9-1995

Department of Agricultural Meteorology CSREES Comprehensive Review

Bio-Environmental Climatology

Description: Description of basic climatic parameters such as radiation, temperature, and precipitation and their role in shaping the environment of natural and managed ecosystems. Discussion of how climate influences plant and animal growth, performance and diversity. Examination of man-made influences on the atmospheric environment and the role of climate and its impact on environmental quality.

Justification: With the increasing emphasis on proper management of natural resources and the need for greater harmony between agricultural production systems and the natural environment, it is critical to examine the important role of climate and its interactions with natural and managed ecosystems. This course is designed to provide a basic overview and understanding of climatic variables and their influence on plants, animals, and the biosphere. The course will emphasize climate as a natural resource and the importance of monitoring and managing that resource. It will also examine the potentially beneficial and detrimental impacts of man's alteration of the atmospheric environment.

Relationship to other courses at UNL: This course is designed for sophomore/junior level students in the agricultural, biological, and natural resource sciences. It will provide a good foundation for students who plan to examine the interactions between the atmospheric environment and various ecosystems in greater depth as taught in AMET 408/808 (Microclimate: The Biological Environment). This course will compliment Geography 150 (Physical Geography) and Geography 308 (Biogeography) and should be a candidate for the UNL Integrated Studies Program.

Methods of Instruction: Three 50-minute sessions per week, includes lectures, discussions, and computer work. Student performance will be based on class assignments (20%), quizzes (20%), and exams (60%). Prerequisite: College Algebra.

? Becomes a prerequisite for AMET 408 ?

Intro to Meteorol.

Bio-Environmental Climatology

Section 1

I. Radiation
   a) earth-sun relations
   b) radiation balance

II. Temperature
   a) daily/seasonal patterns and variablility
   b) calculation of heat units (GDD/HDD/CDD)
   c) affects of upper/lower thresholds/limits, optimal temperatures
   d) modifying effects of bodies of water
   e) effects of altitude and latitude

III. Precipitation (and Drought)
   a) daily and seasonal patterns
   b) persistence
   c) return periods
   d) precipitation/evapotranspiration curves

IV. Climatological Probabilities
   a) temperature
   b) precipitation
   c) degree days

Section 2

V. Soil Characteristics
   a) soil texture
   b) soil temperature
   c) soil water

VI. Evapotranspiration
   a) meteorological factors
   b) plant factors
   c) models

VII. Impact of Weather on Crop Development and Yield
   a) corn
   b) soybean
   c) crop ecology/geography

VIII. Impact of Weather on Animals

Section 3

IX. Natural/Man-Made Phenomenon: Impacts on Climate
   a) impacts of increased trace gases
   b) volcanic eruptions
   c) urban heat islands
   d) "rain follows the plow"

X. Natural/Man-Made Phenomenon: Climatic Impacts on Environmental Quality
    a) water quality
    b) irrigation (leaching of fertilizers, herbicides, pesticides)
    c) crop dusting

XI. Local-Scale Weather Modification
    a) wind breaks
    b) irrigation
    c) frost protection

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Acknowledgements

Many individuals have devoted considerable time and effort in preparation of this self-study document. Numerous thoughtful and probing questions have been asked by faculty, staff, and students to help the department think about and plan for its future.

Particular thanks are due those who took the lead in preparing various sections of the report. We are especially indebted to Sharon Kelly, Deanna Batty, and Vicki Wilcox for their patience, persistence and excellence in preparing this document. Thanks also is expressed to Deb Wood for editorial assistance and for the design of the self-study cover, and to Cindy Hays, who helped compile some of the statistics for the report.

The department appreciates the members of the CSREES review panel and the UNL comprehensive review team for their significant commitment in preparing for and conducting this review. We look forward to their counsel and insight. We likewise appreciate the support of the UNL administration, particularly those in IANR, for their responsiveness to our ideas and for providing support for various departmental programs. We value the opportunity to work in an environment that we perceive as being people-oriented and one that looks toward and plans for the future.

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1995 CSREES Comprehensive Review
Agricultural Meteorology
September 26-29, 1995

Agricultural Meteorology Comprehensive Review Schedule September 26-29, 1995

Tuesday, September 26, 1995		Location	Leader
7:30 p.m.	Review Team Meeting	Nebraska Center for Continuing Education	Boyd Post

Wednesday, September 27, 1995

Overview of Department and University			
7:30 a.m.	Breakfast with UNL Administration	East Campus Union Rm on Kiosk	Vice Chancellor Irvin Omtvedt
9:30 a.m.	Departmental Overview and Review Goals and Objectives	Rm 225 Chase Hall (LWC)	Blaine Blad
10:45 a.m.	Break	Chase Hall	
Research Programs			
11:00 a.m.	Current and Past Research Programs	Rm 225 Chase Hall	Shashi Verma
12:30 p.m.	Lunch with Faculty	East Campus Union Rm on Kiosk	Blaine Blad
1:30 p.m.	Research Programs	Rm 225 Chase Hall	Shashi Verma
2:45 p.m.	Challenges and Concerns	Rm 225 Chase Hall	Blaine Blad
3:05 p.m.	Break and Walking Tour of Departmental Facilities	Chase Hall	
3:15 p.m.	Meeting with Graduate Students	Rm 225 Chase Hall	Elena Tsvetsinskaya
4:15 p.m.	Meeting with Technical Support Staff	Rm 225 Chase Hall	Mark Mesarch
5:15 p.m.	Adjourn		
6:30-8:30 p.m.	Dinner with Faculty and IANR Administration	To Be Determined	Blaine Blad

Thursday, September 28, 1995		Location	Leader
Academic Programs			
8:00 a.m.	History and Current Teaching Programs	Rm 225 Chase Hall	Albert Weiss
8:15 a.m.	Future Challenges and Opportunities for Academic Program	Rm 225 Chase Hall	Albert Weiss
9:45 a.m.	Break		
International Programs			
10:00 a.m.	Discussion of Departmental International Activities	Rm 225 Chase Hall	Elizabeth Walter-Shea
11:00 a.m.	Meeting with Office Support Staff	Rm 225 Chase Hall	Sharon Kelly
12:00 Noon	Lunch with IANR Department Heads	East Campus Union Rm on Kiosk	David Marx
Outreach Programs			
1:30 p.m.	History and Current Status of Department Outreach Program	Rm 225 Chase Hall	Kenneth Hubbard
2:00 p.m.	Future Challenges and Opportunities for Extension/Scholarly Service	Rm 225 Chase Hall	Kenneth Hubbard
3:15 p.m.	Break	Rm 225 Chase Hall	
3:30 p.m.	Opportunity for Small Groups or Individual Meetings with Review Team	Rm 225 Chase Hall	Faculty, Staff or Students
5:00 p.m.	Adjourn		
Evening	Review Team Writes Preliminary Report	Nebraska Center for Continuing Education	Boyd Post

Friday, September 29, 1995		Location	Leader
8:00 a.m.	Breakfast with Department Head	East Campus Union	Blaine Blad
9:30 a.m.	Exit Report to UNL Administration	Rm 225 Chase Hall	Boyd Post
10:30 a.m.	Report to AgMet Faculty, Staff and Students	Rm 225 Chase Hall	Boyd Post
12:00 Noon	End of Review	Rm 225 Chase Hall	

Executive Summary

Present Status

The department has experienced significant change since the 1989 CSRS Comprehensive Review. Much of this change occurred in response to recommendations made by that review team and as a result of suggestions made at regular departmental planning sessions. The size of the department has expanded, the number of courses offered in the department has grown, several new centers have been established within the department, the level of funds has increased substantially (mostly due to external funds), and we have made improvements in office and laboratory space.

At the time of the 1989 review there were six faculty members; there are now ten and one faculty member just left on August 1, 1995. We have added six new support positions. This increase in faculty and staff has been accomplished almost exclusively through the use of external funds.

Since the last review there have been substantial changes in the departmental curriculum. Three courses have undergone major revision and five new courses have been added. During this time the FTE devoted to teaching has only increased from 0.55 to 0.74. Recent calculations show that we are teaching the equivalent of about 1.4 FTE. One of the new courses is an instrumentation course for which we have recently received a grant from NSF to purchase needed instruments. We are likewise developing laboratory facilities to be used in teaching the labs for that course. Several courses require the use of computers, which are generally available in general use areas for students. Classrooms available for our use are generally adequate for the courses we offer.

There are five centers housed within the department which provide significant funding in support of departmental programs, especially those in research and scholarly service. Three of these centers have been added since the last review. They are the Center for Laser-Analytical Studies of Trace Gas Dynamics, the Great Plains Center for Global Environmental Change and the National Drought Mitigation Center. Including support from these centers, the total amount of external funding awarded to departmental faculty in 1994 was about $1,275,000. Following the 1989 review, but prior to 1994, average external funding was about $800,000 per year. Increases in appropriated funds have been small since the 1989 review and almost all of those increases have been for salaries. Overall appropriated support for departmental programs is about average compared to other units in the Institute of Agriculture and Natural Resources.

We are still quite cramped for space in the department, due in considerable measure to our recent increase in the number of faculty and staff. Since the last review, space has been renovated in rooms 14 and 20 in Chase Hall and work has begun to provide research laboratories in the basement of Chase Hall. These laboratories will help but will not alleviate our continuing need for additional space. All graduate students are currently housed in the Biological Systems Engineering Laboratory building, which is about one block north of Chase Hall.

The number of graduate students in the department has remained relatively constant during the past five or six years but we have had a definite increase in the percentage of students from foreign nations. We also support a higher proportion of foreign graduate students on graduate research assistantships than we did previously.

The support staff in the department are dedicated, effective, and make major contributions to the success of the department. Overall, the morale in the department is high and faculty, staff, and students in the department get along well and work as effective teams. There is general agreement in the department that we are a progressive unit that continually strives for improvement and works hard at maintaining programs that are on the "cutting edge" of our discipline. We likewise have strong interdisciplinary working relationships with colleagues within and outside of the University of Nebraska.

Current and Future Issues

In recent years departmental programs have increasingly focused on areas broader than agriculture. We estimate that only 30-50% of what we now do should be considered as Agricultural Meteorology. We, therefore, are strongly in favor of changing the name of the department to one that reflects more fully the programs of the department. Following several discussions the faculty have suggested that the name be changed to Bio-Atmospheric Sciences. Preliminary discussions with IANR departments and IANR administrators have indicated a willingness to support us in making this name change. Discussion relative to the proposed name change is desired and suggestions are welcomed.

We have developed several new courses in the past few years and propose adding at least two additional courses; one to be called Global Environmental Change and the other Environmental Climatology. We also propose expansion into two new areas. One area would be in bio-environmental meteorology and the second in ecosystem carbon balance modeling. If and when these programs are established we envision that they would have teaching, research, and outreach components. We propose development of an undergraduate minor in Bio-Atmospheric Sciences and a M.S. degree. We plan to strengthen our graduate program to the point that the department could offer a Ph.D. program in the future. We solicit input on the proposed course and program additions. We likewise seek suggestions on the proposed minor and M.S. degree programs along with any insights regarding a future Ph.D. degree for the department.

We have expanded our outreach and international activities since the last review. We are developing a coordinated departmental extension plan that includes active participation in the new cooperative extension action plans. We likewise plan to focus on programs for K-12 teachers and students and to provide more programs for urban audiences. Significant proportions of our outreach programs have been directed to the international community and we feel that there are many opportunities for greater involvement in international activities. We welcome discussions and suggestions regarding the future development of our outreach and international programs.

Expanding programs in Agricultural Meteorology and Biological Systems Engineering have exacerbated our space problems. Renovation of the Chase basement to provide five research

laboratories will improve our situation but space problems will continue to be quite acute, especially for students and staff. Suggestions for solutions to the space problems are sought.

Potential New Positions

The principal emphasis of the department is on increasing support for the positions and programs currently within the department. Nevertheless, the overall program of the department would be greatly enhanced by the additions of proposed programs in bio-environmental meteorology and ecosystem carbon balance modeling. Due to the expertise and current commitment of faculty in the department, the development of these programs requires new faculty to direct these programs. Brief descriptions of these positions are given below.

1. **Bio-environmental meteorologist.** This is a position that has been identified as being important to strengthening the overall program of IANR by the Natural Resources Coordinating Council. The individual in this position would provide leadership in examining the role that climate plays in determining the rates at which chemicals move into the soil and atmosphere from soil and vegetation and how such movement affects climate, air quality, and water quality.

2. **Ecosystem carbon cycle modeler.** The individual in this position would lead departmental efforts in understanding long-term processes of net carbon exchange between terrestrial ecosystems and the atmosphere as they are influenced by natural processes and human activity. This position would strengthen several programs that already exist in the department and help to integrate information generated by these current programs.

Introduction

Review Objectives

Vision and Mission Statement

Vision

The Department of Agricultural Meteorology will be a leader in research and educational programs for providing information to the academic and broader scientific community, policymakers, and the public on matters pertaining to: (1) atmospheric-biospheric interactions and their relationships to the environment and human activities; (2) the incorporation of weather information into decision making for the efficient management and sustainability of agricultural and natural resources; (3) the consequences of climate variability and change on the sustainable use of our natural resource base and for various environmental, social, and economic processes.

