

SWS Contract Report 382

**NORTH
CENTRAL
REGIONAL
CLIMATE
CENTER**

NCRCC

Annual Report

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NCRCC Paper No. 9

by

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1. Introduction

The North Central Regional Climate Center, located at the Illinois State Water Survey, Champaign, was established in September 1981 with the following goals: (1) To develop an infrastructure to coordinate regional climate research, (2) to improve and coordinate climate services, and (3) to improve and coordinate data management activities. The Center has been funded by the National Climate Program Office (NCPO) and by the State of Illinois. The broad regional objective has remained largely the same throughout the Center's tenure; however the goals and emphasis has changed to adopt to difficult funding conditions.

During the past year the NCRCC worked to improve the efficiency and effectiveness of climate information dissemination at the state and regional levels, to oversee State Climate Centers participation in regional climate research, and to serve as a clearinghouse of information between State Climate Centers and other groups.

The Center operates within a rather unique structure. Being funded by NCPO makes the NCRCC accountable to that organization. However, the concept of a regional climate center was first conceived by the North Central-94 (NC-94) agricultural committee. Since NC-94 maintains links to the NCRCC and its objectives and operation (through its oversight committee discussed below), advice and suggested direction comes to the NCRCC from two agencies.

2. Advisory Committee to NCRCC

In addition, NCRCC established a user advisory committee in 1982, with members from the private sector, to guide and advise the NCRCC on its opera-

tion, and to help set goals which would allow the NCRCC to better serve the private and public sectors. The advisory committee meets once each year, and currently consists of Mr. William Burrows (Deere and Co.), Mr. Ray Fosse (former Director, Crop-Hail Insurance Actuarial Association) , Dr. Richard Felch (meteorological/climatological consultant), Ms. Gail Martell (Vice President, E. F. Hutton), and Dr. Kenneth Hadeen (Director, National Climatic Data Center).

At its annual meeting, 4 June 86, the committee discussed opportunities for future funding enhancement for the Regional Center. This is a continuing concern, since the Center has not been, and is not currently funded at the level deemed essential by the founding NC-94 committee. Limited funding substantially curtails the benefit of NCRCC to State Centers, as well as on climate agencies at the federal level.

At the meeting, John Vogel described the current status of the grant from the National Environmental Data and Information Service (NESDIS), a component of the National Environmental Satellite Data and Information Service (NESDIS). NESDIS provides an inventory of data sets and acts as a clearinghouse for such information, and the State Climatologists (or their representative) of the North Central region would serve as information collators from each of their states for the NESDIS information bank.

We discussed the agenda for the future workshops to be held to determine the need and value of real-time, dense weather/climate data. The group suggested focussing on the climate-related problems of the potential users rather than on the products of the system, so that the latter emanate from the former.

The group suggested that the fee schedule of a regional data system should include (1) a subscription fee (perhaps scaled to differentiate between individual users and those who use the data for the generation of new products to be sold to their subscribers) and (2) a charge based on connect-time (to assess the primary users more than the occasional).

The potential budget of such a system was discussed. The group was concerned that a maintenance budget (i.e., annual cost, once the system is established) would be substantially greater than \$100,000. If the proposed system was to grow in data density and diversity, money would have to be available to develop and maintain the ever-increasing number of products.

3. Annual Meeting of the NC-94 Oversight Committee

The NC-94 committee originally imaged a regional climate center which would facilitate regional projects, and would serve as an intermediary for sizable funding of State Climate Centers which would particularly benefit those State Climate Centers with little financial support. As such, NC-94 established an oversight committee to monitor the objectives and activities of the NCRCC. The oversight committee continues to function, however, in an advisory capacity, meeting with NCRCC representatives twice each year. Members of the oversight committee are appointed by NC-94 for 3-year overlapping terms, and from October 1984 to September 1985 the group consisted of Donald Baker (Minnesota), R. Bruce Curry (Ohio), and Ralph Neild (Nebraska).

The NC-94 oversight committee met on 7 June 1985 at the Water Survey. Bill Lytle (South Dakota) attended in place of Ralph Neild, and Bob Dale (Indiana) represented ARS. In addition to the appointed members of the committee, Dr. Thomas Thompson of the University of Nebraska (chair of the North

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Central Computer Institute's committee to investigate establishment of a repository for real-time climate data) met with the group to aid in the discussion of a regional climate data repository.

NCRCC activities of the past year were discussed. Particular attention was diverted toward a communication written by Dr. Sauer, Experiment Station Director of Minnesota to the Director of the North Central Computer Institute, concerning his concern over services of NCRCC. The Director of NCRCC distributed his response to Dr. Sauer's letter. The following discussion resulted in two findings: (1) State Climate Centers cannot expect funding from an underfunded Regional Center, and (2) the perceived added value of Regional Climate Centers to State Climate Center programs will vary inversely with the state support to the given State Center, i.e., already strong State Centers benefit only marginally from services of Regional Centers.

The remainder of the meeting was involved with the promotion of a regional climate data acquisition, dissemination and repository system. The committee offered strong support for such a proposal, and encouraged the distribution of a Request for Proposals (RFP), to be evaluated for funding by the Experiment Station Directors. The value of such a real-time, dense climate data system is apparent to anyone who must make decisions in a weather- or climate-dependent business or activity. In addition to those in the private sector, NCPO, NCRCC and the NC-94 committee have seen the potential benefits of such a system, and have encouraged its promotion and design. It is clear that a real-time regional climate data and information system will be of substantial value to the private sector in addition to those at all levels of government who monitor current natural resources.

