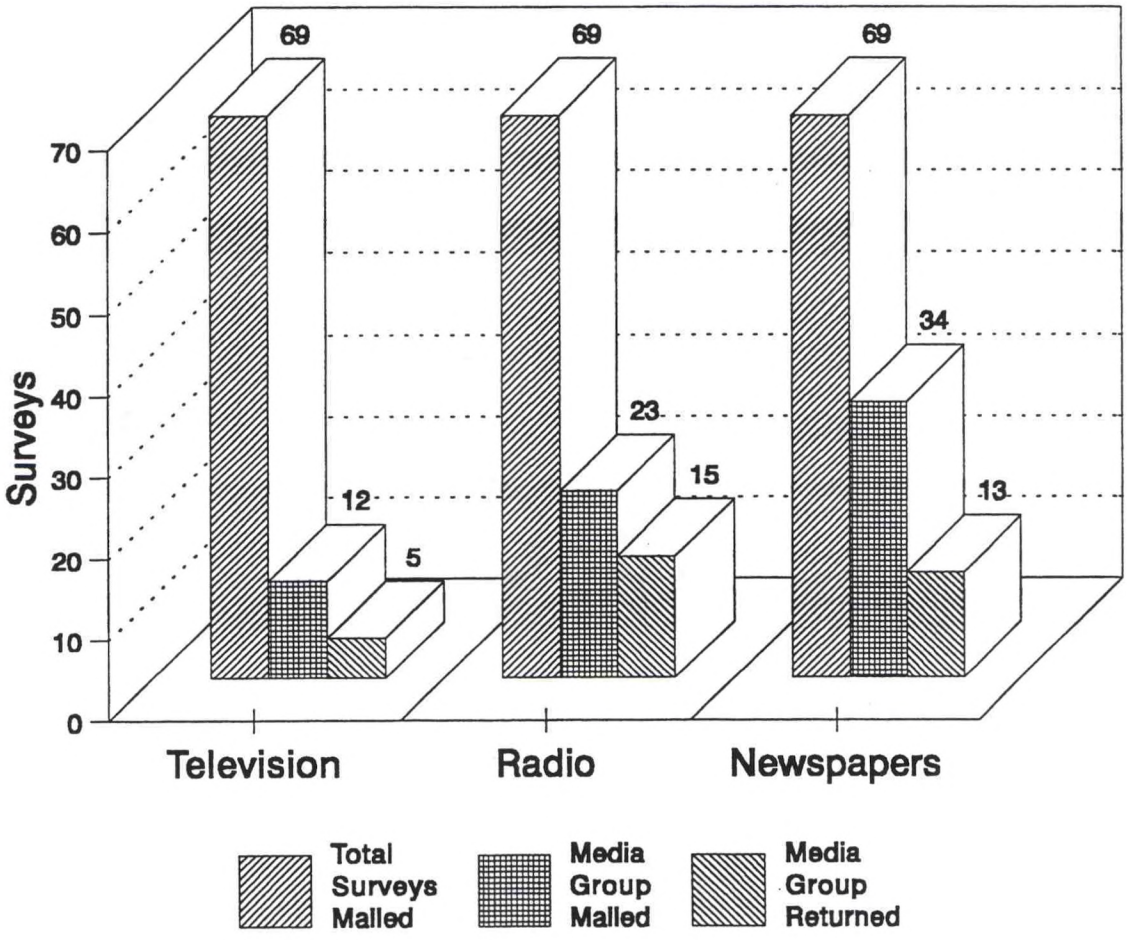

Figure 1. Survey Response

In the user category, nearly 100% of the radio and television respondents used NWR as a source of weather information. In contrast, only 5 of the 13 newspaper respondents (38%) used NWR. Instead, most of the newspapers mentioned television and radio as a primary source of weather information. Of the five newspapers that did cite using the NWR, three rated NWR as their primary source of weather information.

Among radio stations, the NOAA Weather Wire and the Associated Press news wire were listed as the most important sources of weather information. While the television stations considered NWR important, other sources included radar and the NOAA Weather Wire. All respondents generally used NWR for work, but television broadcasters mentioned that they also listened at home to follow their temperature forecasts.

A variety of weather radio brands were cited by users. These included; Radio Shack (Realistic), Bearcat (Uniden), and Plectron. Most of the weather radios were purchased by the employer and the receivers were equipped with a warning alarm tone. The signal quality was rated good or strong by all but two of the respondents; one was located in Shenandoah or about 45 miles from Omaha, and the other specified his home weather radio in southwest Iowa.

The three media segments listed watch and warning information as their top priority for using NWR. For radio and television stations, special weather statements, radar information, local forecast, and hourly weather information were also rated highly. Newspapers rated the local forecast more important than special weather statements and radar information. The least important products to the media were air quality/pollen information and fire danger statements.

Radio stations were the most likely organization to rebroadcast the NWR. The broadcasts were mainly used during severe weather, but were also used on a regular hourly basis by two stations. Television stations used NWR broadcasts as a back-up during severe weather. Newspapers generally used it for planning or personal purposes.

The final section of the media survey pertained to program quality, timeliness, length of broadcasts and opinions about NWR. The following is a summary of responses received:

Quality of Broadcast		Timeliness		Broadcast Length	
Excellent -	22%	Excellent -	26%	Too short -	0%
Good -	78%	Good -	70%	Just right -	87%
Poor -	0%	Poor -	4%	Too long -	13%

Comment Section Summarized

Best Features of the NWR Broadcasts:

* Timeliness with severe weather
* The availability of weather information on demand
* The alarm and warning functions
* Hourly weather is consistent
* The authoritative voice on broadcasts
* The addition of ASOS sites to the hourly weather
* Broadcasts are concise and to the point

Worst Features of the NWR Broadcasts:

* During severe weather would just like warnings to be cycled
* Poor reception (outside broadcast area)
* Hourly weather may not be timely
* Occasionally too technical
* Would like more lead time on warnings

The users were generally comfortable with the information being broadcast and did not feel additional information was needed. However, a couple of radio stations indicated that agricultural information and heating degree days data were not needed.

4. Conclusions

The results of this survey clearly showed that NWR is a vital source of weather information for radio and television stations, especially during periods of severe weather. Newspapers limited their use of NWR for personal rather than professional purposes. It was interesting to note that the employer was the most likely purchaser of the weather radio and should be a target for future weather radio promotions.

The users were generally very satisfied with the overall quality, timeliness, and length of NWR broadcasts. In 1993, Omaha's NWR program added several locations to the hourly weather. These locations were mainly Automated Weather Observing System (AWOS) sites which became available on a regular basis. The program was refined to be more consistent and more sensitive to user needs. Comments received from the media survey recognized these changes as positive to the NWR program.

While the media survey illustrated that the current NWR program was rated high, suggestions to maintain its quality emphasize severe weather information and regular monitoring. The main strength that the NWR has is its

alarmability. Relaying severe weather information to the media quickly will enable them to pass the information on to the general public. During hectic severe weather situations, it is crucial that the broadcaster is aware of all watches, warnings, and statements being aired. A single person in charge of the NWR during the severe weather event will help eliminate confusion. In addition, this one individual monitoring broadcasts will reduce redundant or out dated information.

National Weather Service Media Survey - April, 1994

Name:
Address:

The purpose of this NOAA Weather Radio survey is to give us an opportunity to evaluate our weather radio service and to change our broadcasts in response to your needs. Comments and suggestions are always welcome regarding our KIH-61 broadcasts, so feel free to give us a call or write a note any time of the year.

Please answer the following questions and return the survey in its reply envelope no later than May 1, 1994.

I. General

1. Do you currently use NOAA Weather Radio as a source of weather information?
   a. Yes
   b. No (if no, briefly state why, skip to question 3 and return survey)
2. NOAA Weather Radio is used at:
   a. Work
   b. Home
   c. Both
   d. Other
3. List your three primary sources of weather information in order of importance.
   1.
   2.
   3.

II. Equipment and Reception

1. What city, town, or portion of a county do you listen to us from?
   Work:
   Home:
   Other:
2. What type of radio(s) do you receive our broadcast on?

3. Does your receiver have a warning alarm tone?
   a. Yes
   b. No
4. The purchase of the radio was made by:
   a. Employer
   b. Self
   c. Was a gift

5. About the radio purchase:
   a. Where was the radio purchased?
      Approximate cost?
      Approximate month or year of purchase?
   b. No knowledge of purchase
6. Rate the quality of your signal reception:
   a. Strong
   b. Good
   c. Weak
7. Are you able to receive other NOAA Weather Radio broadcasts from your location?
   a. Yes (list other station)
   b. No

III. NOAA Weather Radio Broadcast Use

1. How to you use the weather information we provide?

   a. Describe use:

   b. Specifically which products do you use:

Circle all that apply	Rank in order of importance
Regional weather synopsis	_____
Watch and warning information	_____
Local and extended forecast information	_____
Agricultural forecast	_____
Special weather statements	_____
Hourly weather information	_____
Short-term forecast/nowcast	_____
Climatological reports	_____
Radar information	_____
Air quality/pollen information	_____
Fire danger statements	_____
Wind chill/ heat index statements	_____
Other	_____

2. Do you re-broadcast/re-print NOAA Weather Radio information?
   a. Yes - If you re-broadcast/re-print NOAA Weather Radio information:
      How often do you re-broadcast/re-print?
      Which information?
      At what times during the day?

   b. No

IV. Program Information

1. Rate the quality of our broadcasts:
    a. Excellent
    b. Good
    c. Poor
    Comments:

2. Rate the timeliness of the products:
    a. Excellent
    b. Good
    c. Poor
    Comments:

3. Rate the length of our broadcasts:
    a. Too short
    b. Just right
    c. Too long

4. The hourly weather information for local and surrounding cities is:
    a. Too little (add:)
    b. Just right
    c. Too much (eliminate:)
    Comments:

5. What do you like best about NOAA Weather Radio broadcasts?

6. What do you like least about NOAA Weather Radio broadcasts?

    Suggestions:

7. Is there any weather information currently being broadcast that you feel is not needed?

8. Is there any additional weather information you feel needs to be added to the broadcast?

CENTRAL REGION
APPLIED SERVICES AND PROGRAMS TREATISES 1-03

NEXRAD WEATHER SERVICE OFFICE IN WICHITA, KANSAS IMPROVING THE NOAA WEATHER RADIO PROGRAM

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1. Introduction

In the Spring of 1994, the Staff at the NEXRAD Weather Service Office (NWSO) Wichita, Kansas, undertook the task of conducting an encompassing NOAA Weather Radio (NWR) survey in all three of our listening areas in Kansas (Figure 1). Instead of the usual method of conducting a NWR survey on the air, this survey effort was completed in conjunction with spotter training and safety talks in the spring. These spotter and safety talks were open to the public, and advertised on television, radio, newsprint, and on the NWR. It allowed us to distribute and collect surveys to a wide variety of customers in all 29 counties under NWSO Wichita's warning responsibility area. We were able to get more people to respond to the survey and we compiled responses from 343 customers.

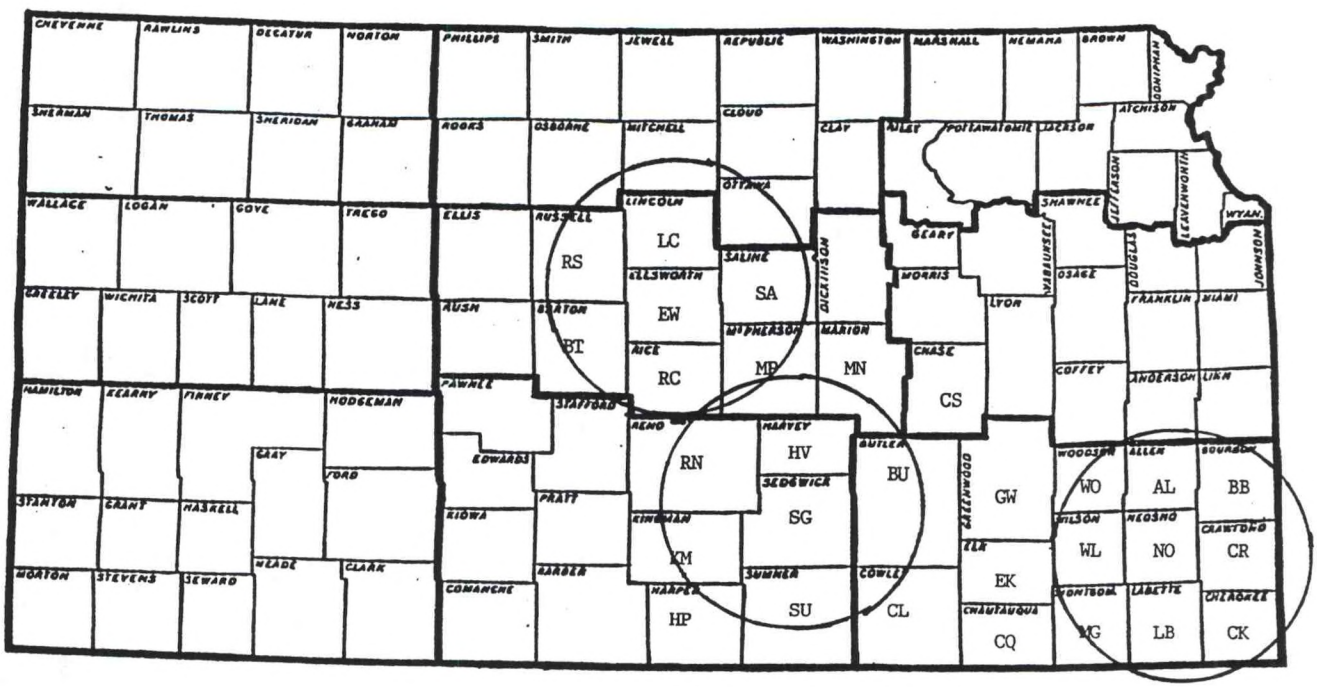

Figure 1. Three listening areas in Kansas and the county abbreviations.