Role and Mission

To accomplish this vision, faculty and staff in the department will: (1) conduct research and provide educational programs to address issues that affect citizens of Nebraska, the nation, and the world; (2) provide a quality program for the education of undergraduate and graduate students that incorporates the latest research findings, technology, and understanding of the basic principles, physical laws, and issues required to understand the atmospheric environment and to appreciate its interactions with biological and natural resource systems; (3) provide modern, effective programs to disseminate and use climate and climate-related information; (4) maintain a strong outreach program to increase understanding of relevant issues related to the impacts of climate change, climate variability, and atmospheric processes on the environment and society.

Objectives

The overall objective of the departmental review is to obtain insight and counsel from the review team on the proposed plans of the Department of Agricultural Meteorology to achieve its vision and to accomplish its role and mission. To accomplish this, the department has developed the following specific objectives that it wishes the review team to address.

1. Maintaining and enhancing the research program of the department by (a) continuing strong research programs in micrometeorology, trace gas dynamics, remote sensing, agricultural climatology, global change, and climate impacts; (b) initiating programs in ecosystem carbon cycling modeling and bio-environmental meteorology; (c) expanding and improving research facilities and capabilities; and (d) recruiting a strong cadre of graduate students and postdoctoral fellows.

2. Strengthening the academic program of the department by (a) developing new courses, (b) initiating educational programs in bio-environmental meteorology and

ecosystem carbon cycling modeling, (c) offering an undergraduate minor in Bio-Atmospheric Sciences, (d) developing a M.S. degree program, and (e) developing our graduate program to the point that we can eventually offer a Ph.D. degree.

3. Developing a strong departmental outreach effort through (a) participating actively on appropriate extension initiative teams, (b) using outreach programs of various centers to disseminate usable knowledge to resource users and the public, (c) strengthening programs in K-12 education, (d) initiating and enhancing programs directed toward rural and urban communities in Nebraska and the surrounding region, and (e) taking advantage of appropriate technology to deliver departmental programs and information.

Input from the review team on these objectives and our implementation plans will help establish priorities and develop a framework for departmental programs during the next four to five years. Specifically, the reviewers' recommendations will be helpful to the department for seeking funds to address priority programs, directing and redirecting departmental resources, determining shifts in faculty FTEs to address the main issues, and maintaining relevant scientific and scholarly programs to ensure a strong national and international reputation.

Review Planning

The last comprehensive review of this department was conducted in September 1989. At that time, several recommendations were made. The department has responded to many of these recommendations, as discussed in section 3.

Since the last comprehensive review the department has held at least two half-day planning retreats each year to evaluate current programs, set future goals and objectives, and develop action plans. Much of the impetus for this planning has come from the strategic planning process under the direction of the Vice Chancellor for the Institute of Agriculture and Natural Resources (IANR). (See section 10 for copies of IANR Strategic Plans.) The department developed action plans as part of the strategic planning effort in 1992 and has recently submitted action plans for 1995-1999. Copies of these plans are in section 10.

Formal planning for the 1995 comprehensive review began with three half-day planning sessions in April 1994, followed by a two-day retreat in November 1994 and eight two-hour meetings in April, May, June, and July 1995. All faculty in the department have participated in these planning meetings and, in addition, have spent countless hours in reviewing and discussing materials for this report. Input was also sought from students and staff. Leadership responsibilities for preparing the sections on research, academic and outreach were given to Shashi Verma, Albert Weiss, and Kenneth Hubbard, respectively. Elizabeth Walter-Shea prepared material on international activities and programs. The directors of each center housed in the department prepared brief center descriptions. The remainder of the self-study document was prepared by Blaine Blad.

Appreciation is expressed to all members of the department for their insights, suggestions, and dedicated assistance in preparing for this review. We take this task seriously and expect the entire process to be meaningful and worthwhile.

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Faculty Personnel

Name	Rank	%FTE	Institution/ Degree	Years in Dept.
Blad, Blaine L.	Head and Professor	Administration (0.60) Research (0.32) Teaching (0.04) Extension (0.04)	University of Minnesota, Ph.D., 1970	25 years
Easterling, William E.	Associate Professor	Administration (0.25) Research (0.60) Extension (0.15)	University of North Carolina, Ph.D., 1984	4 years
Hayes, Michael J.	Assistant Professor (Special Appointment)	Research (0.60) Scholarly Service (0.40)	University of Missouri-Columbia, Ph.D., 1994	2 months
Hubbard, Kenneth J.	Professor	Research (0.50) Teaching (0.10) Extension (0.20) Scholarly Service (0.20)	Utah State University, Ph.D., 1981	14 years
Meyer, Steven J.	Assistant Professor (Special Appointment)	Research (0.50) Extension (0.50)	University of Nebraska-Lincoln, Ph.D., 1990	5 years
Stooksbury, David E.	Assistant Professor (Special Appointment)	Research (0.40) Scholarly Service (0.60)	University of Virginia, Ph.D., 1992	2 years
Verma, Shashi B.	Professor	Research (0.85) Teaching (0.15)	Colorado State University, Ph.D., 1971	23 years
Walter-Shea, Elizabeth A.	Associate Professor	Research (0.85) Teaching (0.15)	University of Nebraska-Lincoln, Ph.D., 1987	6 years
Weiss, Albert	Professor	Research (0.70) Teaching (0.15) Extension (0.15)	Cornell University, Ph.D., 1975	21 years
Wilhite, Donald A.	Professor	Research (0.50) Teaching (0.15) Scholarly Service (0.35)	University of Nebraska-Lincoln, Ph.D., 1975	18 years

Short Biosketches of Faculty

For more information see faculty vitae in section 10.

Blaine L. Blad, Head and Professor; and Associate Director, Great Plains Regional Center for Global Environmental Change. Dr. Blad team-teaches Microclimate and the Biological Environment. His research interests are radiation and energy balance, atmosphere-biosphere interactions, evapotranspiration, water use efficiency, remote sensing of shortwave and longwave spectral radiation interactions with earth's surface, and global environmental change.

William E. Easterling, Associate Professor; and Director, Great Plains Regional Center for Global Environmental Change. Dr. Easterling team-teaches Agricultural Climatology. His research interests are the interaction of greenhouse gas-induced global warming with systems of natural resources, especially agriculture, in regions of environmental stress like the Great Plains. In addition to directing the Great Plains Regional Center for Global Environmental Change, Dr. Easterling has an active extension program providing outreach to agriculturalists in Nebraska on the risks associated with possible climate change.

Michael J. Hayes, Assistant Professor and Climate Impact Specialist. Dr. Hayes conducts research on drought mitigation technologies, including the development of new climate monitoring tools. He is also evaluating existing drought plans and the effectiveness of recent drought response efforts of government. Dr. Hayes works with a diverse clientele on the development and delivery of new drought information products for the Drought Mitigation Information System.

Kenneth G. Hubbard, Professor; and Director, High Plains Climate Center. Dr. Hubbard teaches Bio-Atmospheric Instrumentation. His monitoring of the region's weather and electronic dissemination of information via on-line computer brings clients into contact with climate products more than a million times per year. Dr. Hubbard's research interests are using models and field data to investigate climate sensitivities.

Steven J. Meyer, Assistant Professor. Dr. Meyer's research interests include assessing climate's impact on crop development and yield, and relating climatic probabilities to agricultural decision making. He is also working to enhance public awareness of climate's role in Nebraska's agricultural and natural ecosystems, particularly for elementary and secondary students.

David E. Stooksbury, Assistant Professor. Dr. Stooksbury's major research interest is climate impact on environmental, agricultural, and economic systems. He is developing a research and service program in climatological aspects of wind and solar energy potentials in Nebraska and surrounding states. He is also using the methods of synoptic climatology and multivariate statistics to investigate the climate of the High Plains.

Shashi B. Verma, Professor; and Co-Director, Center for Laser-Analytical Studies of Trace Gas Dynamics. Dr. Verma teaches Turbulent Transfer in the Atmospheric Surface Layer and team-teaches Microclimate and the Biological Environment. He conducts research in the areas of

micrometeorology; energy and mass exchanges; fluxes of atmospheric trace gases; and the development of state-of-the-art micrometeorological eddy correlation instrumentation.

Elizabeth A. Walter-Shea, Associate Professor. Dr. Walter-Shea teaches Radiative Transfer in Vegetation and team-teaches Microclimate and the Biological Environment. Her research interests are in the interactions of solar radiation with vegetative components and underlying surfaces and in applying canopy radiative transfer models and remote sensing techniques to estimating land-surface processes.

Albert Weiss, Professor. Dr. Weiss teaches Crop Growth and Yield Modeling and team-teaches Agricultural Climatology. He has a leadership role in the IANR's Ag Briefings - Climate Subcommittee which provides weekly climate updates during the growing season to faculty, staff, and the media. His research interests include the use of crop modeling techniques to study the interaction of microclimate and plant pests.

Donald A. Wilhite, Professor; and Director, International Drought Information Center and National Drought Mitigation Center. Dr. Wilhite teaches the course Climate and Society. He conducts research on drought management and planning techniques, climate impacts, and climate policy interactions. He has worked on the state, regional, national, and international levels to foster drought management and preparedness.

Interrelationships with Others

The department has a history of working with colleagues from a wide range of disciplines within the University of Nebraska and with scientists from other states and nations. The number of centers housed within the department is a strong indicator of the level of interaction between faculty in the department and their colleagues. Information on these centers is given in section 8. Collaboration with scientists from outside the University is given in the research part of this document (section 4).

Each faculty member in the department is currently collaborating with scientists from other units within the University of Nebraska as listed below. The list is by no means exhaustive, but does reflect our extensive interactions.

Blaine Blad: Garald Horst, Horticulture; Don Rundquist, Conservation and Survey Division.

William Easterling: James Brandle, Fisheries, Forestry and Wildlife; Michele Schoeneberger, Fisheries, Forestry and Wildlife.

Kenneth Hubbard: Terrance Kayes, Fisheries, Forestry and Wildlife; Dermot Coyne, Horticulture.

Steve Meyer: David Gosselin, Conservation and Survey Division; Drew Lyons, Panhandle Research and Extension Center.

David Stooksbury: Bing Chen, Electronics Engineering Technology, UNO; Anne Parkhurst, Biometry.

Shashi Verma: Frank Ullman, Electrical Engineering; Tim Arkebauer, Agronomy.

Elizabeth Walter-Shea: Ram Narayanan, Electrical Engineering; Lee Lauderback, Chemical Engineering.

Albert Weiss: Kent Eskridge, Biometry; Stephen Baenziger, Agronomy.

Donald Wilhite: Charles Francis, Agronomy; James Merchant, Conservation and Survey Division.

Units within the University of Nebraska with which Agricultural Meteorology has significant interactions include the following: Agronomy; Biological Systems Engineering; Biometry; Chemical Engineering; Civil Engineering; Conservation and Survey Division; Electrical Engineering; Entomology; Fisheries, Forestry and Wildlife; Geography; Horticulture; Plant Pathology; Water Center, Center for Sustainable Agriculture and the Center for Grassland Studies. We also work with faculty at the West Central, South Central, Panhandle, Northeast, and Southeast Nebraska Research and Extension Centers.

Courtesy and Adjunct Appointments

The following individuals have courtesy or adjunct appointments in our department.

Michael H. Glantz and **Linda O. Mearns** - National Center for Atmospheric Research, Boulder, CO

Joon Kim - Yonsei University, Seoul, Korea

Mark R. Anderson, **Kenneth F. Dewey**, **Michael A. Palecki**, and **Clinton M. Rowe** - Department of Geography

Timothy J. Arkebauer - Department of Agronomy

LeRoy Hahn - USDA Meat Animal Research Center

James W. Merchant and **Donald C. Rundquist** - Conservation & Survey Division

Departmental Changes in the Past Five Years

Since the last review a number of changes have occurred within the department. Many changes are in response to the recommendations made by the review team in 1989. (A copy of the report of the 1989 review team and a memo from the department in response to that report are provided in section 10.) Specifically, the department has:

1. Hired Dr. William Easterling in 1991 to develop a program in global environmental change and created the Great Plains Regional Center for Global Environmental Change (GPRC) under the leadership of Dr. Easterling. Jan Schinstock was hired as project assistant. The research technologist position filled by Cynthia Hays was redirected to assist Dr. Easterling in his research program.

2. Developed the Center for Laser-Analytical Studies of Trace Gas Dynamics under the leadership of Dr. Shashi Verma and Dr. Frank Ullman from the Department of Electrical Engineering. This center has been highly successful in securing funds to support several research projects.

3. Established the National Drought Mitigation Center (NDMC) under the leadership of Dr. Donald Wilhite. Funds have enabled us to hire Michael Hayes, Kelly Smith, Mark Svoboda and Vicki Wilcox to work for the center.

4. Hired four assistant professors on special appointments using external funds to support departmental programs and programs of various centers. These new faculty are Drs. Steven Meyer and David Stooksbury with the High Plains Climate Center (HPCC), Dr. Joon Kim (recently left to accept a faculty position at Yonsei University in Seoul, South Korea) with the Center for Laser-Analytical Studies of Trace Gas Dynamics (CLAS), and Dr. Michael Hayes, recently hired to work with the National Drought Mitigation Center (NDMC). In addition to these faculty positions, we added 4.5 new technical support positions (one position was terminated July 1, 1995) and 1.5 new office support positions.