4. Tasks

There were 13 tasks in this year's grant. The progress made toward each is discussed below, as well as suggestions for future work.

a. Continue to strive for minimal level funding for State Climate Centers.

This task continues to be only minimally satisfied. Whereas it was much more possible in the past to receive funds for the improvement of facilities (e.g., State Climate Centers) if such allocations were perceived to be able to improve the productivity of the unit, this situation has dramatically changed. The financial limitations at the federal level have essentially excluded such action at the present. It is clear that grants are now made for the provision of specific services or research. In spite of the financial climate, we have negotiated a grant from the National Environmental Data Refereal Service (NEDRES) to provide information of weather observations being made at non-National Weather Service facilities. This information will become the data base for a weather/climate data clearinghouse to be operated by NEDRES. State Climatologists in the region may gather and provide these data, and the grant from NEDRES will support their effort.

We continue to promote State Climate Centers at the federal and state level. One can easily demonstrate that most State Climate Centers are underfunded, but with the State Climate Centers (since 1973) no longer under federal jurisdiction, there is little impetus for federal agencies to contribute toward a services program over which they have no control. In several states of the region, the State Climatologist was appointed to that position without additional financial support for the position,

or without release time, i.e., the SC was expected to perform the duties of the SC appointment in addition to those duties of his primary appointment, e.g., professor, state agency researcher etc. A few states, on the other hand, have gained the service of a State Climatologist for a decade or more with state funaing.

b. Develop a cooperative effort between State Climate Centers to exchange climate data. This objective is fulfilled upon demand, i.e., the need for the data in a given State Center must exist before the NCRCC can facilitate its fulfillment. The NCRCC requested and received digital data from the Iowa Climate Center, to be used in a project for a private seed company who operates in Iowa and Illinois.

c. Promote a regional climate data acquisition and information dissemination system. A regional real-time climate data acquisition and dissemination system is considered to be a most important additional service to State Climatologists, particularly those without the benefit of any real-time service at present, and more importantly, beneficial to private and public users of these data whose management decisions often are at least partly, dependent upon current weather or climate conditions. It is currently relatively straightforward to design and develop a computer-based weather and climate data system which would receive real-time data from a large number of sites within the region, prepare these data into a variety of products, and offer them for distribution via phone line.

We have planned and promoted such a system primarily by means of workshops which we have held in 11 cities of the Upper Midwest. At each we invited 20 to 25 individuals from state and federal government and

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private industry, to ascertain their need of, and interest in a real-time weather/climate data acquisition system from a dense network of reporting stations in the 12 North Central states. The proposed density of stations (about 50 per state) is exceeded by the NWS Cooperative stations, but those data are not available until 2 to 3 months after collection. Real-time data are only available from the NWS First Order stations, and FAA airports (about 10 to 20 per state). These data can be obtained from several private data/information providers for a fee.

At the workshops, the concept of a regional system was proposed. The weather observers (about 50 per state) would call their observations to a central computer (location yet to be determined) on a daily basis. The computer would automatically generate several hundred products each day, which would be available, on demand, to authorized users by means of a terminal and modem. Experience in Illinois suggests that sufficient users will be attracted to the system, once established, and a fee sufficient to substantially support the system will be acceptable to them.

After making general suggestions as to how such a system could operate, the attendees to the workshops were invited to comment, particularly as to how their operation could be benefitted by real-time climate information and data from the region. First, all attendees voiced strong support for a real-time regional climate data and information system. All the attendees were affiliated with organizations whose operation is at least somewhat weather- and climate-related, i.e., decisions must at times be made which are dependent upon current conditions, or the aggregate conditions current to the present.

Responses from the attendees were obtained from the discussion at the meetings, and from questionnaires which most of them completed and submitted. The questionnaire responses (questionnaire shown in Appendix A) will be summarized. and a report of the findings from these workshops will be distributed by the NCRCC (Wendland et al., 1986c).

- d. Encourage and promote the Regional Climate Center concept to federal agencies. Increasing numbers of sites were added to the ROSA (Remote Observation System Automation) network during the past year. Staff from NCRCC coordinated these new stations with the NWS Central Region Office. State Climate Centers continued to provide guidance to NWS Cooperative Program Managers concerning new ROSA stations, particularly which areas of the state needed additional observations.

NCRCC staff worked with staff from the National Climate Data Center to study the bias introduced in mean temperatures as a function of the time of observation. This bias has been recognized for some time, the magnitude having been evaluated for several locations. However, a spatially continuous, and large spatial scale analysis had not previously been available. Research at NCRCC and additional work accomplished in cooperation with staff at the National Climate Data Center led to a scientific paper (Karl et al., 1986). It provides the magnitude of the bias as a function of 6 independent parameters.

NCRCC hosted a meeting of the National Academy of Science Panel on Climatic Data on 31 October to 2 November 1984. The panel had been empowered to determine the present state of climate data acquisition, archival and dissemination, as well as recommend potential methods and

systems. NCRCC staff briefed the 11 person committee, chaired by Werner Baum, on the objectives and operation of NCRCC, and on the Illinois Climate Assistance Service (CLASS), as an example of a means to acquire, archive and disseminate real-time climate data. William Burrows (Deere and Co.), Doris Sincox (Continental Grain Co.), Fred Nurnberger (Michigan State Climatologist), Douglas Clark (Wisconsin State Climatologist), Fred Barrett (Illinois Crop Reporting Service), and Lynn Rose (North Dakota Weather Modification Board) attended, and gave examples of data acquisition and use in each of their states, as well as reviewing their use of the CLASS system.