This paper's objective is to describe our survey methods and subsequent actions taken, in order to improve the Weather Radio program for the customers in our listening areas.

A. Survey[1]

The NWR survey was written in such a way that responses would be easy to compile afterward (Attachment 1). Questions 5 and 6 required a written response that entailed manual compilation.

At each of the spotter training and safety talks, we invited volunteers that were knowledgeable in NWR to complete a survey form. We distributed up to 15 surveys at each talk. This number was chosen because, at the onset, we did not know what kind of response we were going to have and we wanted to keep the number at a manageable level. At most talks, there were less than 15 volunteers. At talks that had more than 15 volunteers, the surveys were distributed randomly. We collected these surveys before everyone departed at the end of the training session.

B. Compilation of the survey

Except for questions 5 and 6, all responses were compiled using the spreadsheet Quattro Pro. We totaled all the raw numbers given in question 1. These raw numbers are seen in the tables for each listening area in Figure 2a-2c. For those products that were left blank, we assigned the number nine, as this would indicate that the product was found not to be very useful when compared to other products. In order to see the "MOST USEFUL PRODUCTS", we took the inverse of the raw numbers for each product, and multiplied by 10,000. This allowed us to graph the usefulness of the various NWR products (Figures 2a-2c) for each NWR listening area.

Questions 2, 3, 4, and 7 were rather straight-forward and easy to compile. Attachment 2 provides a summary of responses to the survey.

Questions 5 and 6 were manually compiled. Besides listing the actual responses, we compiled these responses in the order of frequency received. Attachment 3 summarizes the responses to question 5 and 6.

C. Results of the survey

As with many NWR surveys conducted, we received plenty of positive feedback. Many volunteers commented, "Keep up the good work", or similar phrases. Our objective, however, was to improve upon our current program, and provide a more interesting and valuable service.

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[1]Copies of the complete survey results are available by contacting the authors.

Central Kansas Listening Area

		RWS	ZFP	EFP	STF	HRL	AG	CLI	OTHER
	EW	49	30	42	28	34	54	68	
	LC	42	33	44	20	27	63	64	
	MP	49	23	50	21	32	56	54	
	RC	46	30	25	44	36	67	64	
	RS	50	36	46	32	50	69	66	
CN KS	TOTAL*	236	152	207	145	179	309	316	

* Remember the smaller the number the more useful the product

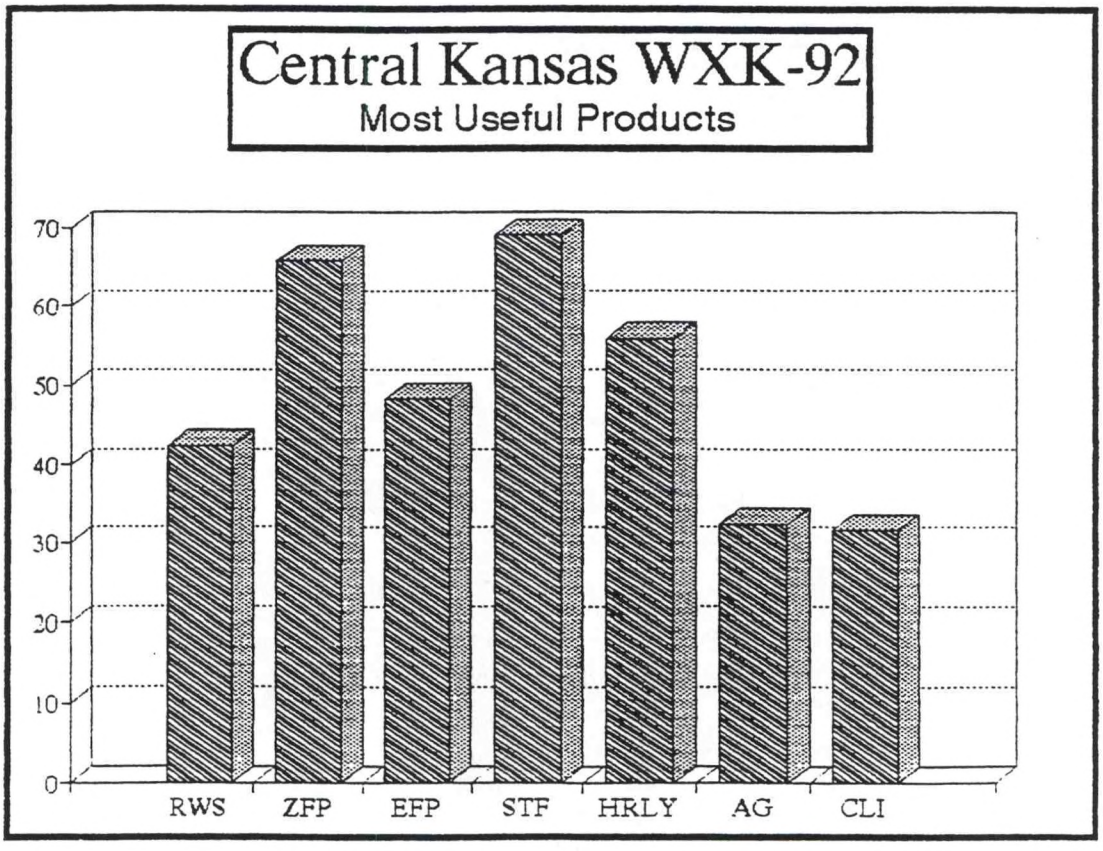


Figure 2a. The usefulness of the NWR products in the Central Kansas listening area.

South Central Kansas Listening Area

	RWS	ZFP	EFP	STF	HRL	AG	CLI	OTHER
SG	376	274	330	272	287	619	541	
HV	64	41	52	32	32	87	86	
HP	15	10	12	14	18	17	20	
BU	129	90	102	76	91	180	174	
KG	52	28	42	34	42	74	70	
SU	19	14	16	10	6	22	25	
CL	50	37	42	39	49	76	94	
RN	74	50	60	48	43	83	80	
SC KS TOTAL*	779	544	656	525	568	1158	1090	

* Remember the smaller the number the more useful the product

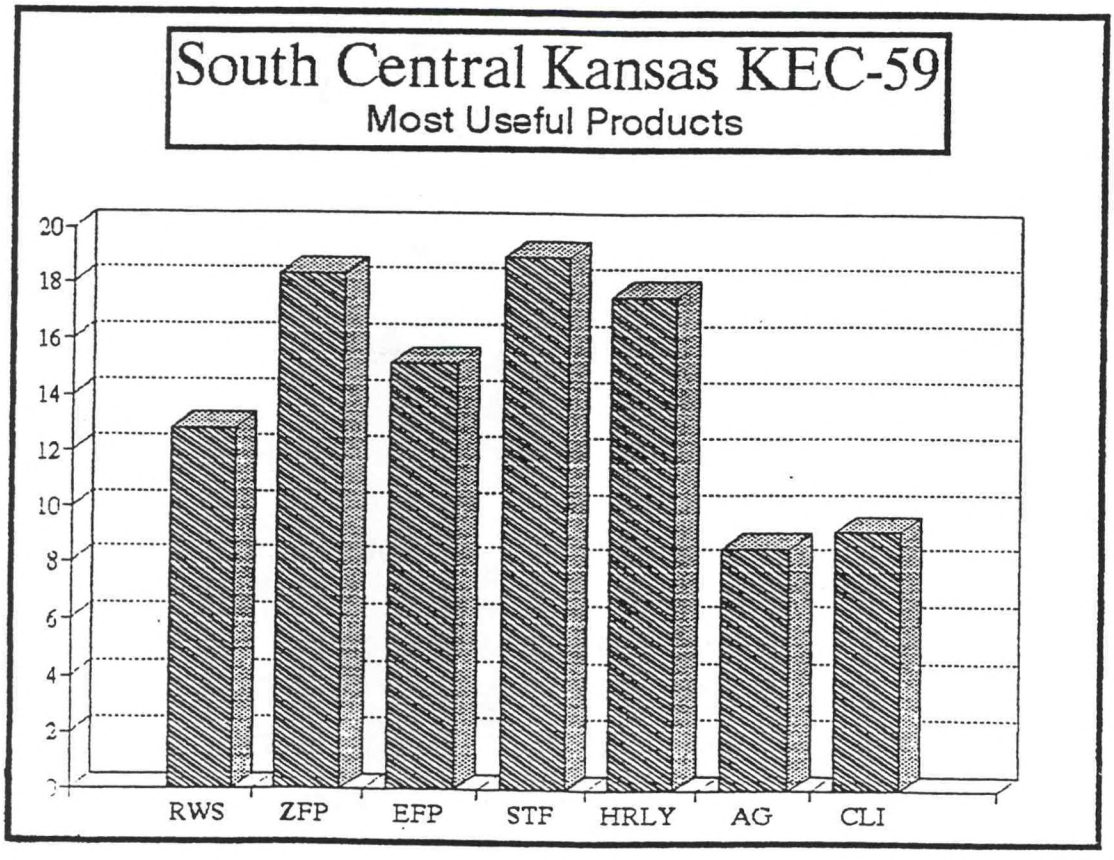


Figure 2b. The usefulness of the NWR products in the South Central Kansas listening area.

Southeast Kansas Listening Area

	RWS	ZFP	EFP	STF	HRL	AG	CLI	OTHER
AL	25	27	37	28	29	37	47	
BB	22	22	22	23	24	36	32	
CR	59	56	69	34	50	82	78	
CK	31	23	27	25	15	52	62	
LB	37	25	31	24	32	51	48	
MG	16	6	10	3	8	16	19	
NO	27	16	17	16	19	34	40	
WL	19	28	30	29	32	41	40	
WO	29	159	196	137	158	274	286	
SE KS TOTAL*	265	362	439	319	367	623	652	

* Remember the smaller the number the more useful the product

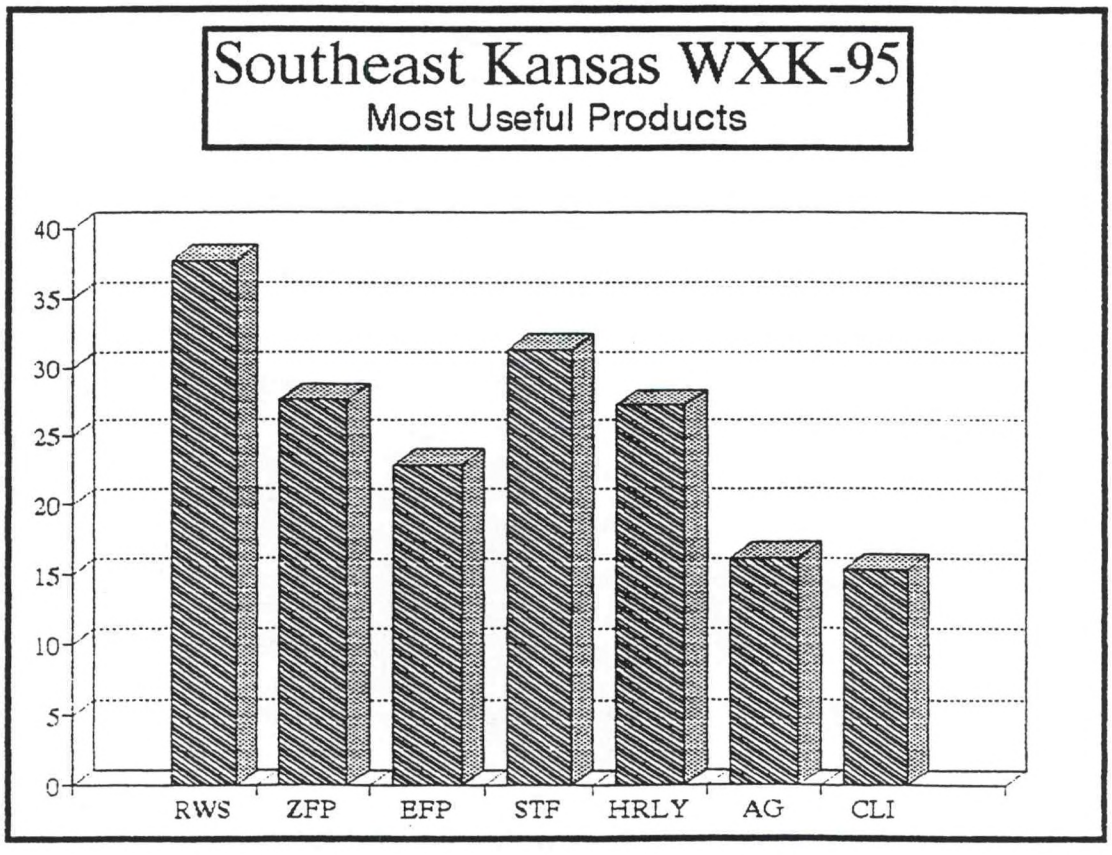


Figure 2c. The usefulness of the NWR products in the Southeast Kansas listening area.

We were pleasantly surprised to learn that the Short Term Forecast was rated the most useful product in two out of three listening areas! This reinforced our views that the Short Term Forecast is an increasingly important Weather Service product, and that our customers are making daily decisions based on the information provided in this product.