5. Revised several courses and added new courses to strengthen our academic programs. The following courses were revised: AMET 408/808, Microclimate: The Biological Environment; AMET 907, Agricultural Climatology; and AMET 908, previously Micrometeorology of the Biological Environment - Advanced Topics, now Solar Radiation Interactions at the Earth's Surface. The following new courses have been added: AMET 450/850, Climate and Society; AMET 469/869, Bio-Atmospheric Instrumentation; AMET 496/896, Independent Study in Agricultural Meteorology; AMET 906, Crop Growth and Yield Modeling; and AMET 909, Seminar in Agricultural Meteorology. Some minor adjustments in FTEs have been made to accommodate these changes. We have appointed a recruitment coordinator from among the faculty to strengthen our student recruitment efforts. We have recently received funds from the Agricultural Research Division to support a graduate research assistantship.

6. Renovated space to help accommodate new faculty, staff, and students. Working cooperatively with Biological Systems Engineering (BSE), we have renovated Room 14 in Chase Hall and changed it from a drafting room to office space for three assistant professors and two research technologists. Minor renovations were made in Room 20 to provide office space for a project assistant and secretary. Room 202 of the Biological Systems Engineering Laboratory (BSEL) was changed to provide office space for graduate students. Funding was recently secured from NSF and the University to renovate space in the basement of Chase Hall to create five research laboratories to be shared with BSE. We have substantially increased our computing resources since the last review and have networked departmental computers and provided linkages to the IANR and UNL computing facilities. Secured temporary laboratory space in BSEL for Dr. Walter-Shea's research.

7. Increased departmental resources through external funding. Since the last review, we have suffered a series of budget reductions from state allocations. We have dealt with these reductions primarily by taking a portion of salaries for support staff and transferring those charges to non-appropriated sources such as grants, overhead return or revolving funds. We have significantly increased the amount of money from external sources.

8. Increased the FTE and amount of effort devoted to outreach programs. Since the last review we have become involved in various K-12 educational programs and have significantly improved our efforts and ability to make climate information readily available to the public.

Responses to Specific Recommendations of 1989 Review Team

Research Recommendations (see pages 7, 8 of 1989 report)

1. Enlarge departmental staff.

2. Provide additional offices, laboratories, computer facilities and storage.

3. Use global change as a unifying theme to enlarge expertise in micrometeorology and applied climatology and seek to establish a Center of Atmospheric and Environmental Change for the High Plains.

4. Develop strong program of climate information services for Nebraska with near-real time information system.

5. Require thesis research proposals, provide research management and grantsmanship workshops, and provide teaching experiences for graduate students.

Actions on Research Recommendations

1. Primarily through the use of external funds, we have added 4 new research assistant professor positions, 4.5 new technical support positions and 1.5 new office support positions (see #4 in previous section).

2. The department has renovated space to provide offices for 7 faculty and staff, developed office space for graduate students, expanded computer capabilities, and acquired storage space in Chase Hall, the Engineering Annex, and the old Judging Pavilion. Received NSF funding for renovation in Chase Hall which will provide additional office space, research laboratories, and enhanced computer facilities (see #6 in previous section).

3. We have established two centers that address global change theme: the Center for Laser-Analytical Studies of Trace Gas Dynamics and Great Plains Regional Center for Global Environmental Change, mentioned in #1 and 2 in the previous section and described in detail in section 9, Departmental Centers.

4. With support from the High Plains Climate Center, the department has recently improved its ability to provide climate information to clientele in near-real time (see additional information in section 7 and section 9 of this report). The number of near-real time weather stations has increased to 130, effectively covering the state and the high plains region. The National Drought Mitigation Center is currently creating a drought information system to serve as an electronic, interactive national information clearinghouse.

5. All graduate students now prepare formal thesis research proposals. The department has not offered workshops on research management and grantsmanship, but some informal training is given and the College of Agricultural Sciences and Natural Resources offers courses that address some of these needs. We have provided limited teaching experiences for our graduate students.

Teaching Recommendations (see pages 8, 9 of 1989 report)

1. Hold faculty retreats to consider curricula, teaching responsibilities, graduate advisees, and opportunities to work with the Geography Department.

2. Develop course on biometeorological instrumentation, relieve Kenneth Hubbard of duties of State Climatologist.

3. Teach Climate and Society course in cooperation with the Geography Department.

4. Incorporate the proposed Crop Modeling course into the Plant-Water Relationships course.

5. Do not develop an Animal Biometeorology course.

6. Offer the Agricultural Climatology course on yearly basis.

7. Reduce the department head's commitment for research to allow more time for planning.

8. Develop a new undergraduate course in plant canopy meteorology.

9. Cross-list some undergraduate Geography courses to develop a minor in agricultural meteorology.

10. Identify non-AgMet courses for students to incorporate into programs.

11. Develop an undergraduate minor but not a major, and institute M.S. and Ph.D. degree programs.

Actions on Teaching Recommendations

1. The department has held several retreats. As a result of these discussions, we made several changes in curriculum, altered appointments to accommodate teaching responsibilities and improved our advising of graduate students. We have had four or five discussion sessions with Geography Department about developing more departmental interactions.

2. Allen Dutcher has replaced Kenneth Hubbard as State Climatologist. Kenneth Hubbard has developed and taught a course on biometeorological instrumentation, now officially designated AMET 469/869 Bio-Atmospheric Instrumentation.

3. Donald Wilhite is teaching the Climate and Society course, but we have not enlisted the help of a faculty member from the Geography Department to help teach the course.

4. Materials covered in the proposed Crop Modeling course were sufficient to develop a stand-alone course without incorporation into the Plant-Water Relationship course. Much of the material for the Crop Modeling course was not compatible with that course.

5. We did not develop the Animal Biometeorology course.

6. Drs. Albert Weiss and William Easterling made major revisions in the Agricultural Climatology course, but demand is not yet sufficient to justify offering it every year.

7. The department head has reduced time and commitment to research to provide more time for planning and carrying out plans.

8. Materials for a course similar to the suggested Plant Canopy Meteorology course have been put together, but the course has not yet been submitted for approval.

9. We are working on course requirements for an undergraduate minor in Agricultural Meteorology, but it may not require cross-listing any Geography courses. The minor will require some courses taught in the Geography Department.

10. A list of non-AgMet courses is provided to all prospective graduate students.

11. We plan to offer an undergraduate minor and a M.S. degree, but are not yet in a position to offer a Ph.D. degree.

Extension Recommendations (see page 10 of 1989 report)

1. Develop a departmental plan.

2. Adjust faculty focus to bolster extension efforts.

3. Encourage linkages with Extension Service specialists in other IANR departments and centers.

4. Complete conversion of weather-related AGNET products to new dial-up system.

5. Develop a cost recovery and/or funding plan.

Actions on Extension Recommendations

1. We have spent several retreats discussing the role of the department in extension activities. We are continuing development of a well-coordinated and well-rounded extension plan.

2. We have added FTE in extension with the hiring of Drs. Easterling and Meyer and have adjusted FTE of Drs. Hubbard and Weiss. The net result is a bolstered effort in extension.

3. We have made some progress in establishing linkages with other IANR specialists, but we need to participate more actively on extension priority initiative teams.

4. All weather-related AGNET products were converted to a new dial-up system and, since this conversion, we have made significant improvements in the dial-up system.

5. We have developed and implemented cost recovery plans.

Other Suggestions (see page 10 of 1989 report)

1. Reallocate funds administered through the Conservation and Survey Division to Agricultural Meteorology.

2. Have faculty peers review grant proposals of faculty members.

Action on Other Suggestions

1. Funds were reallocated and are now part of the Agricultural Meteorology budgeted resources.

2. Individual faculty members review grant proposals on a routine basis.

Issues

The department wishes to obtain feedback from the review panel on the issues described below.

1. Name Change. After considerable discussion, members of the department have unanimously recommended a change of the department's name to Bio-Atmospheric Sciences. Agricultural Meteorology describes only about 30-50% of the activities of members of the department. We have greatly expanded our efforts in the past few years to research in ecosystems other than agricultural and to working on issues that are not agricultural in nature. Much of our time and resources are directed toward work in non-agricultural ecosystems such as: grasslands, wetlands, and boreal forests. We likewise deal with the impacts of climate variability and change on many aspects of society, including agriculture. We are especially concerned with the impacts of climate and climatic events on our natural resources. Does the review team support this name for our department? Should we consider other names and, if so, we welcome your suggestions.

2. Academic Changes. For almost a decade the department has discussed the need and desirability of offering its own graduate degree program. For various reasons our goal to establish a graduate degree program has never been accomplished. We have significantly increased the number of courses offered in the department in the past five years and we propose adding at least two additional courses. This, we believe, puts us in a stronger position to offer graduate degrees. Should we develop these two new courses given the current constraints on faculty who might take the major roles in developing these courses? Should the department offer an undergraduate minor in Bio-Atmospheric Sciences? Should we develop an M.S. degree program? Should we plan to develop a Ph.D. program given that our Ph.D. students can now pursue a degree in agronomy with an area of emphasis in Agricultural Meteorology. What can we do to increase the likelihood that we will have a Ph.D. program in the department in the future?

3. New Program Areas. The department has identified two program areas that we believe would enhance and strengthen programs in the department and/or bring expertise that we currently lack to address some important issues related to bio-atmospheric processes. One area is bio-environmental meteorology. This program would focus on determining and understanding the movement of chemicals, trace gases and other materials in the biosphere as they are influenced by the atmospheric environment. The second area would be a program in ecosystem carbon balance modeling. This latter program would provide expertise to complement current programs within the department, especially those in trace gas dynamics and global environmental change. Both programs would require new resources. Are these important and fruitful areas for development in the department? Should we strengthen current programs before expanding into these new areas? What suggestions can the panel offer about potential funding sources for these programs?

4. Space and Facilities. Through excellent cooperation from BSE the department has made progress in improving its facilities and increasing the amount of space it controls. Further improvements are being made. However, not much more can be done in Chase Hall to help alleviate our overcrowded conditions and to bring together faculty, staff, and students into one building. The potential long-term solutions are either construction of a new facility such as the

proposed Natural Resources Building or the relocation of the department into other space such as the former Biochemistry building. The former Biochemistry building needs extensive renovation before relocation would be feasible. We welcome any comments and suggestions from the panel regarding our space and facilities. We would, likewise, appreciate comments and suggestions that the panel might make regarding the adequacy of our research, teaching, and outreach facilities.

5. Outreach Programs. The department has expanded its programs in the extension/ scholarly service area since the last review. We are in the process of developing a well-coordinated program in outreach. We are expanding our efforts in K-12 education and in programs to address the needs of urban audiences. We have likewise given attention to the area of renewable resources such as wind and solar energy and water conservation in urban environments. Most centers within the department have or are developing outreach programs to help the centers carry out their mission. In doing so, these center programs will be strongly supportive of and complimentary to the department's outreach efforts. Are the proposed areas of emphasis appropriate? Are there gaps in our extension/scholarly service programs that we should be addressing? Are we making adequate use of modern communication technologies or should we expand our efforts in this area?

6. International Activities. The department has been and will continue to be active in international activities. We could have greater involvement than we currently have (various opportunities arise but are declined) but, considering our current commitments, we do not foresee any major redirection of efforts into international programs. We would appreciate any insights from the review team relative to the desirability of increasing the number of foreign graduate students in our department and working with various international agencies. Should we play a greater role in training foreign scientists? How active should we be in pursuing working relationships with academic institutions in other nations?

Background

Nebraska Agriculture

Nebraska is a leading agricultural state in both production and agribusiness. A map of the state is given in Fig. 1. Of the almost 48 million acres of land used for agriculture in Nebraska, about 18 million acres are in cropland and 30 million are in rangeland. Nebraska is second only to California in irrigated farm land with 8.5 million acres. In 1990, Nebraska ranked fourth in the nation in farm income behind California, Texas, and Iowa; eighth in cash receipts from crops; and second only to Texas in receipts from livestock and animal products. Approximately two-thirds of Nebraska's farm income is from livestock and animal products and one-third from crops. Table 1 gives the ranking of Nebraska in the nation for a number of agricultural commodities.

Agriculture will continue to dominate the state's economy. About one of every two Nebraskans are dependent upon agriculture for their employment. About 96% of the land in Nebraska is privately owned and most of it is used in some way for production agriculture. The main crops in Nebraska are corn, alfalfa, soybeans, sorghum, wheat, rye, oats, barley, sugar beets, and dry edible beans. Nebraska is attempting to diversify with alternative commodities like fruits, aquaculture, honey, nuts, milkweed, potatoes, vegetables, amaranth, crambe, and sunflower. Nebraska has a major opportunity to add value to our commodities rather than selling raw products. About one-third of Nebraska's crop production is exported.

Table 1.