We also continued to work closely with the staff of NCPO in the planning and operations of NCRCC and other climate centers. We provided extensive information on NCRCC and other Centers to other federal agencies and members of Congress. We met with NCPO staff and NWS staff in January and August to discuss potential development of future climate centers in the NWS, partially in response to federal and NAS interests in regional climate center. We participated in the 5-year review of NCPO in July and we prepared a document explaining the rationale for regional center (Wendland et al., 1986a).

- e. Develop computer software to collect and transmit near real-time data, and provide computer expertise to work with individual State Climate Centers. This objective has been indirectly met through our efforts to promote a regional real-time climate data distribution system, both through (1) the workshops we have held and will be holding, to determine the data and information needs of potential users, and (2) by our participation in the committee charged with designing a method to solicit and

evaluate proposals from the regional states to establish a real-time data delivery system. In a more direct sense, we have contributed to the development of appropriate software for a real-time regional data and information system (1) by cooperating with the Midwest Agricultural Weather Service in the development of a component of their real-time data system, and (2) by the development of the Illinois Climate Assistance Service (CLASS), a computer-based system which retrieves data from 36 observing sites in Illinois, and makes those data available to private and public users via phone and their terminal. Software for a regional data delivery system can only be specifically designed by the operating agency, and only after they have conceptually designed the system.

- f. Provide guidelines for collection of real-time climatic data base. There are at least 3 efforts to develop specifications for the collection of real-time climate data. First, there is a NC-94 committee studying the problem. Second, the American Association of State Climatologists is preparing a similar document, and third, the climatologists associated with Long Term Ecological Research projects (funded by NSF) at about 6 institutions across the country are also preparing such guidelines. All of these are in preliminary stages of preparation, but all are directed at about the same goal, so that their final forms should be complementary. The Director will summarize each of the recommendations, to identify significant differences, if any, present them in the final report of the North Central Regional Climate Center, and disseminate them to a wide audience in the National Weather Service, and the states of the region.

- g. Provide for a general format for regional publications. NCRCC has developed a format for its continuing publications. The NCRCC has also developed a mailing list for its various publications, which may be requested by other state and regional centers.
- h. Receive, archive, and disseminate federal data and specialized state climate data. As with points "b" and "e," above, this task has been addressed indirectly through our participation in and strong support of a regional real-time data delivery system. Again, specific methods for data reception, delivery and archival, cannot be given until (1) the location of the regional system is known, and (2) the equipment which they propose for the system is known. The NCRCC has experience in satisfying this task, and will be available to the regional data delivery system center, to aid in any way requested, as able. This experience derives from the NCRCC's close association with the Illinois Climate Assistance Service (CLASS), and with its acquaintance with the Nebraska AGNET system, and those of other states in the region.
- i. Offer help and assistance to establish a regional climate data archive.
- John Vogel of NCRCC participated in the NC-94-sponsored committee to write the Request for Proposals (RFP) to establish a regional weather/climate data repository (presented in Appendix B). After 18 months, in September 1985, the committee released the RFP which was distributed throughout the region. This RFP invited staff of any of the land-grant institutions within the region to prepare a proposal for the design, development and operation of a real-time climate data acquisition, and data and information dissemination system. Data could be acquired from NWS ROSA stations, from additional NWS Coop stations, from

the Midwest Agricultural weather Service Center, and from state operated climate networks. The proposals would outline the components of the system, and describe it's possible operation plan. All interested parties were invited to submit proposals prior to 1 December 1985 outlining how they would design such a system, and to list the costs (both from the proposal and those supplied by the state) to develop and operate the system. The proposals which were submitted were to be evaluated by a NC-94 committee chaired by Mark Hodgson, of the North Central Computer Institute.

This task was aided by the NCRCC by means of the workshops which were or were to be held at several cities of the Upper Midwest. The participants at these meetings (invited from the private and public sector) helped define the various weather/climate data needs of users within the region. Preliminary findings were summarized after 8 of the workshops had been held, and distributed to all SCs and NC-94 representatives in the region by letter (23 October 1985, shown in Appendix C), to assist them in the preparation of proposals to develop a regional repository in their state. This information offered particular help in the development of specific products that users typically wish to have available. The full report of these workshops will be distributed to NC-94 members, State Climatologists of the region, and other regional and federal agencies in spring of 1986 (Wendland et al., 1986b).

- j. Explore offering limited climatic services to states with limited services, as requested. At the present level of funding to the North Central Regional Climate Center, we could not solicit SCs of the region to offer such a service. At the same time, however, we have not been

approached by SCs of the region or other representatives of the State Climate Centers to provide such services.

k. Promote a regional climate data and information system. The NCRCC has promoted such a system during the past 1 1/2 years by means of private discussions and formal presentations. We place high value and priority on the development of such a system because of the very positive response to the Illinois CLASS system, with which we are well acquainted. Private and public users of CLASS claim its value and need, and their comments and responses to our inquiries strongly suggest that moderate user fees could support the maintenance of CLASS (see Wendland & Changnon, 1986). Formal presentations were made at the annual AASC meeting at Reno in August 1985, the NC-94 meeting at Ames in October 1985, and at the 13 regional workshops discussed above. Response to these workshops and presentations has been very favorable and the group was very supportive of the concept. The attendees were in almost all cases involved in weather- or climate-related activities where real-time data are currently expensive to obtain, or cannot be obtained for a station density which is necessary for the given activity. The response of all workshop attendees was positive, mostly strongly positive.