Results from questions 2, 3, and 4 were not as surprising. Peak listening times occurred in the early morning and again in the evening. Most customers listened to the NWR under 10 minutes (about 2 NWR cycles).

The information from questions 5 and 6 was probably some of the most useful information obtained from the survey. Here our volunteers were able to tell us where we could improve, and what information they would like to hear.

Question 7 gave us an overall view of our NWR program. Clearly, there is room for some improvement. It is interesting to note that the area in which NWSO Wichita is located (south central Kansas) received the highest overall rating, even though the broadcasts are identical (as far as product type) in all three service areas. Is there a perception that people are getting better service because the office is close to them?

D. Putting together a task team

Once all the data was compiled, a weather radio task team was developed, which consisted of two HMT's, one Intern, one Meteorologist, and one WCM. The task team took the results of the survey, evaluated them, and made recommendations that would satisfy the needs of these customers. These recommendations would include NWR program content and needed changes in current methods and operations of programming and broadcasting.

E. Recommendations and actions taken to improve the NWR program

The working group reviewed the responses received and worked to address the concerns and suggestions of the volunteers. Most of their suggestions were considered, while planning and implementing a new NWR strategy.

There were three basic considerations that were addressed: Hardware, Broadcast, and Programming.

Hardware: The possibility of increasing the power of the NWR transmitter for more range and making improvements to our NWR broadcast room. Also, include carpeting, microphone boom and stand, and possibly reconfiguring the three consoles in the NWR room. Another hardware consideration was to be sure the tapes were erased thoroughly, in order to improve tape audio quality. To help us with this, we purchased a stronger desktop magnetic tape eraser.

Broadcast: Working to improve our writing style and speaking voices, in order to deliver a clear, concise and smoother flow of information. In order to help the staff accomplish this goal, two writing seminars were given to the staff in May and June, and two broadcast seminars were given to the staff in August.

Programming: Reviewing the survey results to provide increasing emphasis on the most useful products and services, and to improve in the following areas:

* Provide more frequent and detailed weather updates (mainly during severe weather).
* Provide storm reports.
* Shorten the hourly weather tape.
* Relay significant weather just outside the listening areas.

We should create a NWR tape explaining why it would be impractical to do some of the suggestions received (such as current weather every 30 minutes, pilot weather information, etc).

The primary changes made to our NWR programming, as theresult of the survey are as follows:

- The number one comment made on how we can improve the weather radio broadcast was to provide more severe weather information during times of severe weather. This severe weather season, we decided to send out more information on severe storms and to relay as much ground truth information as possible, using shorter and more concise Severe Weather Statements. The reaction, thus far, has been very favorable. We believe that this will help satisfy the requests by providing more timely severe weather information.

- Since the Short Term Forecast (STF) was rated the highest in two out-of-the three listening areas, we placed an increased emphasis on the Short Term Forecast. We now include most convective watch and winter weather watch and warning information in the STF, rather than a Special Weather Statement (SPS). We stress the forecast portion of the weather, rather than what is happening or what has happened. We blend the STF with the remainder of the first period of the zones, in order to provide a smooth and consistent flow of information.

- Change the content of the Synopsis and Regional Forecast. In the morn ing and evening, an abbreviated synopsis is broadcasted, along with a travelers "next day" forecast for various air route "hubs" that leave Wichita.

- Shorten the Hourly Weather and focus more on Kansas. The biggest change in this product was that the "Elsewhere across mid-America" section became "Elsewhere across Kansas", and will be summarized. After 11:00 pm when the NWR has its fewest listeners, it was decided to use an abbreviated hourly weather which eliminates the "Elsewhere across Kansas" section.

- Test the alarm tone every Wednesday between 11:00 am to Noon and the first Monday of every month at 7:00 pm. This was requested by several of our volunteers.

- Broadcast storm reports (convective and winter) after the major events, along with more rain and snowfall reports around the service area.

- Create new ID tapes, and play more informational and promotional tapes.

Attachment 4 gives the routine and severe weather programming format.

F. Future objectives and considerations

A weekend recreational product is being developed that would address weather concerns for listeners that are camping, boating, hiking, attending an outdoor activity, etc.

The NWR program will continue to improve. Follow-up on responses to the initial changes will be needed to determine the effectiveness of the improvements and overall NWR program. From those responses, further changes will be implemented, before the cycle begins again.

2. Acknowledgements

Thanks to other members of the NWR working group for their dedication and commitment: John Ogren, Leon Wasinger, and Randy Calloway. Special thanks to Greg L. Noonan, now at NWFO Wakefield, for compiling some of the responses and creating the graphics. Also, thanks to Dick Elder, Mike Stewart, and Leo Ritter for their suggestions and comments.

NWSO WICHITA, KANSAS

1994

*****NOAA WEATHER RADIO SURVEY*****

In a continuing effort to improve your Weather Radio Program, we are requesting that the following questions be answered. Please return the survey form prior to leaving this evening! Your response is very important to us in determining how we can best provide the service you want! We thank you for your cooperation and support.

1. Please rank the following ROUTINE Weather Radio products from 1 to 8, with 1 being the MOST useful to you, and 8 being the LEAST useful.

____ Regional Synopsis and Forecast
____ One to Two Day Forecast
____ Extended Forecast (3 to 5 day)
____ Detailed Short Term Forecast (Out to 6 hours)
____ Hourly weather conditions/observations
____ Agricultural Forecast/Information
____ Climatology Information
____ OTHER - Please specify _____

2. At what time(s) do you normally listen to the broadcast? (please check one or more)

____ Midnight to 3 am
____ 3 am to 5 am
____ 5 am to 7 am
____ 7 am to 9 am
____ 9 am to 11 am
____ 11 am to 1 pm
____ 1 pm to 3 pm
____ 3 pm to 5 pm
____ 5 pm to 7 pm
____ 7 pm to 9 pm
____ 9 pm to Midnight

3. Once on, how long do you normally listen to the broadcast? (please check one)

____ Less than 5 minutes
____ 5 to 10 minutes
____ 10 to 15 minutes
____ More than 15 minutes

4. What is your PRIMARY reason for listening to the Weather Radio? (please check one)

____ Severe Weather Warnings/Statements
____ Recreation or other Outdoor activities
____ Work/School/Shopping
____ Travel
____ Other - please specify _____

5. What type of weather information would you like that is not currently provided on the Weather Radio? _____

_____

6. What can we do better to improve the Weather Radio program for you?

_____

_____

_____

_____

7. On a scale of 1 to 10 (with 10 being the best), how would you rate the overall quality of the NWR broadcast? _____

NWR SURVEY SUMMARY

Question 1:

Most useful products:	NWR Listening Areas C	SC	SE
Regional Weather and Synopsis	5	5	1
1-2 day Forecast (Zones)	2	2	3
3-5 day Forecast (Extended)	4	4	5
Short Term Forecast	1	1	2
Regional Weather Summary (Hrly)	3	3	4
Agricultural Forecast	6	7	6
Climatology Information	7	6	7

(Rankings are from 1 to 7, with 1 being ranked the most useful, and 7 the least useful.)

Question 2:

Peak listening times - 1) 5 am to 9 am
2) 5 pm to 11 pm

Question 3:

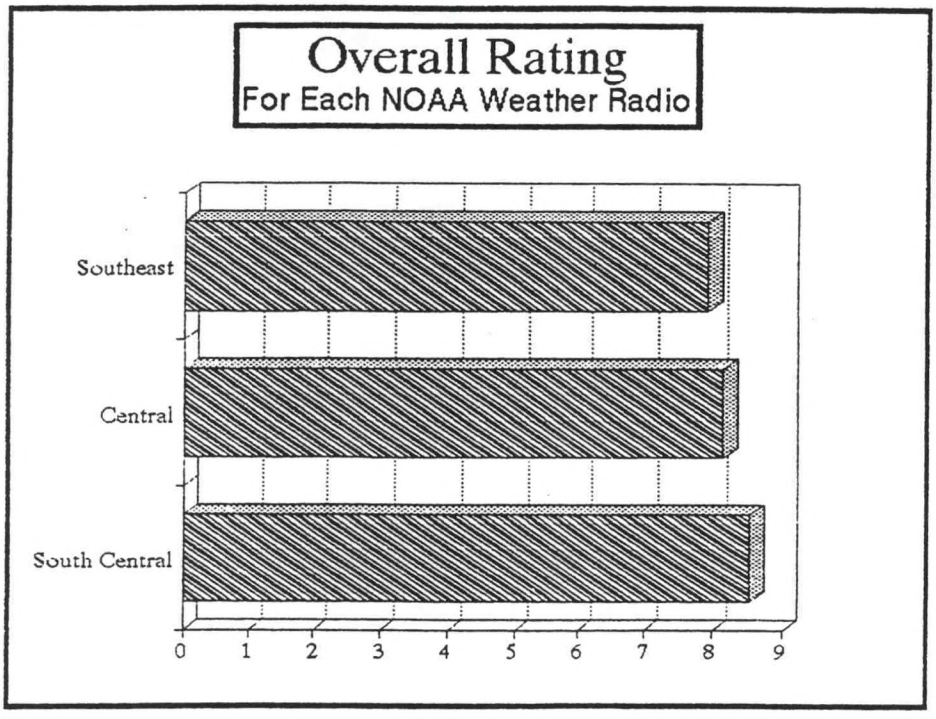
Listening length - Less than 10 minutes

Question 4:

Reason for listening - 1) Severe Weather
2) Work/School
3) Outdoor/Recreation
4) Travel

QUESTION #7: ON A SCALE OF 1 TO 10 (WITH 10 BEING BEST),
HOW WOULD YOU RATE THE OVERALL QUALITY OF NWR BROADCAST?

SEDGWICK COUNTY	8.7		
HARVEY COUNTY	8.7		
HARPER COUNTY	8.8		
BUTLER COUNTY	8.2		
SUMNER COUNTY	8.5		
COWLEY COUNTY	8.6		
RENO COUNTY	8.3	SOUTH CENTRAL KS AVERAGE	8.54
BARTON COUNTY	8.3		
RICE COUNTY	8.9		
ELLSWORTH COUNTY	8.5		
LINCOLN COUNTY	7.4		
RUSSELL COUNTY	8.7		
McPHERSON COUNTY	7.1	CENTRAL KS AVERAGE	8.15
NEOSHO COUNTY	8.8		
CHEROKEE COUNTY	7.7		
WILSON COUNTY	7.8		
WOODSON COUNTY	6.5		
CRAWFORD COUNTY	7.5		
ALLEN COUNTY	7.9		
LABETTE COUNTY	8.2		
MONTGOMERY COUNT	9	SOUTHEAST KS AVERAGE	7.93
ELK COUNTY	5.5		
MARION COUNTY	6.8		
GRAND TOTAL AVERAGE	8.02		



SUMMARY OF QUESTIONS 5 AND 6 RESPONSES

Here are responses that we received more than once in each NWR listening area (the number of respondents are in brackets).

SOUTH CENTRAL KANSAS COUNTIES

5. What type of weather information would you like that is not currently provided on the Weather Radio?

   A. Ongoing storm coverage at it happens (location and path) (5)
   B. More current/up-to-date weather information (4)
   C. Wind information (aloft, wind chills, speed, direction) (4)
   D. Area lake conditions/forecasts for lake areas (3)
   E. Precipitation totals (24 hours) (2)
   F. Definitions of terms used (2)
   G. Weather in other cities within 300 miles (2)

6. What can we do better to improve the Weather Radio program for you?

   A. Improve audio sound quality (15)
   B. Increase radio signal (more power/more range) (13)
   C. Talk more clearly/concise/slowly (11)
   D. More frequent non-severe updates (11)
   E. More updates during severe weather (6)
   F. Selective alert/alarm system (region-county specific) (4)
   G. More weather education or training (3)
   H. More detailed location (regional and local) (3)
   I. More spotter activation information (2)
   J. Improve Short Term Forecast (current conditions no longer current) (2)
   K. Give locations of storms more frequently (2)
   L. Give more local information during storms (2)

CENTRAL KANSAS COUNTIES

5. What type of weather information would you like that is not currently provided on the Weather Radio?

   A. More frequent severe weather information (5)

B. More current weather information (3)

6. What can we do better to improve the Weather Radio program for you?

A. Improve signal strength/range (6)
B. More frequent updates during severe weather (4)
C. Improve speaking voices - some monotone/too fast (2)

SOUTHEAST KANSAS COUNTIES

5. What type of weather information would you like that is not currently provided on the Weather Radio?

A. Report local rainfall/snowfall amounts (3)
B. Report soil temperatures (2)
C. Give more updates during severe weather (2)

6. What can we do better to improve the Weather Radio program for you?

A. Improve reception/more power/more range (17)
B. More frequent updates (3)
C. Improve audio/tape quality (2)

Other comments for consideration:

- NWR cycle too long
- Change alarm testing days/times
- More rainfall/snowfall reports
- Cut down on "current conditions" during severe weather and concentrate more on "forecasted weather"
- Mention significant weather just outside listening area, for better preparation
- Follow-up on storms the next day (eg. LSR reports)
- 6-10 day, 30 day, and 90 day outlooks

The following is the routine NWR programming format as recommended by the NWR working group:

Normal NWR Cycle
5 AM - 11 AM

DECK	Product
1	Morning ID Tape
2	Abbreviated Regional Weather Synopsis and Travelers Forecast
3	Empty
4	Short Term Forecast
5	Zone Forecast...Extended Forecast
6	Hourly Weather
7	Agricultural Forecast 5 AM - 7 AM
	Climate 7 AM - 8 AM
	Precipitation/Snowfall Reports 8 AM - 9 AM

11 AM - 5 PM

DECK	Product
1	Standard ID Tape
2	Regional Weather Synopsis/Hazardous Weather Outlook
3	Empty
4	Short Term Forecast
5	Zone Forecast...Extended Forecast
6	Hourly Weather

Note: The Ultraviolet Forecast for Wichita should be broadcast in Deck 3 of South Central Kansas radio KEC-59 once it is received on AFOS.