Nebraska's National Rank In Agriculture*

Rank:

1st	Commercial cattle slaughter (live weight), 1992, 3,904,167 tons and 6,582,500 animals
1st	Alfalfa meal production, 1992, 225,200 tons; and great northern beans production, 63,500 tons
2nd	Cash receipts from cattle and calves, 1991, $4,783,085,000
2nd	Cash receipts from all livestock marketings, 1991, $5,933,608,000; and commercial livestock slaughter, all species, 1992, 4,625,814 tons
2nd	Sorghum silage production, 1992, 1,170,000 tons; and hay production, 8,023,000 tons
3rd	Corn production, 1992, 1,066,500,000 bushels; sorghum, 143,820,000 bushels; and pinto beans, 50,400 tons
4th	All dry edible beans production, 1992, 126,250 tons; rye, 1,040,000 bushels
4th	Cash receipts from hogs and pigs, 1991, $878,134,000
5th	Value of farmland and buildings, January 1, 1992, $26,790,000,000
6th	Oats production, 1992, 15,400,000 bushels
7th	Sugar beets production, 1992, 1,387,000 tons

Rank:

8th	Soybean production, 1992, 103,320,000 bushels
10th	Winter wheat production, 1992, 55,500,000 bushels
15th	All potato production, 1992, 164,900 tons
20th	Barley production, 1992, 1,500,000 bushels

* Source: 1992-93 Nebraska Agricultural Statistics, Nebraska Department of Agriculture

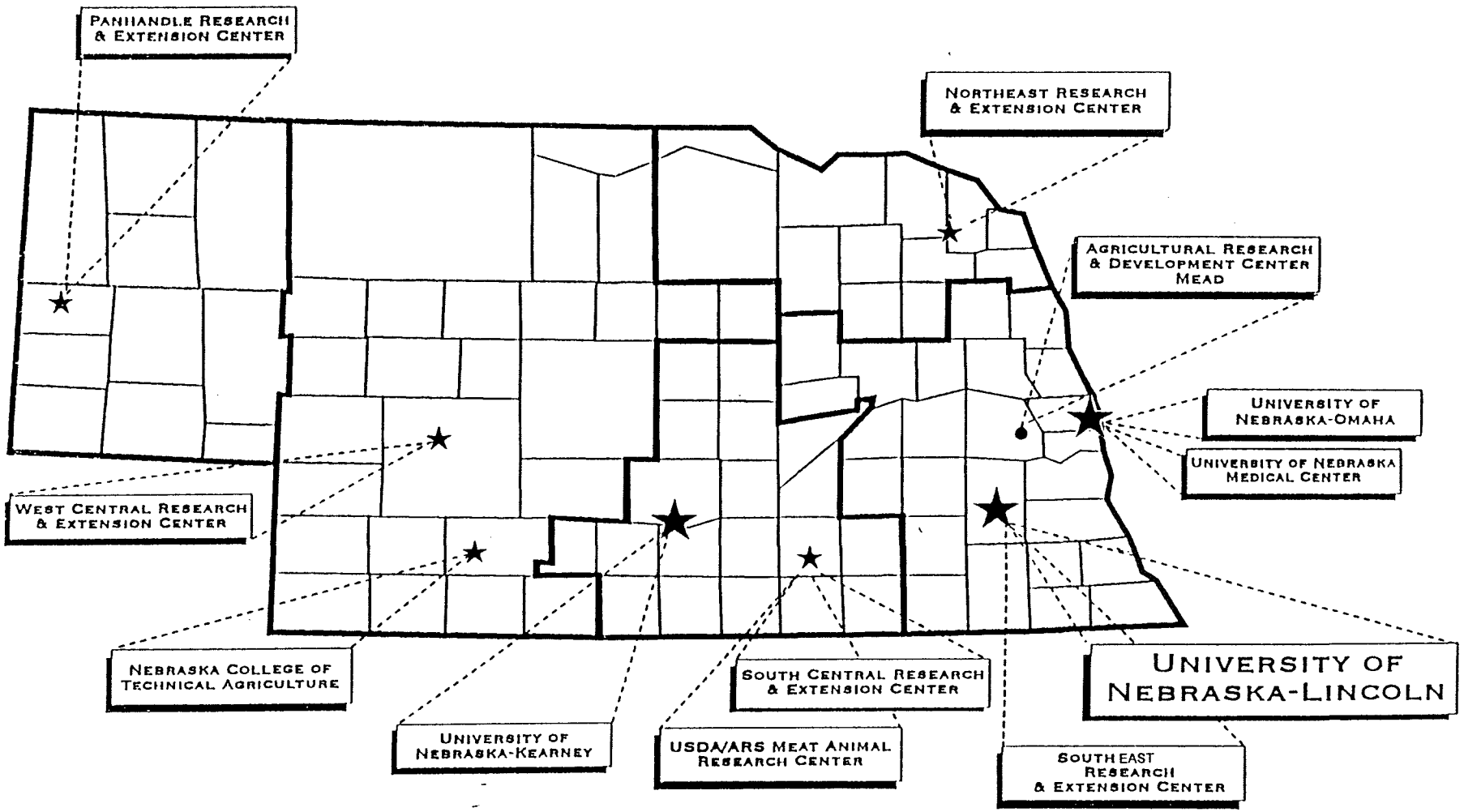


Figure 1. Location of University of Nebraska Campuses, Research and Extension Centers with district boundaries for each Center indicated, and other IANR extended campus sites.

Administrative Structure

University of Nebraska

The University of Nebraska consists of four components, the University of Nebraska-Lincoln (UNL), the University of Nebraska-Omaha (UNO), the University of Nebraska-Kearney (UNK), and the University of Nebraska Medical Center-Omaha (UNMC). This system is governed by an elected Board of Regents representing eight geographical districts in the state. The chief executive officer for the entire system is the president. Each of the four components of the university is headed by a chancellor. This structure and the present offices of the university system are given in Figure 2.

Institute of Agriculture and Natural Resources

The Institute of Agriculture and Natural Resources (IANR) is a separate component of the University of Nebraska-Lincoln and is headed by a vice chancellor. The position is unique in the university in that the incumbent also serves as a vice president of the University of Nebraska (see Figure 2). Three divisions of the institute of major importance to the department are: the Agricultural Research Division, the College of Agricultural Sciences and Natural Resources, and the Cooperative Extension Division. Each is headed by a dean. Three other divisions, headed by deans or directors, are the College of Human Resources and Family Services, the Conservation and Survey Division, and International Programs. Our department is one of 17 academic departments within IANR. Fourteen interdisciplinary centers and programs are administered within IANR by directors. The administrative structure and the present officers are presented in Figure 3. Also listed in Figure 3 are the extended campus locations administered by the IANR vice chancellor. Academic departments are administered by heads who report to respective deans for each program represented in the department (see Figure 4). Thus, the head of Agricultural Meteorology reports to Dean Donald Edwards for teaching, Dean Darrell Nelson for research, and Dean Kenneth Bolen for extension.

Research and Extension Centers

IANR pioneered the concept of subdividing the state into districts based on cropping patterns and population centers and established a research and extension center within each district. The location of each center is indicated on the state map in Figure 1.

The Panhandle Research and Extension Center (PHREC) is located in Scottsbluff and serves the 11 counties in western Nebraska. Major agricultural production in this district includes corn, wheat, dry edible beans, sugar beets, commercial vegetables (potatoes and onions), range, alfalfa hay, and livestock. *The West Central Research and Extension Center (WCREC)* at North Platte serves 26 counties bordered by South Dakota, Colorado, and Kansas. Cattle, hogs, range, alfalfa hay, corn, wheat, sorghum, soybeans and dry edible beans are major agricultural commodities in this district, which has a combination of dryland and irrigated agriculture. *The Northeast Research and Extension Center (NEREC)* serves the 12 counties bordered by South

Dakota and Iowa and is located at Concord. Major agricultural production in this district includes corn, soybeans, sorghum, oats, barley, commercial vegetables, alfalfa hay, dairy, beef cattle, and hogs. *The South Central Research and Extension Center (SCREC)* at Clay Center is located with the USDA/ARS Meat Animal Research Center. The center serves 19 south central counties along the Kansas border. In this district, major production comes from corn, sorghum, soybeans, wheat, commercial vegetables, alfalfa hay, beef cattle and hogs. *The Southeast Research and Extension Center (SEREC)* on campus in Lincoln serves 25 counties bordered by Iowa, Missouri, and Kansas. The center also serves the metro areas of Omaha and Lincoln. Corn, sorghum, soybeans, alfalfa hay, commercial fruit and vegetables, cattle, and hogs are the primary agricultural commodities.

Department of Agricultural Meteorology

The department is administered by a head reporting to three deans as shown in Figure 4. The various activities and programs of the department are administered by standing committees. Committee assignments for 1995-96 are given on page 31.

Figure 2.

University of Nebraska Administrative Structure

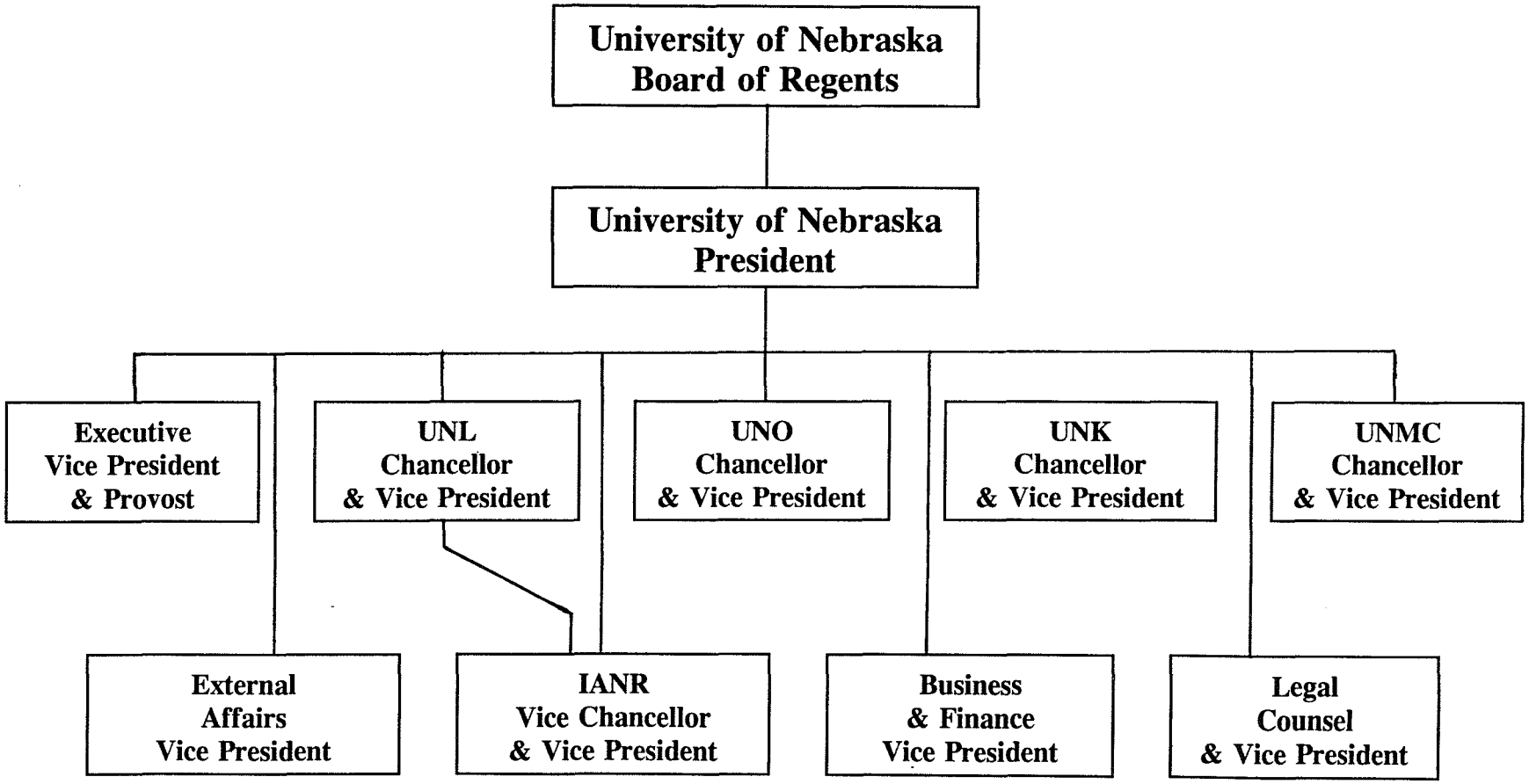
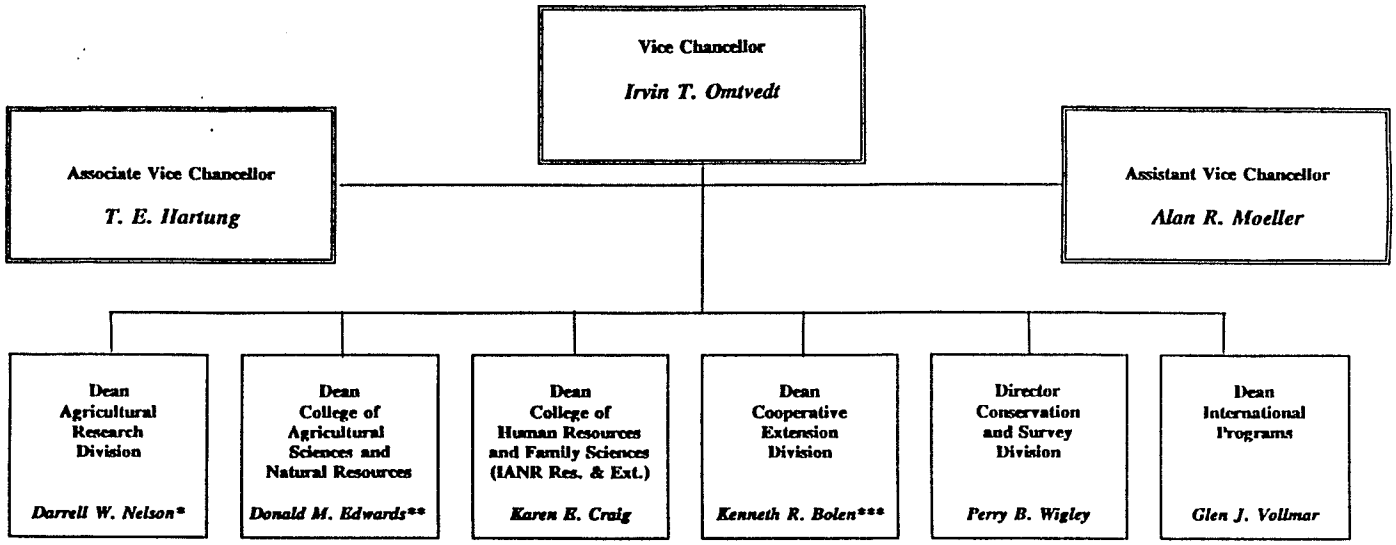


Figure 3.