Strong support was voiced by State Climatologists in states which offered little or no support to the State Climate Center.

l. Coordinate, prepare, and promote regional efforts toward development of a major research proposal. A proposal was written by the NCRCC Director and submitted to NSF to fund a project which proposed to investigate macro-scale circulation changes associated with the temperature trends

of the last 90 or so years. This project would have involved the services of all State Climate Centers in the region to (1) provide data, and (2) help in the analysis and preparation of the final report. We proposed to determine airmass frequency changes over time by means of analyzing histograms of daily maximum temperatures for various months from 1901 to the present. The analysis scheme was designed after that of Bryson (1966). The proposal was rejected by NSF, primarily because a referee claimed that the analysis technique was improper and would not be able to demonstrate any meaningful changes. After some discussion at the NC-94 meeting, we have decided to resubmit the proposal, but to strengthen the discussion of the analysis technique by means of including a pilot study of airmass changes gleaned from data from about 10 stations in North Dakota, Minnesota and Illinois. John Enz and Don Baker will participate in this study. We trust that the pilot study will convince the referees that the technique is viable.

Late in 1984, staff at the NCRCC obtained a tape of 1951-80 mean monthly temperature, precipitation, and degree day data from the National Climatic Data Center. We wrote the software to plot these data on maps, identifying the time of observation at each station as well as marking those where the time of observation had changed more than 3 times during the period of record. These maps were then analysed by NCRCC staff, correcting the mean temperatures for the time of observation. The resulting charts exhibit mean maximum, minimum, and mean monthly temperatures as if all observations were taken at midnight, i.e., the bias due to different observation times has been removed. Drafts of each map were provided to the State Climatologists for review. Although data

density was on the order of 50 stations per state, they reviewed the analyses for anomalies due to topography, proximity to water etc. The corrected maps were then digitized, plotted, printed and are now available (Wendland et al., 1985).

NCRCC has encouraged SCs in the region to prepare a number of papers for presentation at the conference to be held at NCDC, August 1986, to discuss the impact of recent weather/climate variability on human activities. The following topics were suggested: (1) the lack of moisture stress on plants during the 1985 growing season, (2) the rapid flooding which developed in northeast Illinois and northwestern Indiana in February 1985, (3) the unusually high levels of the Great Lakes, (4) the record-breaking precipitation of November 1985 in and around Illinois, and (5) the extent and magnitude of drought in and around Nebraska during the 1985 summer.

5. Visits to State Climate Centers

The NCRCC Director met with representatives of the State Climate Center of all the North Central states at least once during the year, most of these discussions being held at the annual AASC meeting in Reno, or at the NC-94 meeting in Ames. In addition, conversations were held with the Assistant State Climatologist of North Dakota in Fargo, Ken Hubbard, the Nebraska SC at the Reno meeting, Jim Newman, the Indiana SC at Indianapolis, and Dick Carlson, the NC-94 representative at Ames. Each of the above meetings were held in conjunction with another formal meeting.

A half day was spent with Fred Nurnberger, the SC of Michigan in conjunction with the regional climate data system seminar. This did not provide

sufficient time to meet many other personnel associated with the SC's operation, but was sufficient for a briefing on the operation of the Michigan Climate Center.

Also in conjunction with a regional data System workshop, the NCRCC Director met 2 days with Earl Kuehnast, the Minnesota SC, Jim Zandlo, the Assistant SC, and Don Baker, the NC-94 representative. This was sufficient to see some of the products that the Minnesota State Climate Center compiles routinely, as well as view some of the procedures used to acquire, analyze, and publish those products. In addition, he met with Dick Skaggs, Chair of the Geography Dept. of the University of Minnesota.

6. Conclusions

The NCRCC has been in operation for nearly 4 years, however, prior to 1984, it was known as the Regional Climate Coordinating Office (RCCO). During that time 2 research papers were written (with contributions from the 12 State Climatologists, and co-authorship), and published in the Bulletin, American Meteorological Society. In addition, 2 research papers were written and published by NCRCC personnel. The first analyzed 1951-80 temperature and precipitation for the North Central region, with the observations corrected for the time of observation bias. The second analyzed the magnitude of the time of observation bias introduced in mean temperatures (Head, 1985). A third paper presented a rationale for regional climate centers, based on our experience in the operation of NCRCC. The Director of NCRCC participated in a study of the time of observation bias based on data from the United States. This paper was published in Journal of Climatology and Applied Meteorology. A research proposal is in preparation to the National Science Foundation to study changing

synoptic patterns over the Upper Midwest since the turn of the century.

Services to State Climate Centers include responses to various requests during the past year, both from the State Climatologists and from federal agencies relative to the State Climate Centers. A grant has been negotiated, and will be awarded to NCRCC within the next 3 months to support the collating of climate data in the region for inclusion in the NEDRES clearinghouse data base.