5 PM - 10 PM

DECK	Product
1	Evening ID Tape
2	Abbreviated Regional Weather Synopsis...Travelers Forecast
3	Empty
4	Short Term Forecast
5	Zone Forecast...Extended Forecast
6	Hourly Weather
7	Climate 7 PM - 8 PM
	Precipitation/Snowfall Reports 8 PM - 9 PM

Note: The Ultraviolet forecast for Wichita should continue to be broadcast in

Deck 4 of South Central Kansas radio KEC-59.

10 PM - 5 AM

DECK	Product
1	Standard ID Tape
2	Regional Weather Synopsis
3	Empty
4	Short Term Forecast
5	Zone Forecast...Extended Forecast
6	Abbreviated Hourly Weather

When broadcasting the Short Term Forecast and Zone/Extended forecast products a minimum in transitions will be used. The reason for this is that we want the program to sound like a broadcast and not a reading of the weather wire. If the Short Term Forecast and Zone Forecast repeat information in the first period, the duplicate information should only be included in the Short Term Forecast and not the Zone. A smooth transition into the Zone Forecast will be used so that it will be virtually impossible for the listener to notice a change in tapes. The reason the products are to be kept separate instead of combining them is that it was deemed to difficult to keep updating the whole forecast in times of rapidly changing weather.

NWR Severe Weather Cycle

A. Watch In Effect/No Warnings In Effect

DECK	Product
1	ID Tape With Appropriate Safety Message
2	Watch tape
3	Empty
4	Short Term Forecast
5	Zone/Extended Forecasts
6	Hourly Weather Abbreviated

B. Watch In Effect/Warning(s) In Effect

DECK	Product
1	ID Tape With Appropriate Safety Message
2	Watch Tape
3	Warning Tape
4	SVS (If Appropriate)
5	Short Term Forecast
6	Hourly Weather Abbreviated

C. No Watch in effect/Warning issued

DECK	Product
1	ID Tape With Appropriate Safety Message
2	Warning Tape
3	Empty
4	SVS (If Appropriate)
5	Short Term Forecast
6	Hourly Weather Abbreviated

D. Flood Watch in effect and/or Flood Warning in effect

DECK	Product
1	ID Tape With Appropriate Safety Message
2	Flood Warning
3	FFS If Just A Flood Statement Run For 3 Hours
4	Short Term Forecast
5	Zone And Extended Forecasts
6	Hourly Weather

Note: The sequence Watch-Warning-Statement should always be followed. Therefore, if two watches are in effect, they are played in Deck 2 & 3 and other products are bumped back one deck. The exception to this rule is when a statement will replace a warning, with a synopsis of the appropriate warning appended to the end of the tape.

E. Winter Weather Watches

DECK	Product
1	Winter Weather ID
2	WSW-Watch or SPS-Redefining Watch issued by Wichita
3	SPS (If Appropriate)
4	Short Term Forecast
5	Zone Forecast and Extended Forecasts
6	Hourly Weather

F. Winter Weather Warnings and Advisories

DECK	Product
1	ID Tape With Appropriate Winter Weather Message
2	WSW-Warning/Advisory
3	SPS (If Appropriate) or SVS If A Blizzard Warning
4	Short Term Forecast
5	Zone Forecast and Extended Forecasts
6	Hourly Weather

CENTRAL REGION
APPLIED SERVICES AND PROGRAMS TREATISES 1-04

NOAA WEATHER RADIO PROGRAMMING AT THE WEATHER SERVICE OFFICE IN CONCORDIA, KANSAS

Christopher T. Noles
NEXRAD Weather Service Forecast Office
Topeka, Kansas

1. Introduction

While stationed at the Weather Service Office (WSO) Concordia, Kansas, I was the NOAA Weather Radio (NWR) focal point. WSO Concordia was responsible for the NWR broadcasts from two transmitters; WXK-94 at Concordia and WXK-92 at Ellsworth, Kansas, serving central and north central Kansas. Having had several years of radio and some television experience, I tried to incorporate some of what I learned into the NWR program.

After making some changes, I composed a new Weather Radio manual with a step-by-step approach in an easy to read format. These changes made were within regional and national guidelines to accommodate the listeners of central and north central Kansas the best way possible.

2. Programming

Before making changes, I consulted with the staff at WSO Concordia then I did an informal survey over the telephone. I called various individuals from across the area that were a part of our cooperative observing network (local storm spotters), as well as persons employed at local radio stations. My study also included talking with law enforcement officials from all seventeen counties that were in Concordia's area of warning responsibility.

After receiving feedback, the program was evaluated to see how well it suited the listeners according to their comments and requests. After making the comparison, some changes seemed appropriate. The first and most broad scale change was making sure the text was recorded in a fashion that made the listener feel as if we were carrying on a conversation directly with them. Nearly half of those surveyed felt as if the broadcast was sometimes read in a monotone fashion or too quickly.

The next step was to evaluate what material was being broadcast and in what order. Most WSOs have Weather Radio Consoles. These consoles consist

of six playback decks and two decks that both record as well as playback. The decks are usually numbered accordingly. The first deck in our broadcast cycle contained our station identification tape.

Traditionally, Deck 2 was used for the regional synopsis. We continued using the synopsis, but also incorporated a hazardous weather outlook. The hazardous weather outlook is a special weather statement issued around mid-day. The statement is issued when severe weather is expected over the area later that day or evening. It informs spotter groups that activation may or may not be required.

In addition, we typed out special holiday or activity weather outlooks which concentrated on central and north central Kansas. We incorporated an outlook on what travel conditions were forecast to be like across the region. This proved to be valuable during the Thanksgiving and Christmas holiday season when winter weather threatened.

Another example of outlooks for the area would be county fairs or other special outdoor activities. In addition, we added extended period outlooks if a significant change in the weather pattern was expected. A good example would be above normal temperatures in late fall changing to well below normal temperatures with increasing chances for precipitation.

Deck 3 contained the local and extended forecast. We used an improvised version of the Short Term Forecast (STF), for some or all of the first period followed by the remainder of the forecast. Sometimes the first period forecast was placed on the same tape with the remainder of the forecast. When the weather was changing more rapidly, the first period forecast was placed in Deck 3 with the forecast dropped back to Deck 4. This placed more emphasis on the STF in the broadcast cycle and allowed staff members to update the tape easily.

Deck 4 and sometimes Deck 5 was reserved for the hourly weather conditions. Major changes were made to this program as the previous format had information not relevant to the region. In the past, local conditions were followed by a listing of temperatures and sky conditions for as many as 15 locations in Kansas and surrounding states. Those surveyed were more interested in local conditions and a more summarized look at the conditions around the rest of the state. Being in an agricultural community, my survey determined that listeners were interested in current wind conditions and wind forecasts. As a result, the staff broadcast sky conditions, temperature, and wind for selected cities across north central Kansas.

To keep the radio broadcast fresh and simple, a radar summary was no longer placed on the hourly weather tape. The short term forecast often takes care of what the weather is expected to do over the next few hours and where.

In addition, during thunderstorm season, you may have to switch quickly from a radar tape to a special weather statement tape. This is where Decks 5 or 6 come into play.

Decks 5 or 6 were reserved for radar summaries, when used, or special weather statements. Since the STF is being emphasized now more than ever, sometimes the STF and an SPS were run in the same cycle. This pertained mainly to thunderstorm season when near severe weather is threatening and use of the SPS becomes warranted.

Decks 6, 7, and 8 were reserved for climatological information, agricultural forecasts and weather trivia.

3. Theory

The staff concluded that the number of carts used in the broadcast cycle is not a problematic issue. It is the style and manner in which the information is being broadcast to the public. The public should be given a product that contains quality and accurate information in a stimulating manner.

The cycle should be kept in a position where updates can be made quickly and easily. I encourage people to adlib. This can sound more natural rather than script-like.

Direct the program in a manner that will best suit the broadcast area. This can give the audience information they will use and enjoy listening too.

During severe weather or potentially severe weather situations, we brought the weather radio into the radar room to be monitored. Monitoring the weather radio can help remind the staff working that a product is about to expire. One can also determine if a tape is bad or going bad or if any other problems arise with the cycle. Severe or inclement weather provides an ideal chance for the NWS to "shine" on NWR broadcasts.

4. Reactions from the Staff and the Listeners Surveyed

The staff at WSO Concordia was very willing to try out the new ideas suggested. Members of the staff have rather good "radio voices" and provided good broadcasts. Each individual had just a slight variation in the way they recorded a product. This is good and it makes the broadcast unique. It can provide the listener with an image of the person behind the voice.

The feedback from the listeners and law enforcement officials I surveyed was positive. They appreciated the way we focused our attention on north central Kansas weather.

Three out of four persons surveyed said they wanted information updated as much as possible during strong to severe thunderstorm activity. These indivduals felt we did a very good job updating the weather radio accordingly. This goes to show that expired information playing on the weather radio can seriously jeopardize the credibility of the NWS.

5. Acknowledgements

The author would like to thank the entire staff at WSO Concordia, Kansas for their time, input and effort with improving the NWR program. Without their support, the excellent broadcast provided to the listeners of central and north central Kansas would not have been possible. In addition, the author would like to thank Warning Coordination Meteorologists, Mike Akulow from NWSFO Topeka, Kansas and Brian Smith from NWSFO Omaha, Nebraska for their input into this paper.

CENTRAL REGION
APPLIED SERVICES AND PROGRAMS TREATISES 1-05

NOAA WEATHER RADIO SURVEY

Kathleen Schlachter
National Weather Service Office
Lincoln, Nebraska

1. Introduction

NOAA Weather Radio (NWR) plays a very important role in the lives of people. Weather radio broadcasts include many different items that are used by various people in their every day lives. For example, the agricultural broadcast segment is used by farmers, gardeners, and grain speculators. While severe weather watches and warnings are extremely important to all. To gain a better understanding of the needs of our listening audience, a radio survey was conducted (Attachment 1). This survey asked questions ranging from, "Where do you live?" to "What products do you use the most?". This paper displays the results, offers suggestions, and improvements in the radio programming as a result of the survey.

2. Procedures

The radio survey was conducted in the Weather Service Office (WSO) Lincoln, Nebraska county warning area during the month of July 1993 (Figure 1). A message was broadcasted, which asked the public to write to the station for a questionnaire. An incentive was also included in the broadcast which stated all postcards received were entered into a drawing for a rain gauge. This incentive tripled the amount of questionnaires from 77 responses in the 1992 survey to 246 in 1993.

The survey message was broadcasted for three weeks, 24 hours a-day. The reason the survey was conducted for so long was to include the people who tuned in occasionally.

3. Results

A. Questionnaires received

There were 246 requests received for the questionnaire, and 154 of them were returned. There were 142 requests from Lancaster County, 25 from Saline, 12 from Butler, 15 from Seward, 5 from Gage, 4 from Johnson, and 2 from Jefferson. The only county in the Lincoln area of warning responsibility that

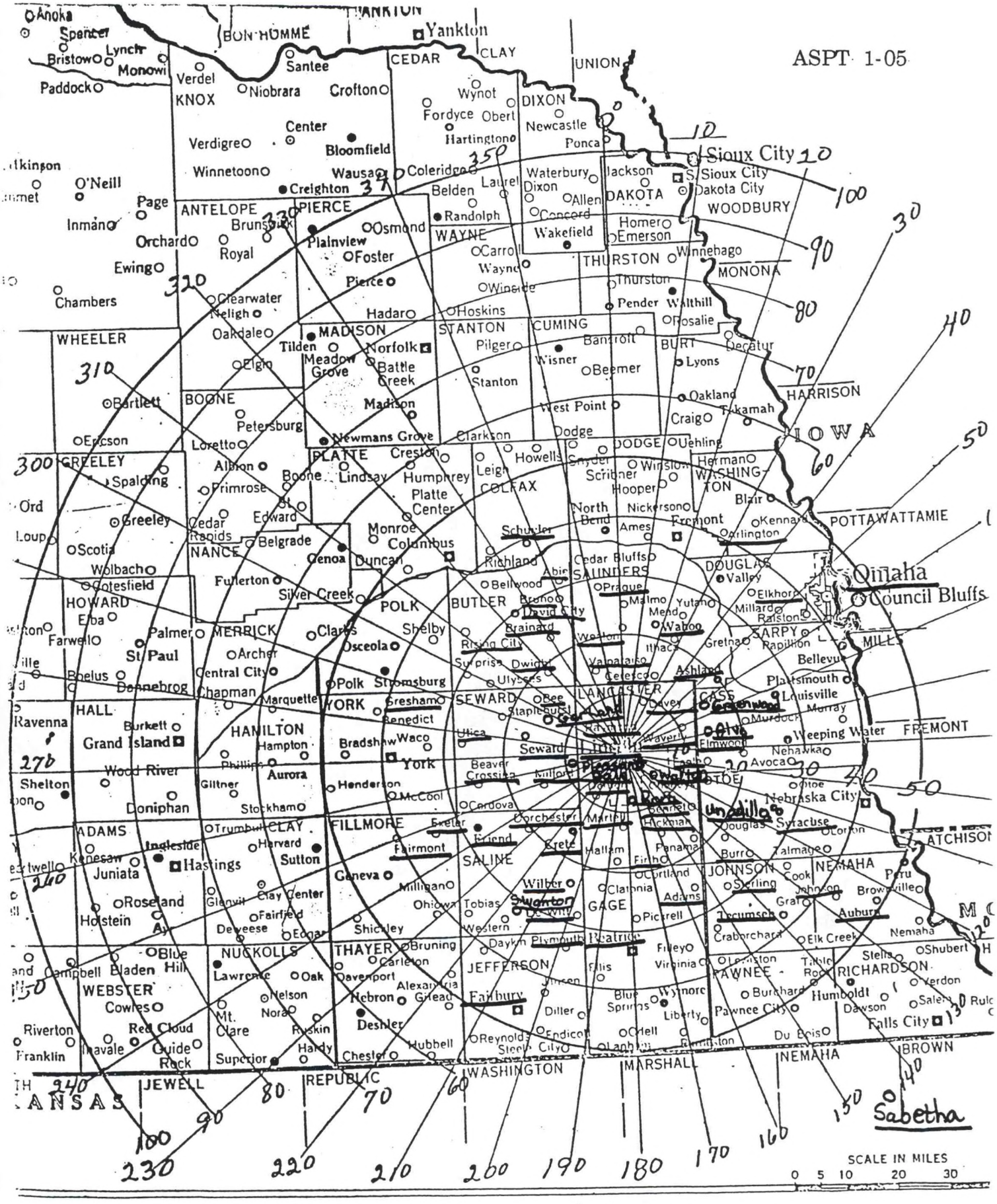


Figure 1. Geographical locations of WXM-20s radio listeners.