Institute of Agriculture and Natural Resources Administrative Structure



* *Director of Agricultural Experiment Station*
** *Dean of Nebraska College of Technical Agriculture*
*** *Director of Cooperative Extension*

IANR ADMINISTRATIVE UNITS

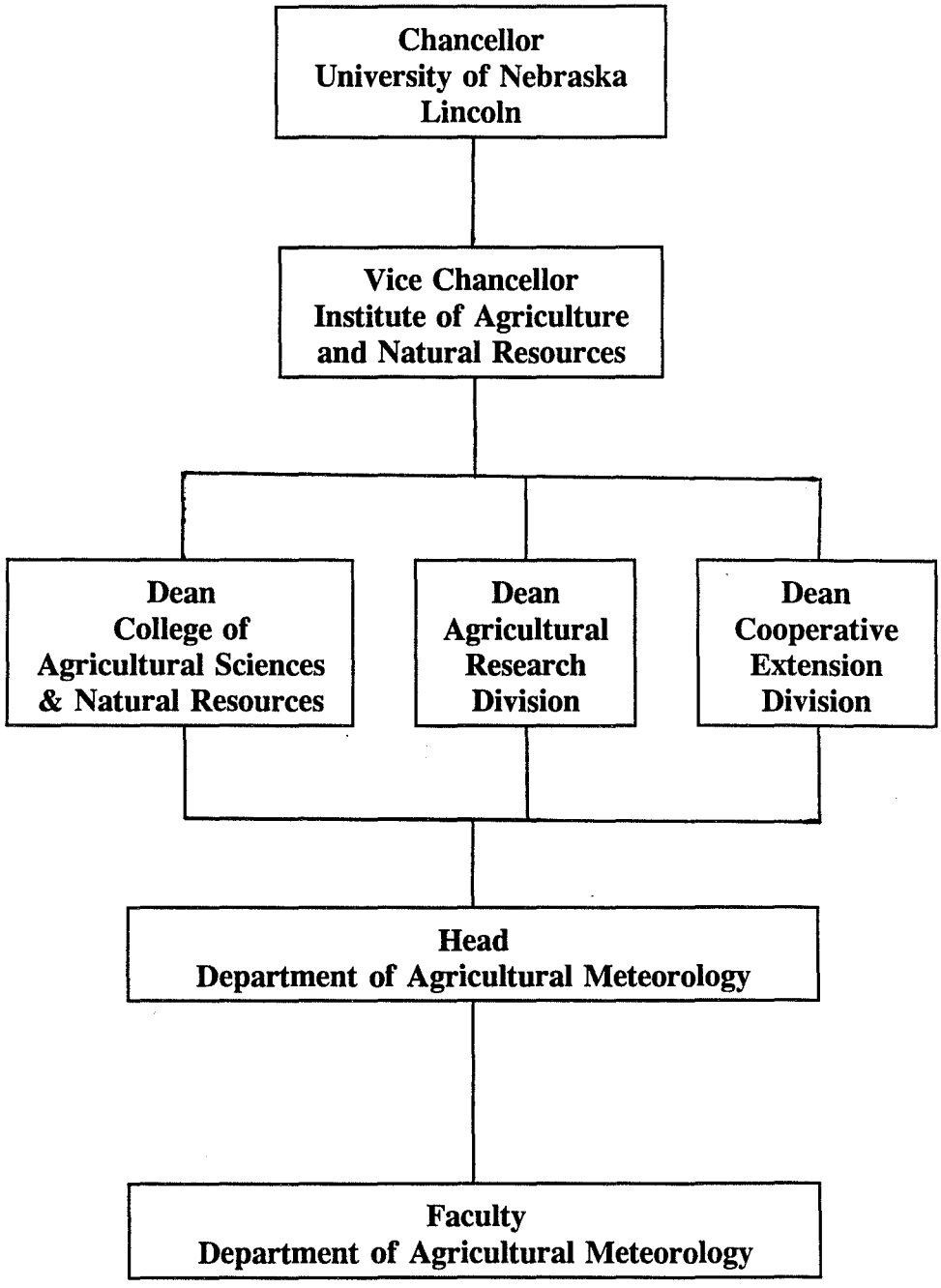
ACADEMIC DEPARTMENTS	INTERDISCIPLINARY CENTERS AND PROGRAMS	PRIMARY EXTENDED CAMPUS LOCATIONS
AGRICULTURAL ECONOMICS *Gary D. Lynne*	CENTER FOR ADVANCED LAND MANAGEMENT INFORMATION TECHNOLOGIES (CALMIT) *Donald Rundquist*	AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER – Ithaca *Dan Duncan*
AGRICULTURAL LEADERSHIP, EDUCATION & COMMUNICATION *Earl B. Russell*	CENTER FOR BIOLOGICAL CHEMISTRY *Marion H. O'Leary*	NEBRASKA COLLEGE OF TECHNICAL AGRICULTURE – Curtis *Don A. Woodburn*
AGRICULTURAL METEOROLOGY *Blaine L. Blad*	CENTER FOR BIOTECHNOLOGY *Donald P. Weeks*	NORTHEAST RESEARCH AND EXTENSION CENTER – Concord *Robert D. Fritschen*
AGRONOMY *P. Stephen Baenziger (1-1-96, Ken Cassman)*	CENTER FOR GRASSLAND STUDIES *Martin A. Massengale*	PANHANDLE RESEARCH AND EXTENSION CENTER – Scottsbluff *Charles A. Hibberd*
ANIMAL SCIENCE *Elton D. Aberle*	CENTER FOR LEADERSHIP DEVELOPMENT *Allen G. Blazek*	SOUTH CENTRAL RESEARCH AND EXTENSION CENTER – Clay Center *Charles L. Stonecipher*
BIOCHEMISTRY *Marion H. O'Leary*	CENTER FOR RURAL COMMUNITY REVITALIZATION & DEVELOPMENT *Sam M. Cordes*	SOUTHEAST RESEARCH AND EXTENSION CENTER – Lincoln *Randy Cantrell*
BIOLOGICAL SYSTEMS ENGINEERING *Glenn J. Hoffman*	CENTER FOR SUSTAINABLE AGRICULTURAL SYSTEMS *Charles A. Francis*	WEST CENTRAL RESEARCH AND EXTENSION CENTER – North Platte *Pete Jacoby*
BIOMETRY *David B. Marx*	CENTER FOR WATER AND ENVIRONMENTAL PROGRAMS *Bob G. Volk*	
ENTOMOLOGY *Sharron Quisenberry*	COMMUNICATIONS AND COMPUTING SERVICES *T. E. Hartung*	
FAMILY AND CONSUMER SCIENCES* *Shirley Baugher*	FOOD PROCESSING CENTER *Stephen L. Taylor*	
FOOD SCIENCE & TECHNOLOGY *Stephen L. Taylor*	GREAT PLAINS REGIONAL CENTER FOR GLOBAL ENVIRONMENTAL CHANGE *William Easterling*	
FORESTRY, FISHERIES & WILDLIFE *Gary L. Hergenrader*	INDUSTRIAL AGRICULTURAL PRODUCTS CENTER *Milford A. Hanna*	
HORTICULTURE *Paul E. Read*	NEBRASKA FOREST SERVICE *Gary L. Hergenrader*	
NUTRITIONAL SCIENCE & DIETETICS* *Marilynn Schnepf*	NEBRASKA STATEWIDE ARBORETUM *James Locklear*	
PLANT PATHOLOGY *Anne K. Vidaver*		
TEXTILES, CLOTHING & DESIGN* *Rita C. Kean*		
VETERINARY & BIOMEDICAL SCIENCES *John A. Schmitz*		

September 1, 1995

*Includes only extension and research programs in IANR.

Figure 4.

Department of Agricultural Meteorology Administrative Structure



Department Committees

July 1995 to July 1996

GRADUATE - Ken Hubbard, Chair
Albert Weiss, William Easterling

RECRUITMENT - Albert Weiss, Chair
Elizabeth Walter-Shea, David Stooksbury

SEMINAR - David Stooksbury, Chair
Michael Hayes

PROMOTION AND TENURE - Shashi Verma, Chair
Kenneth Hubbard, Albert Weiss, Donald Wilhite

SOCIAL - Elizabeth Walter-Shea, Chair
Steven Meyer

FACILITIES - Blaine Blad, Chair
Donald Wilhite, Kenneth Hubbard

Reward Policies and Procedures and Evaluation Process

Personnel in the department have generally received modest increases in salaries ranging between 1.5% and 4.0% annually since the last review. Except for one year when salary increases were uniformly applied to everyone, a significant part of the salary pool has been designated for rewarding meritorious performance. In a very few cases, we have been able to obtain additional money to supplement the salaries of those with especially meritorious service, to address issues of inequity, and for promotions. Salary increases must be given in relationship to annual evaluation ratings. The average faculty salaries for the unit for 1990-91 and 1994-95 are compared with other UNL units in Table 2.

Table 2
Average Faculty Salaries and Average Years in Rank
1990-91 and 1994-95

RANK	1990-91								
	Agricultural Meteorology			Overall UNL - Includes Library			Overall UNL - Excludes Library		
	12 Month			12 Month			12 Month		
	No.	Ave. Yrs. in Rank	Ave. Salary	No.	Ave. Yrs. in Rank	Ave. Salary	No.	Ave. Yrs. in Rank	Ave. Salary
Prof.	2	9.5	$77,900	170	11.6	$71,535	165	8.7	$72,028
Assoc.	3	6.0	54,502	131	5.5	47,858	114	5.5	55,226
Assist.	1	1.0	44,703	100	2.6	42,662	81	2.6	46,106

RANK	1994-95								
	Agricultural Meteorology			Overall UNL - Includes Library			Overall UNL - Excludes Library		
	12 Month			12 Month			12 Month		
	No.	Ave. Yrs. in Rank	Ave. Salary	No.	Ave. Yrs. in Rank	Ave. Salary	No.	Ave. Yrs. in Rank	Ave. Salary
Prof.	5	6.4	$75,026	181	9.6	$80,114	175	9.6	$81,002
Assoc.	1	1.0	55,043	134	5.8	57,990	119	5.9	60,234
Assist.	3	2.3	38,074	75	3.6	44,154	57	3.6	48,348

Source: UNL Faculty Salary Study Committee file for above years.

The 1990-91 and 1994-95 Faculty Salary Study files exclude Deans and other administrative salaries and include chairpersons.
Faculty with 1.00 or greater FTE who are active on October 1 and ranked as instructor and above are included. Named Professorship stipends are included.

Every member of the department is evaluated annually. The department head is evaluated by faculty, staff, and the IANR deans, and feedback is provided to the head by the Promotion and Tenure (P&T) Committee and the deans. Each faculty member is evaluated annually by the department head with input from appropriate IANR deans and comments from support staff supervised by the faculty member. The departmental P&T Committee and the head also evaluate all faculty who are not fully promoted and provide faculty with feedback on their progress toward promotion and tenure. They likewise make recommendations to the IANR administration for continued employment. The criteria used for promotion and tenure and the forms used to provide feedback and recommendations are given in section 10. Each support staff member is evaluated by his/her supervisor. In all cases, verbal and written evaluations are provided. The evaluation and reward system works very well and generally leads to improved performance and accurate feedback to faculty and staff. This system generally ensures that there are no surprises at the time when promotion and/or tenure decisions are made.

Financial and Physical Resources

The department receives financial support from state and federal appropriations, regional research project funds, and grants and contracts. The department has been especially successful in securing grant funds; in fact, it is one of the top units in IANR and UNL in terms of the financial support obtained from external funds. The amount of administrative overhead funds returned to the department in recent years has provided operating funds and a significant amount of money for supporting faculty programs.