Eight workshops have been held and 3 more are scheduled, to help define and determine the need and value of a regional real-time climate data and information acquisition and dissemination system. Between 8 and 25 persons who work in weather/climate related businesses participated in each, having been chosen from names suggested by the SCs and NC-94 members. The results of these discussions will help formulate products for real-time regional data and information systems.

7. References

Bryson, R. A. 1966: Airmasses, streamlines and the boreal forest. Geogr. Bull. 8:228-269.

Head, D. E. 1985: Mean temperature biases as a function of the time of observation. NCRCC Paper No. 6. North Central Regional Climate Center, Illinois State Water Survey, Champaign. 105p.

Karl, T. R., C. N. Williams, Jr., P. J. Young & W. M. Wendland. 1986: A model to estimate the time of observation bias associated with monthly mean maximum, minimum and mean temperatures for the United States. J. Clim. Appl. Clim. In press.

Wendland, W. M., J. L. Vogel & S. A. Changnon, Jr. 1985: Mean 1951-1980 temperature and precipitation for the North Central Region. Paper No. 7. North Central Regional Climate Center, Illinois State Water Survey, Champaign IL. 30p.

_____, S. A. Changnon, Jr. 1986: Assessment of usage of real-time climatic data and information to the public and private sector. Annual report to the Climate Analysis Center (NOAA), Grant COMM NA85AA-D-MC-056. Illinois State Water Survey, Champaign. In preparation.

_____, S. A. Changnon, Jr. & J. L. Vogel. 1986a: Rationale and role of Regional Climate Centers in the United States. NCRCC Paper No. 8. North Central Regional Climate Center, Illinois State Water Survey, Champaign IL. 22p.

_____, J. L. Vogel & S. A. Changnon Jr. 1986b: Assessment of usage of real-time climatic data and information to the public and private sector. Illinois State Water Survey, Champaign. In preparation.

Appendix A

Questionnaire to Assess Climate Products that should be Available on a Regional Climate Data and Information System to make the Data and Information Useful to Your Business

To help the North Central Regional Climate Center design a climate data and Information system that would be helpful to the operation of your business, please respond to the following questions. Please be assured that you acquire no obligation from your responses. Please bring the completed questionnaire to the seminar, or send it to Wayne M. Wendland, Director, North Central Regional Climate Center, Illinois State Water Survey, 204 Griffith Dr., Champaign IL 61820. Thank you.

- Please indicate the climate parameters given on the following matrix which would be helpful to the operation of your business activity, and the area for which the data should be representative, i.e., what is the minimum resolution you require? Please indicate your interest in each item from 1 (greatest interest) to 5 (least interest).

Indicate Your Interest in these Products from 1 (highest) to 5 (lowest)	MINIMUM SPATIAL RESOLUTION DESIRED (Check all that apply)			
	1234 or 5	STATION	DISTRICT	STATE
TEMPERATURE DATA				
• Daily updated temperature				
• Last 7 days mean temperature				
• Mean temperature for last month				
• Mean growing season temperature				
• Total growing degree days since May 1				
• Other (PLEASE SPECIFY) _____				
• Other (PLEASE SPECIFY) _____				
PRECIPITATION/STORM DATA				
• Daily updated precipitation data				
• Last 7 days total precipitation				
• Total growing season precipitation				
• Total precipitation for last month				
• Current Palmer Drought Index				
• Other (PLEASE SPECIFY) _____				
• Other (PLEASE SPECIFY) _____				

2. In addition to the parameters listed in question 1, in which of the following parameters would you be interested, and to what degree are they important to you?

PARAMETER	NO INTEREST	MILD INTEREST	MUCH INTEREST
	(please check one)		
30- and 90-day temperature and precipitation outlook			
predicted crop yield for U.S.			
predicted crop yield for various areas of world			
1 to 5 day outlooks of temperature and precipitation			
6 to 10 day outlooks of temperature and precipitation			
soil moisture information			
frost depth information			
snow cover			
other _____			
other _____			
other _____			

3. Relative to the density of observing stations available on this regional system, in general how many stations per state would be necessary for these data to be helpful to you?
- 1 to 5 stations per state
 - 6 to 10 stations per state
 - 11 to 19 stations per state
 - 20 to 29 stations per state
 - 30 or more stations per state
 - other density; _____
4. If such a system came into being, its maintenance would be supported by user fees, probably consisting of an annual subscription plus a time-of-use cost. If you were to participate in such a system, which of the

following methods would you prefer? (please check one)

- a. flat fee for all users
- b. an individual fee lower than that assessed of companies, particularly companies who further distribute information received from this system.
- c. other (please specify) _____

5. Based on your experience, and your perceived value of the data and information described herein, which of the following annual rates is most appropriate?

- a. more than \$1,000 per year
- b. \$500 to \$999
- c. \$300 to \$499
- d. \$200 to \$299
- e. \$100 to \$199
- f. other: _____

6. With which of the following economic sectors are you most closely associated (please check all that apply)?

- a. fertilizer company
- b. seed producer
- c. municipal government
- d. county government
- e. state government
- f. federal government
- g. radio
- h. television
- i. newspaper
- j. gas or electric utility
- k. consulting firm
- l. travel business
- m. insurance
- n. water resources
- o. self-employed
- p. other (please specify): _____

7. With which of the following professions are you most closely associated (please check all that apply)?

- a. farmer
- b. farm manager
- c. county extension agent.
- d. researcher
- e. broker
- f. banker
- g. engineer
- h. rates manager
- i. clerical

j. plant manager

k. other (please specify): _____

8. If the weather and climate data and information were available to you, in what ways might you use them (please check all that apply)?