produced no requests was Pawnee County. There were other requests from people who bordered Lincoln's warning area. From NEXRAD Weather Service Forecast Office (NWSFO) Omaha area there were 36 requests for questionnaires. The WSO Norfolk had one from Colfax county, NEXRAD Weather Service Office (NWSO) Hastings had three, and NWSO Topeka, Kansas had one request (Figure 2). The results of the demographics were surprising. It was interesting to discover the breadth of the range and the number of people who listened to our NWR broadcast.

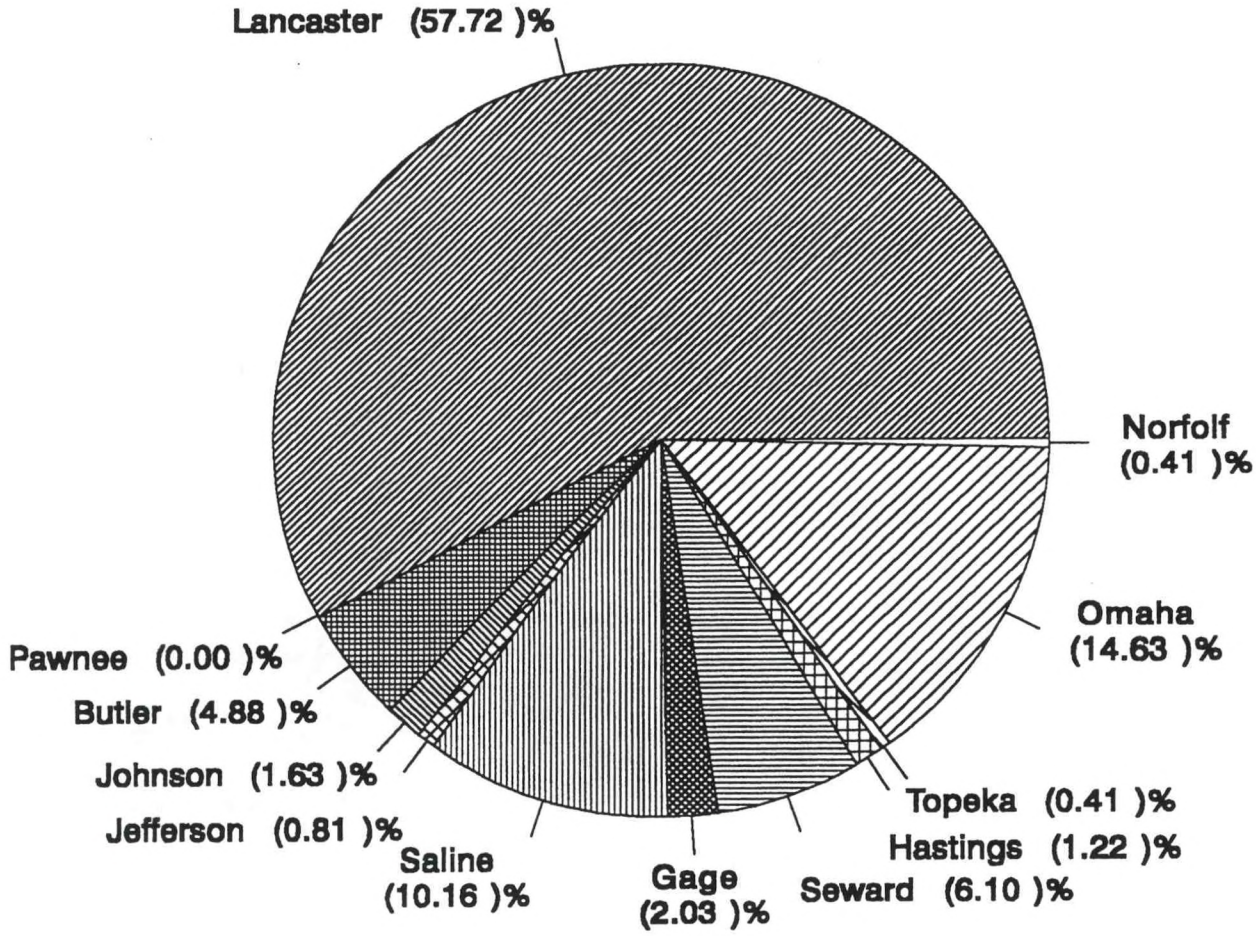


Figure 2. Area of surveys received.

B. Occupations

One of the questions asked was the occupation of the individual answering this question (optional), but not all the surveys had a response. Twenty-seven retired people completed the survey which was the most in any occupational group. Farmers were the second largest group with 23 responses. The rest of

the occupations had ten or less people in their respective categories (Figure 3). Some examples of the occupations of people who listen to our forecasts are: postal workers, police officers, a welder, a geologist, construction worker, teachers, a research scientist, a water plant operator, a house husband, a Protestant minister, a railroad engineer, a professional driver, a physician, a psychotherapist, business professionals, and a heavy equipment operator.

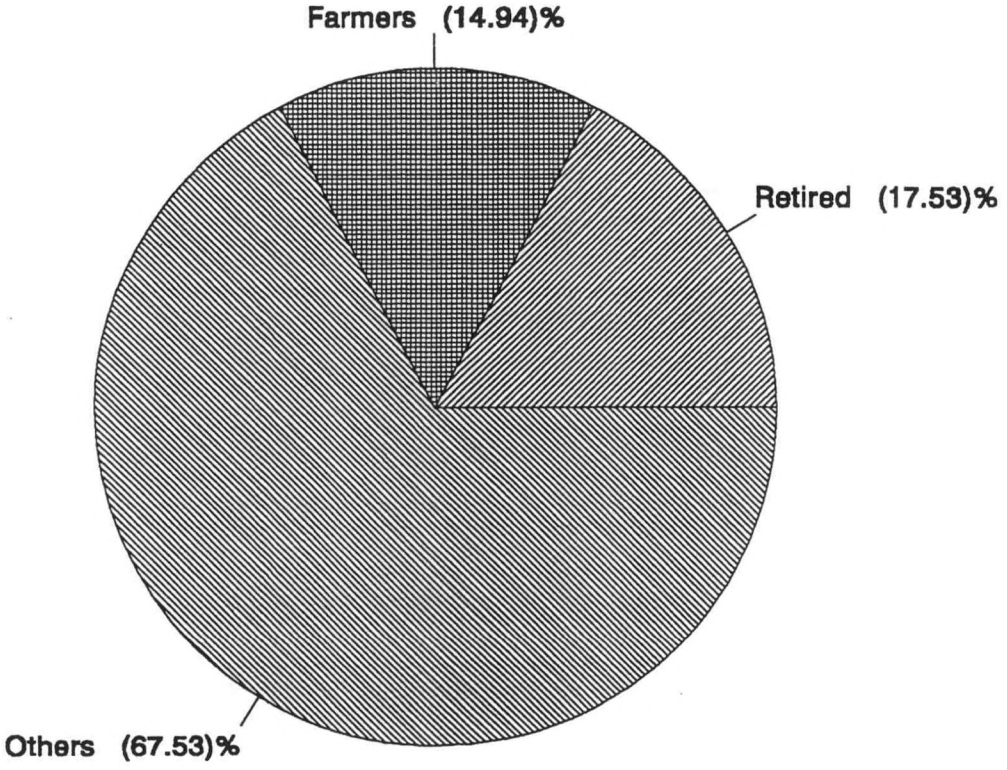


Figure 3. Occupations.

C. Radio location

The bedroom and the kitchen were the two places where people listened to their radios the most. Another location high on the list was the living room. One person had eight radios in his home! Two radios were in the bedroom and basement, while the living room had three. A radio was also stored with a winter survival kit. Several farmers indicated they had radios in either their tractors, combines, or farm trucks.

D. Radio Signal or Loss of Signal

Many surveys indicated no problems with the radio signal. Some people stated that the signal was very strong. There were a few surveys that indicated a weak or loss of the radio signal during thunderstorm events. A majority of these locations were 30 miles beyond the transmitter site.

E. Radio warning alarm tone and test

Most people were aware of the weekly alarm test conducted on Wednesday. Fifty-nine people indicated they had an alarm on their radio and knew about the test. Twenty-nine people knew about the weekly test, but did not have an alarm on their radio. Thirty-seven people did not know about the test or have a radio alarm. The rest of the people had an alarm but did not know about the test (Figure 4).

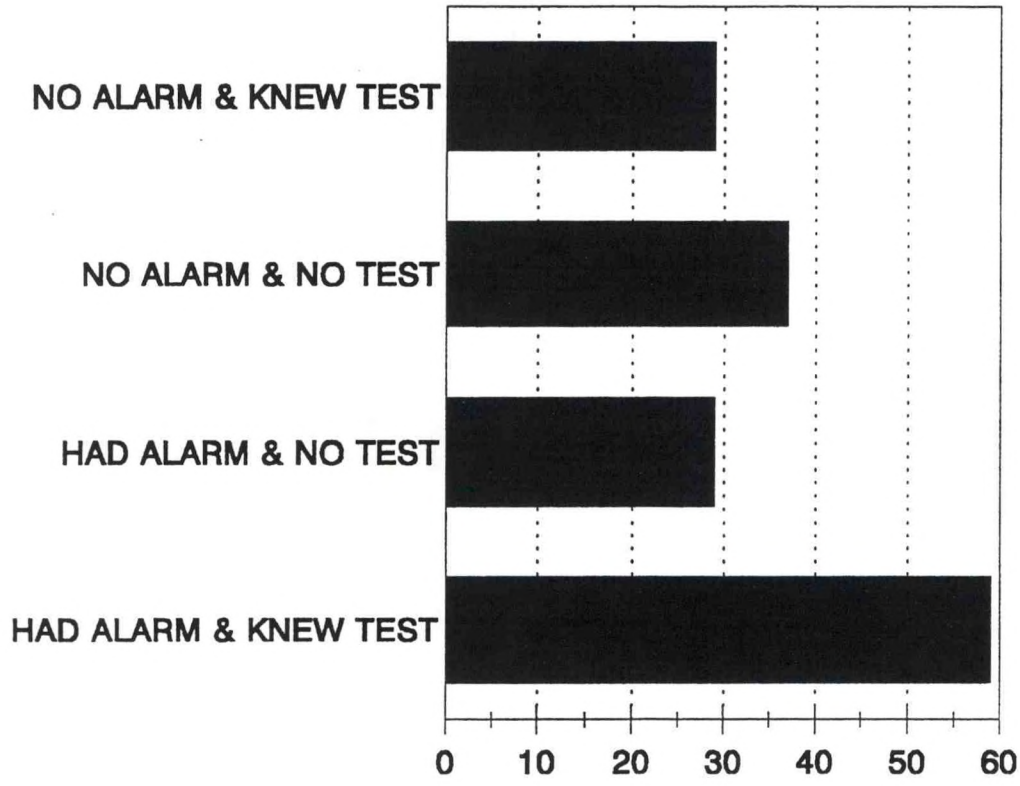


Figure 4. Alarm test.

F. Likes, dislikes, and comments on presentation

There were 45 questionnaires that indicated the listeners liked all of the programming on the weather radio. Besides the overall programming, the local forecast was second on the preference list, while the continuous weather information was third. Some surveys indicated only one answer while other listed several aspects of the radio programming that they liked. There were even two people who like the rain gauge drawing contest!

There were a few dislikes indicated by this survey. Most of the dislikes were; too long of a regional weather synopsis, mispronunciation of words, and some scheduled programming never broadcast on the radio. As examples, the climatology tape and the hourly weather.