The total budgeted dollars and the budgeted FTE, (i.e., for tenured or tenure-track positions, for research, teaching, and extension) are summarized in Table 3. The substantial increase in the research budget from 1989-90 to 1990-91 occurred as the result of transfer of money to the department that was administered by Agricultural Meteorology before 1989-90 through the Conservation and Survey Division and as a result of substantial salary increases. The increase in the research and extension budgets that occurred from 1990-91 to 1991-92 reflects the addition of a faculty position (filled by Bill Easterling). Other increases reflect primarily salary increases. The decrease in the research budget from 1992-93 to 1993-94 reflects a budget cut in response to a budget decrease mandated by the Nebraska Legislature.

A summary of money available for operating expenses in the department is given in Table 4. These funds include budgeted funds for research, teaching, and extension; funds available from the three regional research projects in the department; and the return of administrative overhead. A substantial increase in the return of administrative overhead has occurred during the past three years. There are only minor changes in the operating funds in the other categories, with moderate increases in regional research funds and extension funds and a general trend for decreased operating funds in research and teaching the past few years. The department would not have adequate funds to operate without the substantial contribution we receive from the return of overhead money. Increased operating funds from budgeted funds will be needed in the very near future.

Table 3
Department of Agricultural Meteorology
Budgeted Dollars, A-Line FTE for
Research, Teaching and Extension

	Research			Teaching			Extension		
Year	Total Budgeted Dollars	Budgeted A-Line Dollars	Budgeted A-Line FTE	Total Budgeted Dollars	Budgeted A-Line Dollars	Budgeted A-Line FTE	Total Budgeted Dollars	Budgeted A-Line Dollars	Budgeted A-Line FTE
1989-90	442,122	227,039	4.25	39,113	30,484	0.55	51,660	42,737	0.85
1990-91	655,142	305,565	5.10	45,686	34,630	0.55	58,166	45,049	0.85
1991-92	702,354	320,698	5.15	63,968	49,558	0.80	79,136	57,147	1.05
1992-93	719,106	339,453	5.15	65,860	53,070	0.80	85,802	60,912	1.05
1993-94	713,113	347,718	5.15	66,324	54,121	0.80	87,770	63,384	1.05
1994-95	728,238	355,544	5.15	67,818	55,350	0.80	89,950	64,759	1.05

Table 4
Total Appropriated Operating Research, Teaching and Extension Funds,
Regional Research and Return of Administrative Overhead

Year	Research	Teaching	Extension	Regional	Overhead
1989-90	$31,878	$655	$4,030	$38,000	$18,115
1990-91	$43,300	$818	$4,030	$38,000	$28,896
1991-92	$45,700	$818	$6,833	$40,000	$25,638
1992-93	$46,700	$818	$7,175	$44,000	$32,983
1993-94	$42,433	$585	$7,175	$44,000	$43,021
1994-95	$42,433	$584	$7,175	$46,000	$75,172

Performance characteristics for the department and comparisons with other IANR units are detailed in Tables 5-7. The budgeted support per research FTE in fiscal year 1995, compared with the average of all Agricultural Research Division (ARD) units, is presented in Table 5. The total support per FTE in the department is just slightly less than the ARD average. We have above-average support for our managerial/professional positions, but are significantly below average in support for our office/service positions, graduate student assistantships and hourly workers. These apparent imbalances reflect decisions made by the department over the past decade or two and have not caused us any serious difficulties. However, with recent changes regarding support of office personnel that can be charged to grants, we will probably need to secure additional budgeted support for our office staff.

Table 5
Analysis of Fiscal Year 1995 Research Budget
for Agricultural Meteorology Department

Research budget data for **Agricultural Meteorology Department** compared with the average of all units in the Agricultural Research Division for fiscal year 1995. The base data included in the calculations were budgeted faculty and support staff FTE including TBAs, the assigned average budget, regional research funds, McIntire-Stennis, Animal Health funds and resources permanently added to the unit during the fiscal year. Revolving, grant, and contract funds are not included, nor are funds for diagnostic laboratory activities.

Characteristics	Agricultural Meteorology	ARD Average
Faculty research FTE	4.61	6.17
Faculty salary, $/FTE	67,448	65,303
Manager/Prof employ., fte/FTE	1.08	0.61
Manager/Prof salary, $/FTE	31,397	16,617
Office/Service employ., fte/FTE	0.52	0.95
Office/service salary, $/FTE	11,113	19,829
GRA salary, $/FTE	2,593	10,471
Hourly employee wages, $/FTE	-0-	1,445
Fringe benefits, $/FTE	26,537	23,078
Operating, $/FTE	19,183	21,840
Total support, $/FTE	90,823	93,280
Total investment, $/FTE	158,271	158,583
Total grant, $/FTE (FY94)	276,460	108,884

Other performance characteristics compared to other IANR units are given in Table 6 for 1992-94. The department has a good record of publication but is below average in the number of graduate degrees per faculty member. As shown, we have an excellent record of receiving funding for proposals that we submit. Thus, the overall support we have for our programs is very good. Table 7 shows the trends for the department since 1989 in the categories listed in Table 6. The information provided in Table 7 shows some year-to-year variability but, overall, there is a fairly consistent pattern reflecting a solid performance by faculty within the department.

Please note that all data are normalized to faculty research FTE in the unit to allow comparison of support across all units. Differences in support among units may be the result of differential cost of research in varying disciplines, long-term unit productivity or decisions on the nature of budget reductions taken in previous years. For example, some units elected to cut operating, GRA stipends and support staff rather than faculty FTE during the 1980s and the current biennium. Other units have volunteered to give up faculty FTE to gain additional operating and support staff.

Table 6
Agricultural Meteorology
Unit Performance Characteristics Compared to Other IANR Units

Characteristic	FY 1994		Average of FY 1992-1994	
	Ag. Meteor.	ARD Ave.	Ag. Meteor.	ARD Ave.
Total Approp. $/FTE[1]	154,734	156,120	157,383	154,483
Ref. Publications/FTE[2]	3.90	3.37	3.67	2.91
Theses/FTE[3]	0.43	0.97	0.57	0.94
Total Grant $/FTE[4]	*276,460	108,884	*210,222	79,532
Total Grant $/Total Approp. $	1.787	0.728	1.336	0.536
Total Grant Proposals/FTE	3.25	7.55	3.60	7.75
Total Resources, $/FTE	*431,194	265,002	*367,604	234,387

[1] Data reflects unit appropriated budget plus RRF, McIntire Stennis, Animal Health, and funds added to unit during fiscal year.

[2] Publications include journal articles, books, book chapters, and research bulletins.

[3] Theses include M.S. theses and Ph.D. dissertations.

[4] Includes proposals to all funding agencies (federal and state agencies, commodity boards, UN foundations, corporations, and internal grant proposals).

* Includes all grant funds awarded to the department in research and extension. Does not include funds from the Nebraska Research Initiative awarded through the Center for Laser-Analytical Studies of Trace Gas Dynamics (CLAS) of the College of Engineering and Technology, administered jointly by Agricultural Meteorology and Electrical Engineering. The budgets for this center are: 1990-91, $250,000; 1991-92, $293,000; 1992-93, $290,070; 1993-94, $290,070; and 1994-95, $318,000.

Table 7
Resource and Performance Trends for
Agricultural Meteorology

INDICATOR	FISCAL YEAR					
	1990	1991	1992	1993	1994	1995
Research FTE	4.02	5.12	4.67	4.61	4.61	4.61
Approp. $/FTE[1]	117,174	132,773	160,676	156,746	154,734	158,271
*Total Grant $/FTE	184,577	184,344	193,990	160,215	276,460	NA
Grant $/Approp. $	1.567	1.348	1.207	1.022	1.787	
*Total Resources, $/FTE	301,751	317,117	354,666	316,961	431,194	
Ref. Pubs/FTE	1.99	2.81	2.13	4.99	3.90	
Theses/FTE	0.50	0.77	0.63	0.65	0.43	
Total Proposals/FTE[2]	3.73	4.08	3.43	4.12	3.25	

[1] Includes state and federal formula funds. Does not include administrative overhead, diagnostic laboratories, or general support of ARDC or interdisciplinary centers.

[2] All grant proposals including those submitted to commodity boards, industry, and university internal grant competition.

* Includes all grant funds awarded to the department in research and extension but not the funds for CLAS (see footnote on Table 6).

Facilities and Equipment

The main research laboratory for the department is located at the University of Nebraska Agricultural Research and Development Center near Mead, Nebraska. This laboratory has about 20 hectares of land for conducting field experiments and houses state-of-the-art equipment for micrometeorological flux measurement of mass and energy. The department has acquired research equipment and portable research facilities that enable us to conduct research at remote locations. This is exemplified by our projects in Kansas, north central Nebraska, Minnesota, and in Canada and Russia. The Kansas, Canada and Russia projects are described in more detail in section 8 (International Activities).

We are developing, but do not yet have adequate facilities for calibrating some sensors used in our research and outreach activities. For example, Dr. Walter-Shea has built a goniometer for characterizing reflectance properties of reference panels used with remote sensing instruments, Dr. Hubbard has some capabilities for calibrating instruments that are used on our automated weather data network, and Dr. Verma has facilities for calibrating some micrometeorological instruments. Calibration of other instruments requires the use of facilities at other institutions. Some instruments are calibrated by manufacturing companies. The new research laboratories in the renovated space in the Chase Hall basement will contain some calibration facilities. A new NSF grant awarded to Dr. Hubbard and Dr. George Meyer in Biological Systems Engineering to purchase environmental instruments will improve the equipment for educating students in our instrumentation course and at the same time will provide some calibration equipment.

For most of our research we have state-of-the-art equipment and are continually upgrading our capabilities as better instruments are developed. In many instances we work with instrument manufacturers in the testing of new equipment before its release to the general scientific community.

The department has good computing capabilities with more than 60 personal computers and two work stations. Most computers are networked to each other and to the computing centers on the east and city campuses. We have been reasonably successful in updating our computer capabilities and facilities as needed.

We have adequate classrooms for teaching our courses although better facilities are needed for teaching the lab sections of some of our courses. Laboratory facilities will improve when the basement is renovated.

The facilities for collecting and archiving most of the climatic data and information are inadequate. We have good computer capabilities to handle data collection, computations, and analysis. We have good capabilities for collecting climate data through our automated weather station network and have recently upgraded our computing facilities to make more data more readily available for use by scientists, private industry, public officials and the general public. However, we do not have adequate space to house the computers needed to support these activities or to store essential climatic data and information.

We do not have adequate space for our support personnel. The advent and subsequent increase in personal computers and the steady increase in staff was not anticipated at the time of the 1980 renovation of Chase Hall. Room dimensions that were adequate fifteen years ago rapidly became too small for a growing number of staff with an ever-increasing amount of computing (and other) equipment and project materials. And almost without exception, there are at least two support persons in each office. Our office staff are especially crowded and have little privacy. These overcrowded conditions will be alleviated to some degree when the basement is renovated but for the most part the overcrowded conditions will continue until new facilities are built.

Personnel

At the time of the last review we had six faculty members with 4.60 FTE assigned to research and service, 0.85 FTE assigned to extension, and 0.55 assigned to teaching. Currently we have 10 faculty with 5.80 FTE for research, 1.55 FTE for scholarly service, 1.00 FTE for extension, 0.74 FTE for teaching, and 0.91 FTE for administration. We currently have 1.0 FTE for a postdoctoral research fellow.

In 1989 we had 5.35 FTE budgeted for research managerial/professional personnel and this has increased to 5.68 FTE. For the office/technical staff we had 2.59 FTE for research support in 1989 and this has increased to 2.86 FTE. In 1989 we had 0.16 FTE of office staff for teaching; today we have only 0.04 FTE. We had no extension FTE for support staff in 1989; we now have 0.20 FTE for office staff support. The remaining funds for our technical and office support staff come from grants and contracts or from revolving and overhead funds. Including the budgeted FTE, we now have a total of 11.5 FTE in the managerial/professional category, 4.5 FTE in the office support category, and 3.0 FTE in the technical support category.

We have $2,000 budgeted in extension for hourly workers. All other hourly employees are paid from grant funds. The number of hourly employees varies widely from year to year and seasonally depending on the need. We currently (August 1, 1995) employ the equivalent of 4.5 student hourly workers.

We have six graduate research assistants working to obtain M.S. degrees and ten students working on Ph.D. degrees. For more information on graduate students see sections 6 and 8.

The university has no formal sabbatical leave program; rather there is a faculty development leave program. Generally, IANR faculty who take such leaves go for 6-12 months and, in some cases, up to two years. The IANR administration is strongly supportive of IANR faculty taking a faculty development leave. No one in Agricultural Meteorology took advantage of this program during the period since the last review. However, some faculty in the department have taken a change of duty station for up to one or two months to work with scientists from other institutions, particularly those in foreign countries.