	Planning Activities		Operational Decisions	
	General Info	Systematic Use	General Info	Systematic Use
Crop and variety choice				
Cultivation practices				
Planting and harvesting date choice				
Planting density				
Fertilizer applications				
Pesticide applications				
Irrigation scheduling				
Livestock numbers				
Investment/borrowing decisions				
Project decisions				
Personnel deployment				
Marketing decisions				
Insurance decisions				
Information dissemination				
Consulting activities				
Management decisions				
Sales activities				
Purchasing				
Other (please specify) _____				
Other (please specify) _____				
Other (please specify) _____				

Your answers will be kept confidential. However if you prefer to remain anonymous, do not complete the remaining entries. We want your contribution, regardless of whether you identify yourself or not. Thank you for your consideration.

Name (optional): _____

Title: _____

Organization: _____

Address: _____

Phone: (_____) _____

Appendix B

REQUEST FOR PROPOSAL FOR ESTABLISHING AND OPERATING A NORTH CENTRAL WEATHER/CLIMATE DATA REPOSITORY

The location of the North Central Weather/Climate Data Repository (hereafter referred to as the Repository) is to be selected by the North Central Agricultural Experiment Stations Directors from bids received from North Central Land Grant Institutions. This is a request for proposals for the initiation and the operation of the Repository. These bids are for a cooperative agreement, not a grant, and the bidder is to describe the operation, staffing, facilities, and provide an implementation plan and a budget with various additional options and their costs listed separately. A screening committee will rate the proposals, and make their recommendation to the Directors. The screening committee will be chaired by Mark Hodgson of the North Central Computer Institute. Other members of the committee will be recommended by the NC-94 in cooperation with the drafting committee of this request for proposals. More in-depth information about the Repository is available in the attachment.

Assumptions

1. The Repository will be located at a North Central Region Land Grant Institution and will be administered within that institution.
2. A network of hourly automated weather/climate stations will be maintained and/or initiated by each state in the North Central Region. The previous day's data from these stations will be transmitted to the Repository by 9 a.m.
3. Repository funding will cover staff salaries, benefits, communications, and travel. Initially, funding will be arranged in cooperation with the Directors and the successful bidder. Funds from user fees and other sources will decrease the member contributions, with the intent being that the Repository will become self supporting.
4. The host institution will provide administrative support of the Repository. The staff of the Repository will be employees of the host institution in terms of payroll and benefits, and be subject to the policies and regulations of the host.
5. National Weather Service (NWS) daily data will be available for the 12 North Central States plus the peripheral states and provinces through the Midwest Agricultural Weather Service Center (MAWSC) or equivalent source.
6. The Advisory Committee will consist of 12 members (one from each state); and will be made up of 6 Cooperative Extension and 6 Experiment Station Representatives.

RESPONSIBILITIES

1. The North Central Directors will a) select the site of the Repository, b) arrange initial funding, c) review the progress of the Repository, and d) appoint an Advisory Committee for the Repository.

2. The cooperating states in the North Central Region will a) set up, collect, calibrate, and transmit data from hourly automated stations, b) work with the Repository to specify methods and formats for transmitting data to the Repository, c) select a representative for the Repository Advisory Committee, and d) determine the distribution policy of data for their state.
3. The Repository will a) perform as outlined in the specifications (listed below) of the Request for Proposal, b) provide cooperating states with equivalent data to the amount of data supplied, c) provide access to the Repository through a toll-free number, d) seek outside funding through the generation of user fees and other potential outside sources, and e) prepare an annual report.
4. The North Central Regional Climate Center (NCRCC) will a) provide oversight, and b) present the Repository's Annual Report to the Directors.
5. The Advisory Committee will a) advise the Repository on operational policy, b) assist in seeking outside funding, and c) evaluate present operations and help plan future goals.

Specifications

The minimum specifications for developing an operational plan are provided below. Additional details pertaining to the intent of these specifications are given in the attached general description of the Repository. Optional or additional features can be submitted in the bid with their individual costs identified.

1. The scope or range of operations should include the following capabilities:
 - a) accept, process, and transmit data from 100 automated hourly weather/climate stations initially, with the capability of expanding to 200 weather/climate stations,
 - b) accept, process, and transmit daily data for up to 500 NWS stations through MAWSC or equivalent source for the North Central Region plus peripheral states and provinces,
 - c) accept, process, and transmit hourly data from up to 200 first-order and FAA stations through MAWSC or equivalent source, if available,
 - d) operate online 24 hours per day, 7 days per week, unattended operation at night and on weekends,
 - e) perform backups on the most recent data from near real-time sources on a separate system at least 3 times per week.
 - f) it is anticipated that the Repository initially operate by processing data from a few states, with other states being added in a scheduled manner, as rapidly as possible. States may add and/or remove stations at any time, after giving some minimum notice period.