All of the surveys stated that the broadcast were presented in a professional manner. Seventy-seven listeners used the local forecast, the most listened of any other broadcast segment. Severe weather coverage and hourly weather were second and third in popularity. The climate report and the agricultural forecast tied for fourth place (Figure 5).

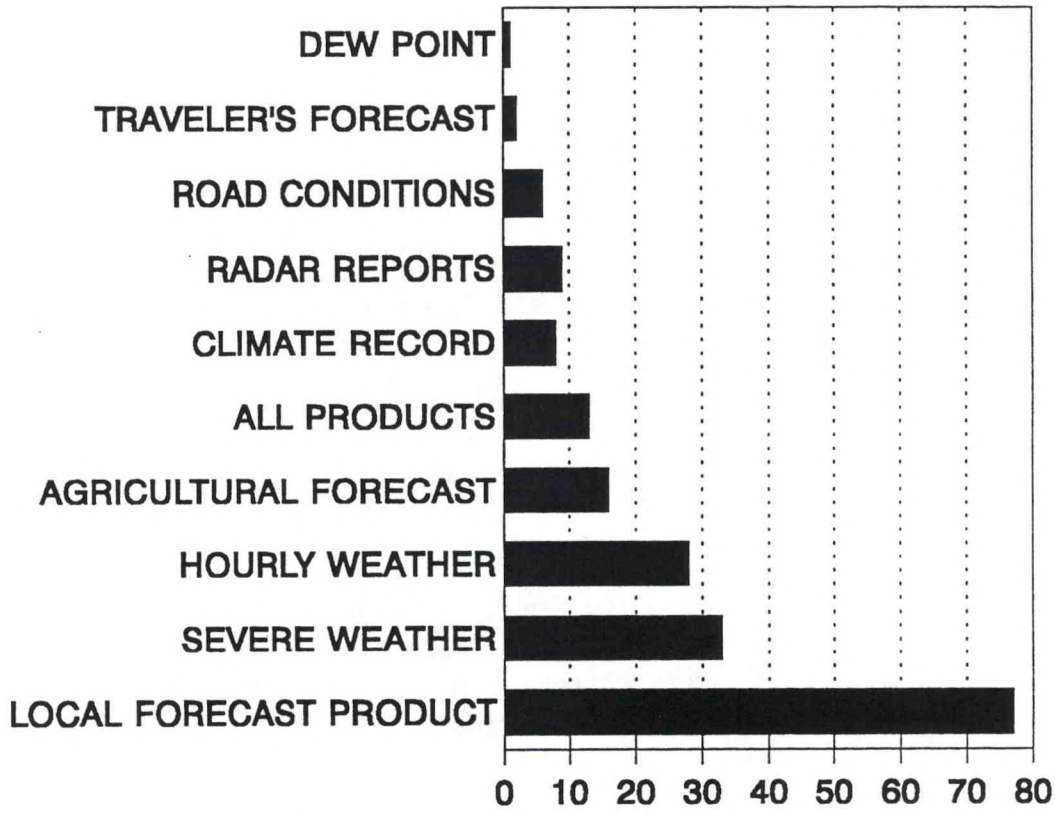


Figure 5. Products used.

G. Winter programming

Most of the answers regarding winter programming were left blank but those that responded liked the road conditions and winter safety messages. Many people just did not remember the winter season programming.

H. Requests

There were many other items that people would like to hear announced on the radio. Some of the items are: precipitation amounts around southeast Nebraska, the 30-90 day forecasts, the state's high and low temperature, and shorter radio cycle time. Some people wanted to know the names of the announcers.

During the course of the year, there had been numerous requests for the NWR pamphlet and wind chill chart. Both pamphlets are advertised on the radio free of charge to anyone who requests them.

I. Spotter network

To enhance our spotter network, we asked all our listeners whether they wanted to be a cooperative precipitation observer, a severe weather spotter, or both. From the surveys, there were 31 people who indicated they would like to help or wanted more information about the programs.

J. This year's survey changes

As a result of this survey, many new radio programming changes were made. There were new ID tapes made for broadcast during severe weather watches and warnings. These ID tapes broadcast safety messages during the severe weather event, as well as identifying the station. The 30-to-90 day outlooks were added, as well as the high and low temperature in Nebraska during the current day. Other programming changes were: a shorter regional weather synopsis, precipitation amounts around Southeast Nebraska, safety messages played more often, and tapes broadcast about weather terms and definitions.

4. Conclusion

Since these programming changes were made as a result of the survey, many people have written indicating their approval. Due to the positive responses, the changes in the radio program schedule will be continued until next year's survey. At that time the programming will be revaluated and adjusted if necessary. Besides improving the radio programming, this survey also expanded our cooperative precipitation observer network and severe weather spotter network. This expansion helped fill in the gaps that were present in the earlier networks.

Overall, the survey indicated that the NWR station in Lincoln is providing the public with accurate and timely information during regular programming and especially when severe weather threatens our county warning area.

1993 WXM-20 WEATHER RADIO SURVEY

1. What town (or nearest town) do you live in?

2. What is your occupation (optional)?

3. Would you be interested in being a spotter or cooperative precipitation observer? If so, please include your name and complete address.

4. What type of weather radio do you have?

5. Where is your radio located or do you carry it with you?

6. How is the radio signal (strong, weak, etc...)?

7. Are there any times when you can not receive the signal?

8. Does you radio have a warning alarm tone? Do you know about the weekly test on Wednesday at 11 am?

9. In the past few months of programming what items did you dislike?

10. What items have you liked?

11. What information do you use the most?

12. Is the programming being presented in a professional manner?

13. Is there any other data that might be of interest to you or other listeners of this weather radio station?

14. Do you have any suggestions to improve our service to you?

15. What comments do you have about winter season programming?

Thank you for your time in filling out this survey. Your responses will help our office to improve the weather radio programming for you and other listeners. If at any other time of the year you have a comment or complaint please drop me a line so I can fix the problem.

Sincerely,

Kathleen Schlachter
Weather Radio Program Focal Point

CENTRAL REGION
APPLIED SERVICES AND PROGRAMS TREATISES 1-06

THE AG TAP SPOTTER PROGRAM

Jeff Raberding
National Weather Service Office
Concordia, Kansas

1. Introduction

We are entering a new era in weather observation, analysis, and forecasting. As the modernization of the National Weather Service (NWS) continues, more and more highly sophisticated equipment will be installed around the country. This will allow forecasters to see the atmosphere in ways never seen before. The WSR-88D, ASOS, wind profilers and AWIPS will all produce datasets that will allow for more accurate forecasts and increase lead times for severe local storms. Even with all this new technology, it can not always tell us what is going on in someone's backyard. That is why spotter networks will still play a vital role in accomplishing the Weather Service's mission of protecting life and property. A good sound spotter program is still a must in the modernized NWS.

This paper explains the spotter program used at Weather Service Office (WSO) Concordia, Kansas. Its purpose is to share information that can be used or incorporated into other offices own programs.

2. What are Ag Tap Spotters?

The term Ag Tap stands for "Algorithm Ground Truth Acquisition Program". Ag tap spotters are volunteers who are recruited by an office to report severe weather and local weather conditions. Many are in the agriculture industry, such as farmers and ranchers, but do come from all walks of life. The one common thread is a great interest in the weather and their willingness to serve their community. They do have some weather training, mainly from attending spotter meetings conducted by the local WSO, as well as through numerous publications distributed by the NWS. This training allows for consistent reporting procedures and more accurate information flowing into the WSO. Here at Concordia, false reports from spotters have been amazingly low. Normally, the Ag tap spotters perform their duties close to home.

3. The Ag Tap Spotter Program at WSO Concordia, Kansas

Ag tap spotters are recruited by telephone. We have rural telephone directories for each of our counties. These directories not only list the names, addresses and telephone numbers of each individual in the county, but also contain a county map showing the location of each township, and even individual township maps showing the location of residences and farms.

Once we find someone that is interested, we send them a letter and a questionnaire. The letter is a basic introduction, informing them of what is expected if they should decide to join. The questionnaire gives us an idea of their weather background, whether they have a rain gauge or any other weather instruments, and the times they would like to be contacted. It also has a place for their name and address, including township and range. Once the questionnaire has been returned and they agree to join, they are then assigned a number. The numbering system we use at Concordia has the county divided up into quarters. Everyone in the northwest quarter has numbers in the 100's, the northeast quarter in the 200's, the southwest quarter in the 300's, and the southeast quarter in the 400's (Figure 1).

The next step is to send another letter and spotter information sheet. This second letter thanks them for volunteering their time and efforts to the spotter program. The information sheet informs them of their spotter number, who to contact when reporting severe weather and what procedures to use when talking with the county warning point. It also reminds them of the information that we are interested in obtaining.

All of the spotters are then plotted on a county map, with a list of their spotter number, name and phone number at the top (Figure 1). A list of the spotters and a copy of the map is then mailed to each county's emergency preparedness director. Occasionally, when spotters sign up late, an additional sheet containing their name, address, and spotter number is forwarded to their representative county to add to their files.

Due to the fact that the Concordia office has only three incoming phone lines, one of which is the ring through number, the spotters are instructed to notify their county warning point with any weather information. The county warning point then relays the information to us.

In late winter, we notify each observer of the county meeting dates, times and locations. These are determined by coordination with each county's emergency preparedness director. A similar letter is also mailed to news directors of the local media for broadcast on air.

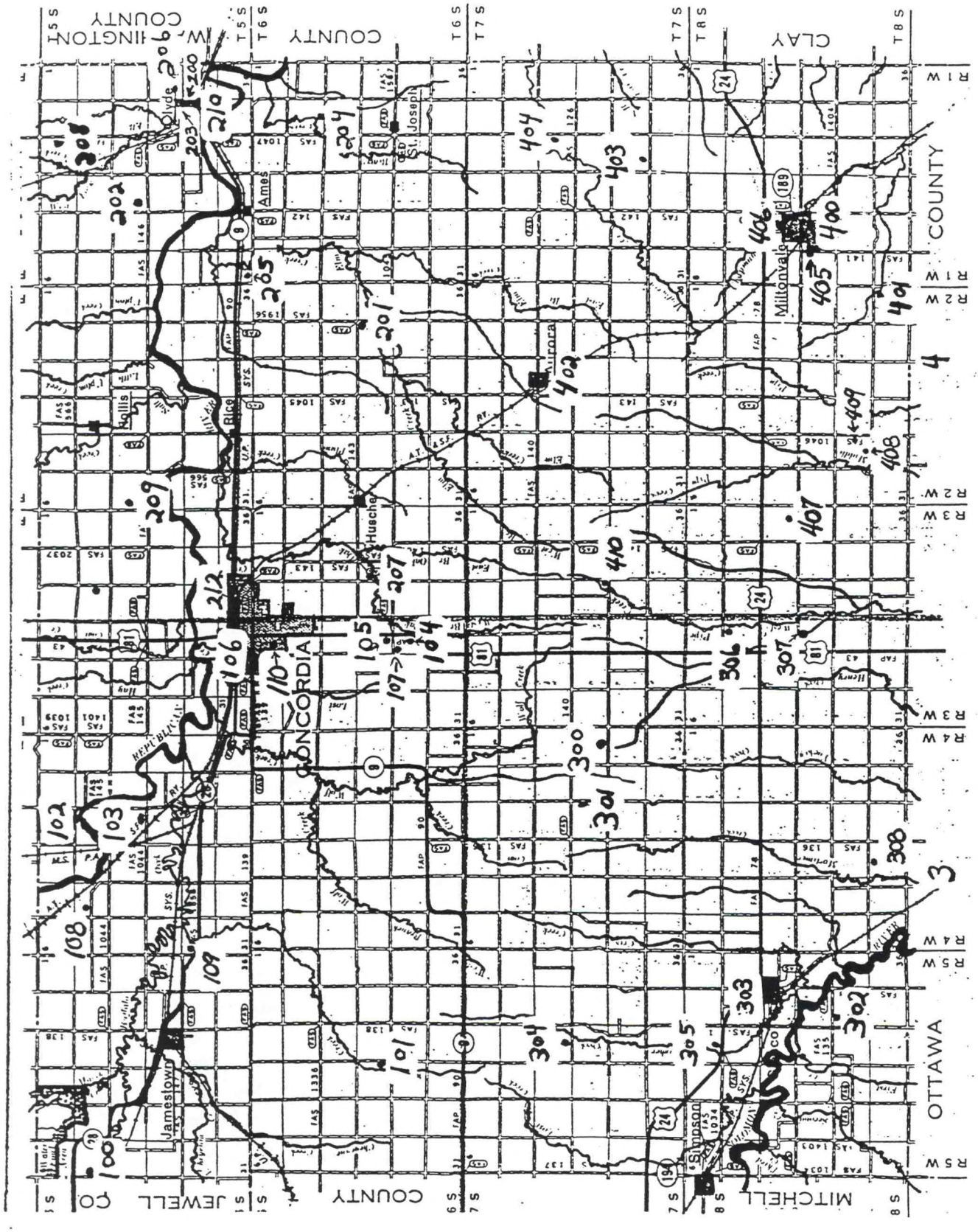


Figure 1. Cloud County, Kansas Spotter Map.

In addition to our own Ag Tap spotters, each county has a network of their own. These usually consist of firemen, ambulance drivers and other law enforcement officials. These are the ones that can be activated and sent to certain areas of the county.

4. Managing the Ag Tap Spotter Program

The list of spotters are entered on a personal computer using most any software package. Here at Concordia, the original network was set up using SuperWriter, but Paradox or WordPerfect would also work. By keeping them on a floppy disk, it is easy tomake changes when necessary.