Research Program

Personnel

Climate and Weather Resources

Dr. Kenneth G. Hubbard, Professor
Dr. Steven J. Meyer, Assistant Professor
Dr. David E. Stooksbury, Assistant Professor
Mr. John D. Draves, Research Technologist
Mr. Allen L. Dutcher, State Climatologist and Graduate Research Assistant (Ph.D. Student)
Mr. James R. Hines, Computer Systems Analyst
Ms. Deborah A. Wood, Editorial Assistant
Mr. Karl E. Blauvelt, Electronics Technician
Mrs. Shellie J. Hanneman, Clerical Assistant/Data Technician
Mr. Craig D. Idso, Graduate Research Assistant (M.S. Student)
Mr. Xiaomao Lin, Graduate Research Assistant (Ph.D. Student)
Mr. Meng Xu, Graduate Research Assistant (Ph.D. Student)

Climate Impacts/Drought Management and Planning

Dr. Donald A. Wilhite, Professor
Dr. Michael J. Hayes, Assistant Professor
Mr. James R. Hines, Computer Systems Analyst
Mrs. Kelly C. Smith, Information Specialist
Mr. Mark D. Svoboda, Climate Resources Specialist
Ms. Deborah A. Wood, Editorial/Computer Graphics Specialist
Mr. John Ansorge, Computer/WWW Home Page Specialist
Ms. Polly Ann Najarian, Graduate Research Assistant (M.S. Student)

Regionally Integrated Assessment of the Interactions of Climate, Natural Resources, Land-Use and Processes of Net Carbon Exchange

Dr. William E. Easterling, Associate Professor
Dr. David S. Guertin, Post-Doctoral Research Associate
Ms. Cynthia J. Hays, Research Technologist
Mrs. Jan M. Schinstock, Project Assistant
Ms. Elena Tsvetsinskaya, Graduate Research Assistant (Ph.D. Student)

Agroecosystem Modeling

Dr. Albert Weiss, Professor
Mr. Alex R. Moreno-Sotomayor, Graduate Research Assistant (M.S. Student)
Mr. Qingwu Xue, Graduate Research Assistant (Ph.D. Student)

Remote Sensing

Dr. Blaine L. Blad, Professor and Department Head
Dr. Elizabeth A. Walter-Shea, Associate Professor
Ms. Cynthia J. Hays, Research Technologist
Mr. Mark A. Mesarch, Research Technologist
Mr. Mauro A. Antunes, Graduate Research Fellow (Ph.D. Student)
Mr. Liqiang Chen, Graduate Research Assistant (Ph.D. Student)
Mr. Bryan C. Leavitt, Graduate Research Assistant (Ph.D. Student)

Trace Gas Dynamics

Dr. Shashi B. Verma, Professor
Dr. Joon Kim, Assistant Professor (left 08/01/95)
Mr. Robert J. Clement, Research Technologist
Mr. Howard D. Earl, Lab Manager
Mr. James R. Hines, Computer Systems Analyst
Mr. Sheldon D. Sharp, Electronics Technician
Mr. Georgiy G. Burba, Graduate Research Assistant (M.S. Student)
Ms. Olga V. Vanyarkho, Graduate Research Assistant (M.S. Student)
Ms. Patricia C. Mielnick, Graduate Research Assistant (Ph.D. Student)
Mr. Andrew E. Suyker, Graduate Research Assistant (Ph.D. Student)

Climate and Weather Resources

Project Number: NEB-27-005

Project Title: Climate Data Base and Model for Estimating Crop Yields

Leader: Kenneth G. Hubbard

Project Duration: January 1984 through June 1994 (revised 1989)

Objectives:

1. Develop a regional climate data base consisting of hourly values of temperature, humidity, solar radiation, soil temperature, precipitation, wind speed and direction collected over grass-covered sites.

2. Determine the suitability of the network for use in operational weather-crop models; test the spatial representativeness of the station coverage and differences between grass- and crop-covered sites.

3. From existing research models and literature, develop operational models for assessing the current status of soil water, crop development, and production potential based on weather conditions.

Publications (Since the previous review):

Journal Articles

Meyer, S. J., K. G. Hubbard and D. A. Wilhite. 1989. Estimating potential evapotranspiration: The effect of random and systematic errors in the variables used to estimate potential evapotranspiration by the Penman method. *Agric. and For. Meteorol.* 46:285-296.

Aceves-Navarro, L. A., K. G. Hubbard and J. J. Schmidt. 1989. Group calibration of silicon cell pyranometers for use in an automated network. *J. Atmos. and Oceanic Tech.* 6(5):875-879.

Robinson, J. M. and K. G. Hubbard. 1990. Soil water assessment model for several crops in the High Plains. *Agron. J.* 82(6):1141-1148.

Meyer, S. J., K. G. Hubbard and D. A. Wilhite. 1993. A crop specific drought index for corn. I. Model development and validation. *Agron. J.* 85:388-395.

Meyer, S. J., K. G. Hubbard and D. A. Wilhite. 1993. A crop specific drought index for corn. II. Application in drought monitoring and assessment. *Agron. J.* 85:396-399.

Paes de Camargo, M. B. and K. G. Hubbard. 1995. Components of a daily water balance for sorghum crop under different irrigation treatments. *Bragantia* (in press).

Book Chapters

Hubbard, K. G. 1993. Monitoring regional drought conditions. In *Drought Assessment, Management, and Planning: Theory and Case Studies*, D. A. Wilhite (ed.), Kluwer Acad. Pub., pp. 17-30.

Theses and Dissertations

Deshpande, R. Y. 1992. Effect of plant architecture on microclimate, white mold and yield of dry beans (*Phaseolus Vulgaris* L.) and implications for disease management. Ph.D. Dissertation. Dept. of Horticulture, University of Nebraska-Lincoln. 146 pp.

Paes de Camargo, M. B. 1993. Sensitivity of sorghum yield to drought and the timing of rainfall. Ph.D. Dissertation. Department of Agricultural Meteorology, University of Nebraska-Lincoln. 131 pp.

Flores-Mendoza, F. J. 1993. The effect of sensor position and sunlit and shaded patterns on composite radiative temperatures over sorghum. Ph.D. Dissertation. Department of Agricultural Meteorology, University of Nebraska-Lincoln. 181 pp.

Sources of Funds:

Funds to support research on this project come from the Agricultural Research Division and the High Plains Climate Center.

Proposed Project

Project Title: Crop-Specific Drought Indices to Monitor and Assess Weather's Impact on Yield (Research Project in preparation)

Leader: Steven J. Meyer

Objectives:

The crop-specific drought index (CSDI) model is a tool for monitoring and assessing weather's impact on crop yields (Meyer et al., 1993a, b). The CSDI model is based on the ratio of calculated evapotranspiration to potential evapotranspiration for specific stages in the plant's growth. An exponential coefficient is calculated for each growth stage based on the sensitivity of the crop to moisture stress during that stage of growth. The product of the ratios supplies the index value.

The application focus of the CSDI is on yield forecasting at any point during the growing season. To do this, the model uses actual weather data to the current date and historical climate data for the remainder of the growing season. As many potential outcomes are generated as there are years of historical data. Based on a probability analysis of the potential outcomes, a specific yield can be predicted and a probability statement can be made for the other outcomes.

1. The primary objective of the research proposed for this project is to make improvements on the model's sensitivity coefficients.

2. A second objective is to make any adjustments necessary to operate the model using current data so that it will run in near-real time.

References:

Meyer, S. J., K. G. Hubbard and D. A. Wilhite. 1993. A crop-specific drought index for corn. I. Model development and validation. *Agron. J.* 85:388-395.

Meyer, S. J., K. G. Hubbard and D. A. Wilhite. 1993. A crop-specific drought index for corn. II. Application in drought monitoring and assessment. *Agron. J.* 85:396-399.

Potential Funding Sources:

Agricultural Research Division and the High Plains Climate Center.

Proposed Project

Project Title: Climatology of Solar Radiation and Wind in the High Plains (Research Project in preparation)

Leader: David E. Stooksbury

Objectives:

The High Plains region has the potential of being a major producer of solar- and wind-generated electricity. However, there is little long-term, reliable data on solar and wind resources (Elliott et al., 1987). The primary objective of this project is to determine the climatological elements that may influence the development of renewable energy industries in Nebraska and near-by states.

In order to meet the project's objective, solar radiation and wind climatologies will be developed for selected sites. Geographic information systems will be used to help evaluate the potential for developing renewable energy industries. I will test GIS-wind energy models (Rohatgi and Nelson, 1994) using actual data. Models of the interactions between meteorological conditions and renewable energy potential will also be developed.

This research program will involve monitoring solar radiation and wind throughout the region. Direct, diffuse, and global radiation will be monitored at several sites in the region. Wind energy is very site specific. Reliable wind energy monitoring requires that the wind be monitored at several levels up to 40 m.

References:

Elliott, D. L., C. G. Holladay, W. R. Barchet, H. P. Foote and W. F. Sandusky. 1987. Wind Energy Resource Atlas of the United States. U.S. Dept. of Energy. 210 pp.

Rohatgi, J. S. and V. Nelson. 1994. Wind Characteristics: An Analysis for the Generation of Wind Power. Alternative Energy Institute, West Texas A&M Univ. 293 pp.

Present Funding Source:

Nebraska Power Association through RLA Consulting (Bothell, WA) for wind monitoring at eight locations in Nebraska.

Potential Funding Sources:

United States Department of Energy
Nebraska State Energy Office
Nebraska Power Association

Climate Impacts/Drought Management and Planning

Project Number: NEB-27-007

Project Title: Drought and Climate Change: Response and Policy Implications

Leader: Donald A. Wilhite

Project Duration: January 1990 to December 1995

Objectives:

1. To evaluate governmental drought assessment and response activities in the United States and elsewhere, with the aim of identifying appropriate contingency strategies for improving the drought-coping capacity of governments and international and donor organizations.

2. To investigate the impacts of and develop techniques to determine the likely effects of water shortages on agriculture and other economic sectors.

3. To investigate the impacts of and identify and evaluate alternative policy responses to climate change at the regional, national, and international level.

Publications (Since the previous review):

Journal Articles

Meyer, S.J., K.G. Hubbard, and D.A. Wilhite. 1989. Estimating potential evapotranspiration: the effect of random and systematic errors. *Agric. and For. Meteorol.* 46(4):285-296.

Wilhite, D.A. and W.E. Easterling. 1989. Coping with drought: Toward a plan of action. *Eos* (American Geophysical Union) 70(7):106-108. February 14.

Wilhite, D.A. 1990. The enigma of drought: Management and policy issues for the 1990s. *International J. of Environ. Studies* 36:41-54.

Wilhite, D.A. 1991. Drought planning and state government: Current status. *Bull. Amer. Meteorol. Soc.* 72(10):1531-36.

Wilhite, D.A. 1991. Drought planning: A process for state government. *Water Res. Bull.* 27:29-38.

Peters, A.J., D.C. Rundquist, and D.A. Wilhite. 1991. Satellite detection of the geographic core of the 1988 Nebraska drought. *Agric. and For. Meteorol.* 57:35-47.

Meyer, S.J., K.G. Hubbard, and D.A. Wilhite. 1991. The relationship of climatic indices and variables to corn (maize): A principal components analysis. *Agric. and For. Meteorol.* 55:59-84.

Wilhite, D.A. 1993. Understanding the phenomenon of drought: Prerequisite to reducing vulnerability. *Hydro-Review* 12:136-148.

Klinedinst, P.L., D.A. Wilhite, G.L. Hahn, and K.G. Hubbard. 1993. The potential effects of climate change on summer season milk production and reproduction. *Climatic Change* 23:21-36.

Meyer, S.J., K.G. Hubbard, and D.A. Wilhite. 1993. A crop specific index for corn. I. Model development and validation. *Agron. J.* 85:388-395.

Meyer, S.J., K.G. Hubbard, and D.A. Wilhite. 1993. A crop specific index for corn. II. Application in drought assessment. *Agron. J.* 85:396-399.

Wilhite, D.A. and S.R. Rhodes. 1994. State-level drought planning in the United States: Factors influencing plan development. *Water International* 19:15-24.

Wilhite, D.A. 1995. Reducing societal vulnerability to drought: A methodology. *Water Res. and Environ. Hazards*. AWRA International Symposium. Refereed paper.

Books, Monographs, Book Chapters, and Edited Symposium Proceedings

Wilhite, D.A. 1990. Drought disaster policies and programs: Past experiences and future directions. Chapter 9, In W.L. Waugh, Jr., *Handbook of Emergency Management Policies and Programs*. Greenwood Press.

Wilhite, D.A. 1991. Drought. In W.A. Nierenberg (ed.), *Encyclopedia of Earth System Science*, Volume 2. Academic Press, Inc. pp. 81-92.

Dziegielewski, B., G.D. Lynee, D.A. Wilhite, and D.P. Sheer. 1991. *Water Management During Drought: A Research Assessment*. Planning and Management Consultants, Ltd. Report prepared for Institute for Water Resources, U.S. Army Corps of Engineers. 200 pp.

Wilhite, D.A., D.A. Wood, and P.A. Kay (eds.). 1991. *Drought Management and Planning*. Proceedings of the Seminar and Workshop. IDIC Technical Report Series 91-1.

Wilhite, D.A. 1992. *Preparing for Drought: A Guidebook for Developing Countries*. Climate Unit, U.N. Environment Program. Nairobi, Kenya. 78 pp.

Wilhite, D.A. 1992. Drought: Its physical and social dimensions. In S.K. Majumdar et al. (eds.), *Natural and Technological Disasters: Causes, Effects and Preventive Measures*. Pennsylvania Academy of Science.