2. The communications capabilities should be bid on the following assumptions:

- a) the Repository will work with each state to establish a convenient, reliable method for transmitting data to the Repository. Each state will specify the format(s) of the data. In theory each automated weather/climate stations could have a different format, but it is anticipated that each state will only have one format,
- b) data retrieval for some of the data may be through other state or private networks, but some users will desire to retrieve data directly from the Repository,
- c) four dial-up ports will be available, these ports will be full duplex, asynchronous transmission using the ASCII communications protocol and character set. Modems must auto answer and automatically speed sense for 300, 1200, and 2400 baud.
- d) a RJE/3780 protocol port will be available. (For cost-saving purposes it is envisioned that communications networks such as BITNET will be used.
- e) initially, the Repository must support 4 interactive users simultaneously, being a combination of 0 to 4 callers retrieving data from the Repository, and 0 to 4 callers sending data to the Repository. The Repository will be accessed via one toll-free phone number. Bids should estimate costs for adding additional simultaneous ports, up to 8, and specify any computer limits less than a total of 8. It is anticipated that it will be desirable to provide access to the Repository via communications networks such as BINET, TELENET, etc. Bids should indicate what network connections exist or are planned at the Institution to which the Repository could use and the extra cost, if known.
- f) an on-line message system for communicating between the user and the Repository would be desirable.

3. Data Processing

The following data processing will be required:

- a) data from the state networks should be processed, stored in the data base, and available for use by noon, providing the data has been transmitted to the Repository by the states by 9 a.m.;
- b) data summaries from the daily NWS stations should be processed and available by noon;
- c) near real-time quality control should at least consist of automatically estimating missing and out-of-range data for daily and automated stations, and flagging suspicious data;
- d) post real-time quality control data from the automated weather/climate stations should involve more rigorous quality control checks

involving spatial and temporal checks and interactions with the state centers responsible for the original data (also see attachment for more detail);

- e) the staff climatologist will work with data providers and the advisory committee to establish and maintain state-of-the-art quality control;
- f) the Repository will maintain a stations log for each automated weather/climate stations which will be readable by users, and can be updated by authorized state center personnel;
- g) the response time for interactive sessions between users and the Repository should be reasonable, and the reception and processing of data will not disrupt access to existing data by users;
- h) specialized reports should be available such as:
 - tabular listings of the data and station descriptions;
 - data logs
 - summary reports;
 - map presentations;
 - variable output format capabilities to users, such format specifications should be capable of being stored at the Repository for future use;
 - data retrieval by state and/or region, within a distance from some specified location (e.g., latitude and longitude), by individual stations, or within some specified region.
 - additional products will be added at the request of users and by the Advisory Committee recommendations.

4. Data Storage/Data Retrieval

The Repository should be capable of the following:

- a) store data from the special weather/climate stations for the current year to date plus the previous calendar year online including original data, status codes, and altered values,
- b) store historical data from the automated weather/climate stations and hourly data from NWS and FAA stations,
- c) data, both historical and near real time, should be available to users online, via 9-track tape, and IBM PC compatible floppy disks.

5. Security and Accounting

The Repository must support login by user name and password, access rights to data on a state-by-state basis, and access charges to data on a state-by-state bases. The Repository will accumulate charges for data access and generate reports for billing purposes. Fees and access rights will be agreed upon at a later date.

SELECTION CRITERIA

All applications for operation the Repository, that satisfy the specifications will be evaluated using the selection criteria listed below. The evaluating factors will be applied in an identical manner to all applications. Weighting factors are given for each category for the guidance of the screening committee. Detailed points to be considered within a category are listed in their order of importance.

1. Suitability of Operation Plan to satisfy specifications. (Weighting Factor 30%)

See specifications.

2. Capabilities and Facilities. (Weighting factor 30%)

- a. Computer capabilities

- b. Communication capabilities

- Multiple access for simultaneous data entry and transmission
- Protocols, Network/Baud Rates (such as TELENET, BITNET or others)
- Error checking procedures

- c. Data Storage

- online
- archive/tapes

- d. Office space for Staff

- computer access
- relative location of Repository to support staff and climatology staff

- e. Contingency capability in event of total or partial Repository computer failure

3. Suitability fo proposed staff (Weighting Factor 25%)

- a. Director

- FTE committment
- managerial and promotion skills
- educational background and experience

- b. Support staff with percent commitment

- computer network operations
- communications
- programming/systems

c. Climatologist/Meteorologist

d. Secretarial

The capabilities of the staff as a unit will be evaluated to determine the suitability of the 'team' to develop and maintain the Repository

4. Financial arrangements and administrative policies (Weighting Factor 10%)

Describe fully the financial policies that the institution would utilize if the Repository was located at your institution. List charges for space rental, communications, computer services, etc. List contributions that could be provided by the host institution at no cost to the Repository. Discuss overhead policies of the host institution as they would apply to the operating budget. Present the operating budget in detail, including charging procedures for data collection points user and value adder users. Include expected outside sources of support.

5. Institutional commitment to related disciplines (Weighting Factor 5%)

Evidence of interest faculty and staff in related disciplines, such as Climatology, Meteorology, and Computer Science as related to agricultural production.

SUBMISSION OF APPLICATION

The completed applications should be mailed to Mark Hodgson, Chairman of the Selection Committee. The deadline for submission is 15 November 1985. Questions concerning the proposal can be directed to Mark Hodgson or other members of the drafting committee of the request for proposal (listed below). The Selection Committee will make their recommendations for site location to the North Central Directors

The Applications should be sent to:

Dr. Mark Hodgson
North Central Computer Institute
667 WARF Building
610 Walnut Street
Madison, Wisconsin 53705
(608) 263-4791

31.