The attrition rate of volunteers have been rather low, therefore here at Concordia the network does not change a lot from year to year. Even with a low attrition rate, holes in the coverage area do materialize over time, so every three to four years a major recruiting effort needs to be done to fill in those holes. I have found that many times, if someone drops out of the network, then it is often passed on to a relative or neighbor. When we send each spotter the letter announcing the spotter meeting dates, we also include a postage paid card. This can be used either to notify us of any changes in their status as a spotter, such as a change of address, phone number etc., or to provide us with additional weather information.

5. Concluding Remarks

The spotter program at Concordia has proven very effective. By having trained people across our entire county warning area we usually have someone close to any storm that develops, providing us with timely and possible life saving information. They also provide a valuable service in the verification of warnings. The system in place at Concordia covered 17 counties in north central Kansas prior to this past spring, when the county warning area was reduced to ten counties, then further reduced on September 1, 1994.

In the new modernized NWS, it will be necessary for each office to maintain a large and well trained spotter network. In order to have the best network possible, ideas must be freely shared between offices.

This paper outlined the Ag Tap Spotter program at WSO Concordia, Kansas. Hopefully, it will assist other offices in establishing a similar network, or enhancing an existing one.

CENTRAL REGION
APPLIED SERVICES AND PROGRAMS TREATISES 1-07

THE EMERGENCY MANAGEMENT FAX PROGRAM IN NORTHEAST COLORADO

Todd Heitkamp
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Sioux Falls, South Dakota

1. Introduction

While serving as the Warning & Preparedness Meteorologist (WPM) at the Weather Service Forecast Office in Denver, CO (WSFO DEN), I realized the communication link between the National Weather Service (NWS) and the northeast Colorado emergency managers was weak or almost non-existent. After talking to a number of the emergency managers on the plains and along the front range of Colorado, I knew something had to be done to allow emergency managers access to valuable meteorological information. It was thought that maybe it could be accomplished by a new product that was being tailored towards the needs expressed to the WSFO by individual user groups. This "new" product was to be issued daily by the forecasters covering the WSFO's County Warning Area (CWA) (Figure 1).

This product called the "Significant Weather Outlook" (SWO) was designed to alert the NWS's users such as "Skywarn" spotters, the media, the public, as well as the emergency management community, of the threat of significant weather. Significant weather was defined as thunderstorms and all of their offspring (tornadoes, hail, lightning, etc.), snow, high winds, freezing precipitation, or even extreme heat. These weather phenomena were determined to have the largest impact on the user community, including emergency management operations. The SWO would serve as a planning tool for the emergency managers by allowing them to better prepare for the forecasted event. This preparation could involve checking resource lists and possibly notifying schools or other interested parties.

The SWO would be disseminated via the routine routes, NOAA Weather Radio and the Contel/GTE Weather Wire. However these two dissemination systems still did not completely cover the emergency management community. Many of the county emergency management budgets were not large enough to allow for the purchase or lease of the Contel/GTE Weather Wire. Also, the coverage of the NOAA Weather Radio was not complete due to the terrain and the low power transmitters (100 watts). Therefore, another dissemination device had to be utilized to get this product in the hands of the emergency managers.

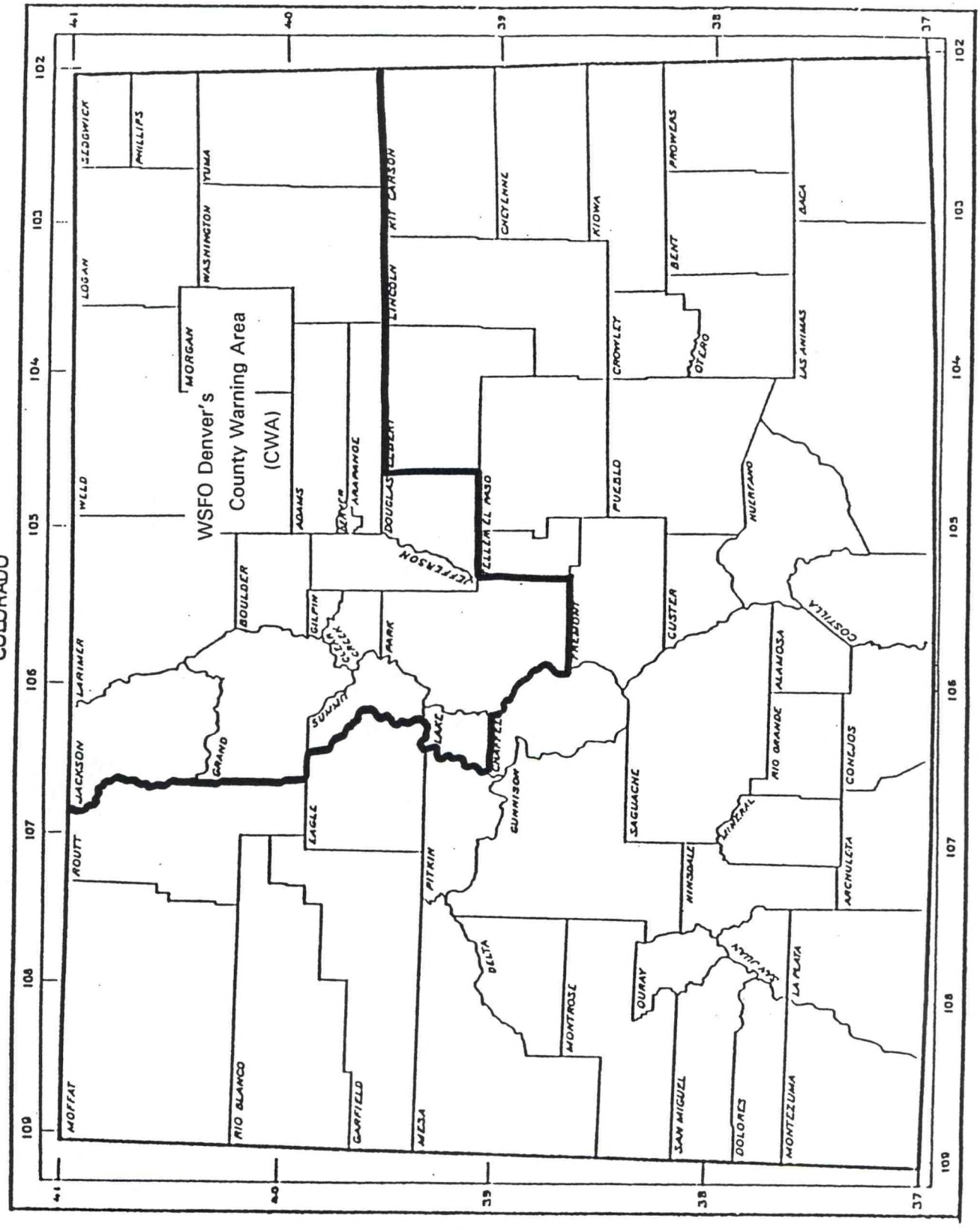

Figure 1. Map of Colorado and WSFO Denver County Warning Area (CWA).

The route that was chosen was the facsimile (fax). Although the level of communication technology differed considerably at each of the emergency management offices, all of them had access to a fax machine.

After deciding that the fax machine was the best avenue into the emergency management offices, a few questions had to be answered. First, would Central Region Headquarters (CRH) approve and secondly, would we be violating the Weather Wire agreement between the NWS and Contel/GTE? The first question was answered with a "yes", but the second one took a little more time in answering. After researching the subject and making contacts with Contel/GTE, it was decided that the agreement only covered alpha-numerics and not graphics. Hence, the graphical SWO was born.

2. Methodology of the Graphical SWO

A map of a northeast Colorado was designed by a fellow forecaster, Wayne Ruff (now at WSFO Norman, OK), that would allow the forecaster to graphically represent what he/she said in the SWO. At first this sounded a lot easier than it was. For many of the forecasters, this was their first time ever to graphically represent their thoughts. To help them, we first had to find out from the emergency managers how they would like the information drawn. To standardize the way the events would be represented on this map was the highest priority. Many of the usual symbols that the forecasters used to represent the various weather items meant absolutely nothing to the emergency managers. So to simplify the process and to minimize confusion, symbols depicting the event were discouraged. Instead, the complete spelling out of the weather phenomena was encouraged although the forecaster could still depict fronts using the standard frontal notation. The actual delineation of the affected areas was also discussed since the forecaster couldn't rely on different colors, but how should this be done: solid lines, dashed lines, or something else. Scalloped lines were a bad idea based on feedback from the emergency managers who mistakenly thought they delineated cloud areas. Consequently, solid and dashed lines were to be used exclusively.

After solving all the preliminary issues on how the product should be drawn, an issuance time had to be established. The logical approach was to issue the graphical representation of the SWO after the alphanumeric SWO was issued. Those times ranged from 10:00 am to 11:30 am depending upon the time of the year. The reasons for this 90 minute window ranged from MST versus MDT, convection initiation times, diurnal pattern, etc.

Once the forecaster was finished preparing the graphical SWO, it had to be faxed to 23 emergency management offices in the northeast quarter of the state. Without a fan out mechanism, this number of calls was impossible for the forecaster to accomplish. To solve this, a dissemination tree was devised (Figure 2).

This tree consisted of the WSFO faxing it to two entities: Weld County Emergency Management and the City of Aurora Emergency Management offices, which are two of the larger emergency management office in northeast Colorado. These two offices in turn would fax it to the offices below them in the tree. This system worked well until it was realized that the fax map became too difficult to read after the second or third faxing. The problem was remedied by decreasing the number of multiple fax transmissions and keeping the map less cluttered.

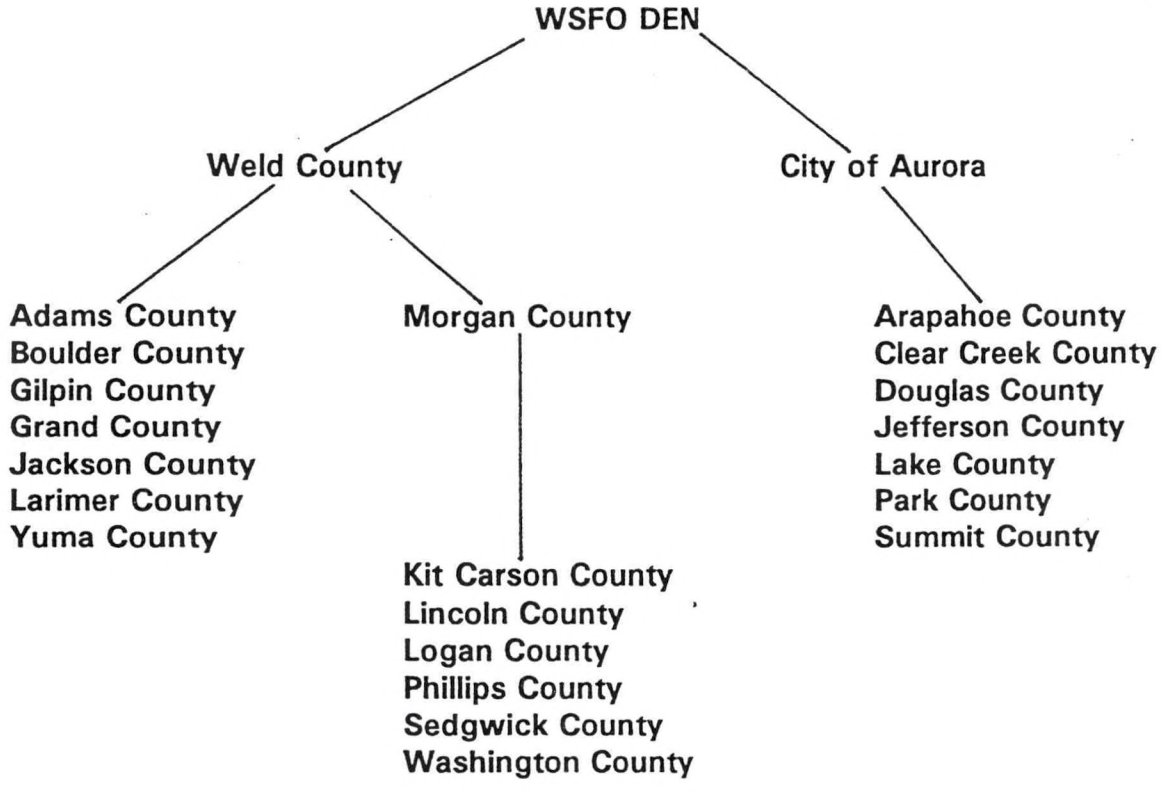

Figure 2. Graphical Significant Weather Outlook (SWO) Dissemination Tree.

3. Example

On July 21, 1993, a short wave was forecast to move across the area by late afternoon. The lower levels of the atmosphere were quite moist in portions of northeast Colorado, so the instability was rather high, which was reflected in the CAPE values (Figure 3). The instability and the vertical wind profile would be enhanced as the short wave moved over the area. Therefore, the SWO (Figure 4) was written to include the chance of thunderstorms by late afternoon. A few tornadoes were also forecast due to the expected wind profile. The words of the SWO text were then put into the graphical SWO shown in Figure 5 which was then faxed to all the emergency management agencies in northeast Colorado.