Or. L. Dean Bark
Department of Physics
Cardwell Hall
Kansas State University
Manhattan, Kansas 66502
(913) 532-6814

Dr. R. Bruce Curry
Department of Ag. Engineering
Ohio Agricultural Research Development Center
Wooster, Ohio 44691
(216) 263-3856

Dr. Thomas Thompson
Department of Ag. Engineering
Chase Hall, East Campus
Lincoln, NE 68583-0726
(402) 472-1642

Dr. John Vogel
Illinois State Water Survey
2204 Griffith Drive
Champaign, IL 61820
(217) 333-4261



Appendix C.

Illinois State Water Survey
2204 Griffith Drive
Champaign, Illinois 61820
217/333-0729

North Central Regional Climate Center

October 23, 1985

A summary of some thoughts expressed at the NC-94 meeting re regional climate research, and concerning the RFP for the repository.

Two new research topics were initiated at the meeting. The first topic was to refine the substantial work that has been done relative to the time of observation bias. Discussion at the meeting led to the following question: Do we know the magnitude of the discontinuity of the bias from the end of 1 month to the beginning of the next? David Head commented on the problem in NCRCC Paper #6, distributed in January of this year, but did not specifically investigate the problem. When in Ames, I had forgotten some of the components of the equation that we had developed to calculate the bias in the paper that will appear in JCAM, January 1986. In that equation, one may specify whether the "drift" which may occur at the beginning and ending of months is to be included in the calculation or not. Since this part of the equation may satisfy the uncertainty which was discussed at the meeting, let me suggest the following. Let us hold off on this study for about 2 months. By then, the paper will have appeared in JCAM and you will have had a chance to study it. If it appears that this equation yields the answers and satisfies our need, we need do no more. Otherwise we'll attack it at that time. By the way, I am furnishing IBM disks to some of you containing a copy of the equation which calculates the bias as a function of several variables. If others of you would like a copy, give me a call please.

The second research idea (i.e., study air mass frequency changes over the last decades by means of daily maximum temperatures), involved several of you suggesting a pilot study, the results of which could be used to strengthen a revised proposal that would be sent to NSF. Specifically, we suggest completing such an analysis for a few sites along 2 transects, with data from 1951-1955, and 1976-1980. The first of these periods represents 1 of the warmer pentads of the last 80 years, and the latter 1 of the cooler. Don Baker agreed to gather data and analyze daily max temperatures from International Falls and Minneapolis for those 2 pentads. I would do the same for St. Louis and Chicago. Those 4 sites give us a north-south transect. John Enz also was interested in the project, and would analyze data for, say, Dickinson and Fargo, to complete an east-west transect. This is sufficient for a pilot study.

Now, to a totally new matter, but something which may be of use to you. I refer to the Request for Proposals for a regional repository, which were sent to the Directors about 2 weeks ago. As you know, all land-grant

institutions in the region may propose such a facility. In order to aid you in that preparation, should you choose to proceed, permit me to summarize our preliminary findings from the workshops we have held around the region. You will remember that NCRCC has called these meetings in cities of the region to discuss such a system to determine the need for such a system, and the degree to which the system could be supported by the users. We have held 6 meetings thus far, with another 3 to 5 meetings planned. The following summarizes the preliminary findings of the first 6 meetings. You might find this information helpful in designing a climate data dissemination system.

There was general consensus that station density should be between 40 to 80 stations per state. Although some users want the data available at the township level, this is probably too demanding for the regional repository, but could be addressed in state delivery systems. Although special needs may demand special data density. Station density can be increased by using NWS First Order stations, Coop ROSA stations, data from MAWSC, additional Coop stations reporting directly to the repository, and data from state networks, as available.

Forecast information is desired in addition to the real-time climate data. Forecast products could be obtained from state WSFO offices, MAWSC, or CAC. The forecasts should include the usual parameters, and include specific reference to variables such as wind direction and speed for the day (for spraying operations) or other special variables as needed. Forecast information should be presented in probability terms as possible, since many users are able to use these values in their models.

The fee scheduling should be scaled, i.e., farmers and perhaps extension agents should be charged least (if at all) since they will be using the information for their own use, or will be furnishing the data to others for no charge. Those who use these data in the preparation of products to be sold to others should be charged a greater fee.

When presenting temperature and precipitation observations, deviations from normal should be presented in absolute deviations for the former, and absolute and percent values for the latter. Some groups would like such a system to have data and information from states outside the region. This is particularly true for certain crops which are also produced in other regions. They would like to keep abreast of growing conditions in that state as well.

Quality control must be accomplished on the data as they are received, e.g., max temp must equal or be greater than the min, etc. It is desirable to spatially correlate the temperature of one station with those of nearby neighbors, or at least make a spatial comparison.

It is important that accommodation be made for marketing these products and the system by advertising in the correct places to attract sufficient support. This may be beyond the experience of many of us in the scientific community, and thus require the assistance of marketing consultants.

If some of the above points are unclear, give me a call, and we can discuss them. The deadline for submitting proposals for the regional repository

35.

is 1 December 1985.

Sincerely,

Wayne M. Wendland, Director
North Central Regional Climate Center
Illinois State Water Survey
217-333-0729