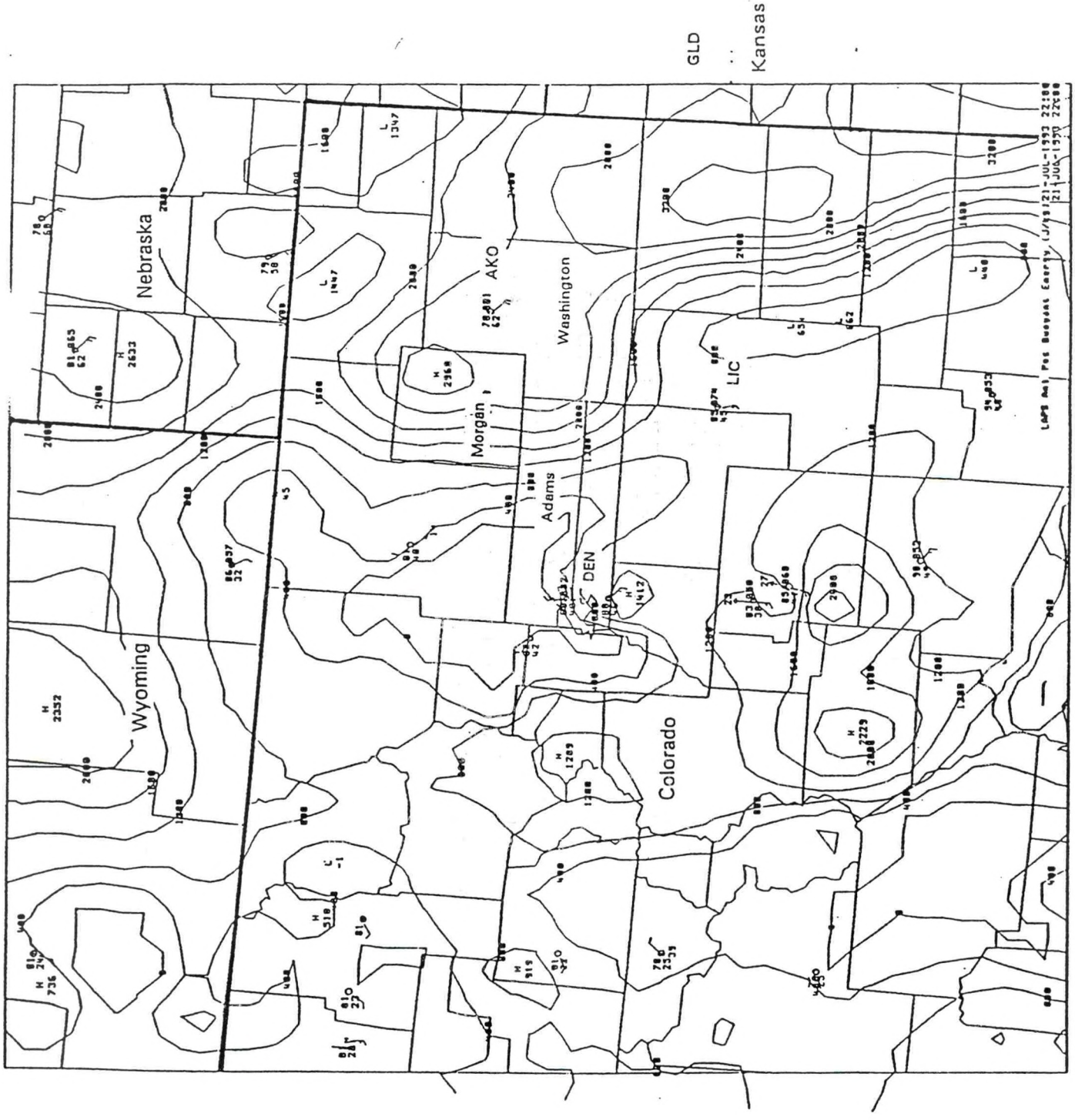

Figure 3. Convective Available Potential Energy (CAPE). Contours are at 400 j/kg.

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ZCZC DENSPSDEN DEF 211800
TTAA00 KDEN DDHHMM
COZ002-004-011-012-013-220600-

SIGNIFICANT WEATHER OUTLOOK FOR NORTHEAST AND NORTH CENTRAL COLORADO
NATIONAL WEATHER SERVICE DENVER CO
1135 AM MDT WED JUL 21 1993

THIS OUTLOOK PERTAINS TO THE FOLLOWING COLORADO COUNTIES

ADAMS          DENVER     JACKSON      LOGAN       SEDGWICK     YUMA
ARAPAHOE       DOUGLAS    JEFFERSON    MORGAN      SUMMIT
BOULDER        GILPIN     LARIMER      PARK        WASHINGTON
CLEAR CREEK    GRAND      LAKE         PHILLIPS    WELD

AN UPPER LEVEL STORM SYSTEM IS FORECAST TO MOVE ACROSS THE NORTHERN
PORTION OF THE STATE LATE THIS AFTERNOON INTO THIS EVENING.  THIS
SYSTEM WILL FIRST CAUSE A FEW STORMS TO DEVELOP OVER THE HIGH COUNTRY
AND THEN ALONG THE FRONT RANGE.  MOISTURE IS DECREASING IN THE LOWER
LEVELS OF THE ATMOSPHERE IN THOSE LOCATIONS...SO PRECIPITATION THAT
OCCURS WITH THE STORMS WILL BE RATHER LIGHT.  THE MAIN THREAT FROM THE
STORMS THAT OCCUR OVER THE MOUNTAINS AND ALONG THE FRONT RANGE WILL BE
STRONG DOWNBURST TYPE WINDS.  WIND GUSTS AS HIGH AS 50 TO 60 MPH WILL
BE A POSSIBILITY THROUGHOUT THE AFTERNOON.

FURTHER TO EAST...MAINLY EAST OF FORT MORGAN...LOW LEVEL MOISTURE IS
QUITE A BIT MORE ABUNDANT.  HOWEVER THE BIG QUESTION IN THIS AREA IS
WHETHER OR NOT STORMS WILL DEVELOP.  THE LOW CLOUDS AND FOG THAT COVERED
MOST OF THE AREA THIS MORNING HAS LIMITED THE AMOUNT OF HEATING AND HAS
ENFORCED THE CAP OR THE LID ON THE KETTLE OF BOILING WATER.  THIS
USUALLY INHIBITS OR DECREASES THE AMOUNT OF CONVECTION.  HOWEVER...THE
UPPER LEVEL STORM SYSTEM WILL HELP BREAK DOWN THE CAP AND INCREASE THE
INSTABILITY WHICH WILL ALLOW STORMS TO DEVELOP BY LATE THIS AFTERNOON.
BRIEF HEAVY RAINS AND LARGE HAIL WILL BE POSSIBLE.  THE VERTICAL WIND
PROFILE IS ALSO FAVORABLE FOR THE POSSIBILITY OF A FEW TORNADOES...
MAINLY EAST OF A FORT MORGAN/DEER TRAIL LINE.

SPOTTERS MAY BE NEEDED IN THE AREAS EAST OF FORT MORGAN THIS AFTERNOON
AND THIS EVENING.  SPOTTERS ALONG THE FRONT RANGE MAY BE NEEDED FOR
REPORTS OF STRONG WINDS.

HEITKAMP
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Figure 4. Significant Weather Outlook (SWO) text for 21 July 1993.

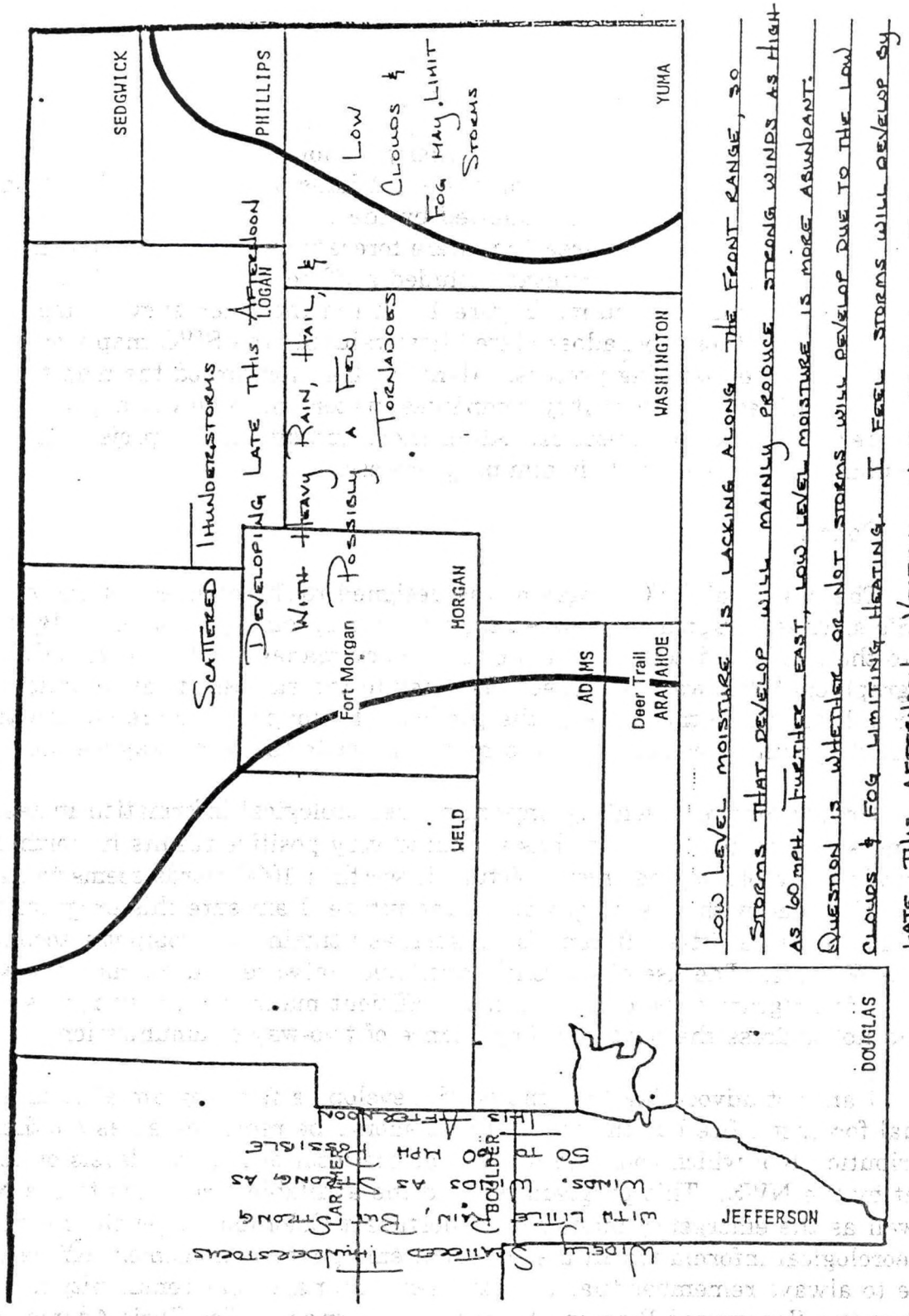

Figure 5. Graphical Significant Weather Outlook (SWO) for 21 July 1993.

After receiving the fax, emergency managers began their planning process for the possibility of tornadoes east of the Fort Morgan - Deer Trail line that was depicted on the SWO map. By mid-to-late afternoon thunderstorms began to develop producing strong downburst winds along the Front Range. As the thunderstorms moved east of the front range into a moisture rich and strongly sheared environment, they began to intensify. Shortly after 5:00 pm MDT, the first tornado warning was issued for eastern Adams and west central Washington counties. This warning was followed by the first of many reports of funnel clouds and tornadoes in the area that were forecast and delineated on the graphical SWO map. Those reports included a F3 tornado (Fujita, 1981) in west-central Washington county (Figure 1). All of the emergency managers that were affected by those tornadoes stated how valuable the SWO map was for them early in the planning process. Many of them forwarded the map to other concerned entities such as utility companies, water and highway departments, and other county or city agencies. All of them applauded this project and to this day is an integral part of their planning process.

4. Conclusion

The graphical SWO program was designed to fit the needs of one of the NWS's strongest supporters, the emergency management community. By listening to the needs and concerns of the emergency managers of northeast Colorado, the graphical SWO was developed. The key to the success of this product or any other is listening to the users of the product. If our products are not meeting the needs of our users why do we continue to write them the way we do?

Graphically representing important meteorological information instead of relying solely on text products has produced very positive results in northeast Colorado. The old saying that a picture is worth a 1000 words seems to have really hit home with this program. In the future, I am sure this program will continue but in a little different form, such as utilizing the computer technology at the WSFO's. The use of currently available software and fax modems would allow this program to be done in a more efficient manner. However, this still would not address the need and importance of two-way communication.

I am not advocating that the NWS develops a fax program at each individual forecast office but the fax machine should be remembered as another distribution tool which could be utilized at the local or regional levels of government by the NWS. This program utilized the available technology to the NWS, as well as the emergency managers of northeast Colorado, to get the needed meteorological information in the hands of emergency management officials. We have to always remember that the emergency management community is a large part of the "Integrated Warning System" or referred by Dr. Chris Adams as the "Weather Warning Partnership" (Adams, 1994).

5. Acknowledgements

The author would like to thank the WSFO Denver staff for their willingness and their cooperation throughout this project. I would also like to thank Eric Thaler, SOO-WSFO Denver, and Ron Holmes, SOO-WSFO Sioux Falls, and David Imy, DMIC-WSFO Denver for reviewing this paper and Wayne Ruff at WSFO Norman, for his help.

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Fujita, T. T., 1981: Tornadoes and downbursts in the context of generalized planetary scales, *J. Atmos. Sci.*, **38**, 1511-1534.