Wilhite, D.A. (ed.). 1993. *Drought Assessment, Management, and Planning: Theory and Case Studies*. Kluwer Academic Publishers, Dordrecht, The Netherlands. 300 pp.

Wilhite, D.A. 1993. The enigma of drought. Chapter 1, In D.A. Wilhite (ed.), *Drought Assessment, Management, and Planning: Theory and Case Studies*. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Wilhite, D.A. 1993. Planning for drought: A methodology. Chapter 6, In D.A. Wilhite (ed.), *Drought Assessment, Management, and Planning: Theory and Case Studies*. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Wilhite, D.A. and S.L. Rhodes. 1993. Drought mitigation in the United States: Progress by state government. Chapter 13, In D.A. Wilhite (ed.), *Drought Assessment, Management, and Planning: Theory and Case Studies*. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Wilhite, D.A. 1993. What is the Importance of a Forecast in a Total Forecast System? *Workshop on Usable Science: Food Security, Early Warning, and El Niño*. Environmental and Societal Impacts Group/NCAR. Boulder.

Faragó, T., D.A. Wilhite, and M.H. Glantz. 1993. A Forecast Is Just a Forecast: It's Not a Guarantee. *Workshop on Usable Science: Food Security, Early Warning, and El Niño*. Environmental and Societal Impacts Group/NCAR. Boulder.

Wilhite, D.A. 1993. Drought Management and Climate Change. Policy paper prepared for the Office of Technology Assessment Report to Congress, *Preparing for an Uncertain Future*. Washington, D.C.

Wilhite, D.A. and D.A. Wood (eds.). 1994. *Drought Management in a Changing West: New Directions for Water Policy*. Proceedings of a Conference. IDIC Technical Report Series 94-1, University of Nebraska-Lincoln. 250 pp.

Texas Water Development Board, in cooperation with D.A. Wilhite. 1995. *Consideration of an Appropriate Drought Management Plan for the State of Texas*. Water Demand-Drought Management Technical Advisory Committee of the Consensus-based State Water Plan. Austin. (In press)

Wilhite, D.A. 1995. Reducing the impacts of drought: Progress toward risk management. In J.C. Ribot, A.R. Magalhaes, and S.S. Panagides (eds.), *Climate Variability, Climate Change, and Vulnerability in the Semi-Arid Tropics*. Cambridge University Press, London. (In press)

Theses and Dissertations, Graduate Students Advised

Meyer, S.J. 1990. The development of a crop specific drought index for corn. Ph.D. Dissertation. Department of Agricultural Meteorology, University of Nebraska-Lincoln. Co-advisor with K.G. Hubbard.

Klinedinst, P.L. 1991. Potential effects of climate change on milk production and conception rate in dairy cattle in the United States and Europe. Department of Agricultural Meteorology. University of Nebraska-Lincoln.

Held, A.R. 1994. M.S. student, non-thesis option. Graduated December.

Chen, X. 1995. M.S. student, non-thesis option. Graduated May.

Sources of Funds:

Funds to support research on this project come from the Agricultural Research Division and external sources. The external funding is outlined below.

National Science Foundation. August 1987-January 1990. $60,000. Improving Institutional Planning for Drought: The Development of a Model for State Government. D.A. Wilhite and M. H. Glantz, Co-Principal Investigators.

International Affairs Branch/NOAA and the World Meteorological Organization. September 1988-August 1990, with continuation. $30,918. The Development of an International Drought Network and Newsletter. D.A. Wilhite, Principal Investigator.

International Affairs Branch/NOAA and the World Meteorological Organization. September 1988-August 1990. $60,222. Regional Training Seminars on Drought Planning and Management (Eastern and Southern Africa). D.A. Wilhite, Principal Investigator.

Lincoln Water System. 1989-1990. $4,000. The Relationship between Climate Factors and Water Usage in the City of Lincoln, Nebraska. D.A. Wilhite, Principal Investigator.

National Climate Program Office/NOAA. 1989-1990. $30,000. International Drought Information Center. D.A. Wilhite, Principal Investigator.

Department of Public Works. March 1, 1990-February 28, 1991. $4,860. Development of Water Conservation Brochures for the City of Lincoln, Nebraska. D.A. Wilhite, Principal Investigator.

Department of Public Works. March 1, 1990-February 28, 1991. $4,640. Climate and Water Use in the City of Lincoln, Nebraska. D.A. Wilhite and S.J. Meyer, Principal Investigators.

National Climate Program Office/NOAA. August 1990-March 1991. $29,500. International Drought Information Center. D.A. Wilhite, Principal Investigator.

United Nations Environment Program. 1990-1991. $40,000. Regional Training Seminars on Drought Planning and Management (Asian and Pacific Regions). D.A. Wilhite, Principal Investigator.

International Affairs Branch/NOAA and the World Meteorological Organization. May 1990-September 30, 1991. $39,915. Regional Training Seminars on Drought Planning and Management. D.A. Wilhite, Principal Investigator.

Cooperative Agreement with the Soil Conservation Service, U.S.D.A. August 1991-September 1992. $19,972. An Assessment of Drought Mitigation Technologies in the United States. D.A. Wilhite, Principal Investigator.

International Affairs Branch/NOAA and the World Meteorological Organization. October 1990-September 1992. $62,000. International Drought Network and Newsletter (Continuation). D.A. Wilhite, Principal Investigator.

Lincoln Water System. March 1, 1991-February 29, 1992. $19,635. Evaluation of Residential Water Utilization Under an Education and Conservation Program. B.L. Blad, D.A. Wilhite, G.L. Horst, and T.P. Riordan, Principal Investigators.

Lincoln Water System. June 1, 1991-May 31, 1992. $4,767. Predicting Water Use for the City of Lincoln, Nebraska. S.J. Meyer and D.A. Wilhite, Principal Investigators.

United Nations Environment Program. March 1992-July 1993. $30,000. Regional Training Seminars on Drought Planning and Management (Latin American and Caribbean Regions). D.A. Wilhite, Principal Investigator.

World Meteorological Organization. January 1993-June 1993. $4,000. Regional Training Seminars on Drought Planning and Management (Latin American and Caribbean Regions). D.A. Wilhite, Principal Investigator.

Nebraska Natural Resources Commission. May 1993-June 1994. $4,444. Developing a Precipitation-Based Assessment of Climatic Conditions in Nebraska. D.A. Wilhite, Principal Investigators.

World Meteorological Organization. July 1993-December 1994. $15,000. Support for Publication of *Drought Network News*. D.A. Wilhite, Principal Investigator.

Environment Canada, the Office of Global Programs/USDA, and NOAA. August 1993 to July 1995. $80,000. Planning for a Sustainable Future: The Case of the North American Great Plains. D.A. Wilhite, Principal Organizer. May 8-10, 1995, Lincoln, Nebraska.

Western Regional Climate Center, $ 8,700; Soil Conservation Service/USDA, $10,000. August 1993-July 1994. Drought Management in a Changing West: New Directions for Water Policy. D.A. Wilhite, Principal Organizer. May 10-13, 1994, Portland, Oregon.

International Affairs Division, NOAA. March 1995-February 1996. $15,264. Support for Publication of *Drought Network News*. D.A. Wilhite, Principal Investigator.

Awarded through the Climate Prediction Center/NWS. April 1, 1995-March 31, 1996. $185,200. National Drought Mitigation Center Program, State Environmental Application Center (StEAC)/National Weather Service. D.A. Wilhite, Principal Investigator.

Awarded through CSREES. June 1, 1995-May 31, 1996. $187,878. Developing Drought Mitigation and Preparedness Technologies for the United States. D.A. Wilhite, Principal Investigator.

Proposed Project

Project Title: Developing Drought Mitigation Technologies (Research Project in preparation)

Leaders: Michael J. Hayes
Donald A. Wilhite

Objectives:

Most drought mitigation strategies rely heavily on responding to a drought that is already in progress. The goal in developing mitigation technologies is to reduce the vulnerability of a region during a drought, as well as before the drought begins. This project would have four main objectives:

1. To modify existing or develop new climate monitoring tools to provide early warning of impending drought conditions.

2. To conduct research leading to the creation of a national information clearinghouse on drought assessment, mitigation, preparedness, and response options for decision makers in the public and private sectors.

3. To analyze existing drought plans at various levels of government to derive new and innovative methods and technologies for reducing vulnerability to future episodes of drought.

4. To evaluate the effectiveness and efficiency of recent response efforts by federal agencies and current levels of coordination with state and local government.

One research topic that could be pursued, relating to the first objective, is a detailed investigation looking at the use of satellite-derived indices to operationally monitor drought conditions. This research would be timely with the recent decision to install an AVHRR receiving station at the University of Nebraska. Recent research has investigated using microwave data collected from satellites to monitor soil moisture conditions, while AVHRR data was utilized within the Vegetation Condition Index (VCI) to monitor drought conditions in the United States and monitor corn production in the U.S. Corn Belt in two recent studies (Kogan, 1995; Hayes, 1994).

References:

Hayes, M. 1994. Utilizing satellite data within a corn production assessment system for the United States Corn Belt. Ph.D. dissertation. University of Missouri-Columbia.

Kogan, F. 1995. Droughts of the late 1980s in the United States as derived from NOAA polar-orbiting satellite data. *Bull. Amer. Meteor. Soc.* 76(5):655-667.

Potential Funding Sources:

National Drought Mitigation Center, CSREES/USDA, Office of Global Programs/NOAA, Office of Global Programs/USDA, NIGEC, and NSF.

Regionally Integrated Assessment of Climate, Natural Resources, Land-Use and Processes or Net Carbon Exchange

Project Number: NEB-27-014

Project Title: The Consequences of Climate Variation and Change for Agriculture and Other Natural Resources

Leader: William E. Easterling

Project Duration: July 1, 1994-June 30, 1999

Objectives:

The general objective is to understand the adaptability of agroecosystems to climate change. Specific objectives are: (1) to explore alternative strategies for coping with climate change at the farm level; (2) to develop appropriate climate change scenarios for the estimation of impacts on cropping systems; (3) to evaluate relationships between changes in agricultural practices in response to climate change and biodiversity and net carbon exchange in the Great Plains.

Publications:

Journal Articles

*Easterling, W. E., N. J. Rosenberg, M. S. McKenney and C. A. Jones. 1992. Paper I. An introduction to the methodology, the region of the study, and a historical analog of climate change. Special Issue: Methodology for Assessing Regional Agricultural Consequences of Climate Change, *Agric. and For. Meteorol.* 59(1-2):3-15.

*Easterling, W. E., N. J. Rosenberg, M. S. McKenney, C. A. Jones, P. T. Dyke and J. R. Williams. 1992. Paper II. Preparing the erosion productivity impact calculator (EPIC) model to simulate crop response to climate change and the direct effects of CO_2. Special Issue: Methodology for Assessing Regional Agricultural Consequences of Climate Change, *Agric. and For. Meteorol.* 59(1-2):17-34.

*Rosenberg, N. J., M. S. McKenney, W. E. Easterling and K. M. Lemon. 1992. Paper III. Validation of EPIC model simulations of crop responses to current climate and CO_2 conditions: Comparisons with census, expert judgment and experimental plot data. Special Issue: Methodology for Assessing Regional Agricultural Consequences of Climate Change, *Agric. and For. Meteorol.* 59(1-2):35-51.

*Work was initiated before arrival at UNL, but completed after arrival at UNL.

*Easterling, W. E., M. S. McKenney, N. J. Rosenberg, and K. M. Lemon. 1992. Paper IV. Simulations of crop response to climate change: Effects with present technology and no adjustments (the 'dumb farmer' scenario). Special Issue: Methodology for Assessing Regional Agricultural Consequences of Climate Change, *Agric. and For. Meteorol.* 59(1-2):53-73.

*Easterling, W. E., N. J. Rosenberg, K. M. Lemon and M. S. McKenney. 1992. Paper V. Simulations of crop responses to climate change: Effects with present technology and currently available adjustments (the 'smart farmer' scenario). Special Issue: Methodology for Assessing Regional Agricultural Consequences of Climate Change, *Agric. and For. Meteorol.* 59(1-2):75-102.

*McKenney, M. S., W. E. Easterling and N. J. Rosenberg. 1992. Paper VI. Simulation of crop productivity and responses to climate change in the year 2030: The role of future technologies, adjustments and adaptations. Special Issue: Methodology for Assessing Regional Agricultural Consequences of Climate Change, *Agric. and For. Meteorol.* 59(1-2):103-127.

*Easterling, W. E., III, P. R. Crosson, N. J. Rosenberg, M. S. McKenney, L. A. Katz and K. M. Lemon. 1993. Agricultural impacts of and responses to climate change in the Missouri-Iowa-Nebraska-Kansas (MINK) region. *Climatic Change* 24(1-2):23-62.

*Rosenberg, N. J., P. R. Crosson, K. D. Frederick, W. E. Easterling, III, M. S. McKenney, M. D. Bowes, R. A. Sedjo, J. Darmstadter, L. A. Katz and K. Lemon. 1993. The MINK methodology: Background and baseline. *Climatic Change* 24(1-2):7-22.

Easterling, W. 1995. Introduction. Special issue of *Agric. and For. Meteorol.* on issues in the adaptation of production agricultural systems to climate change (in press).

Easterling, W. 1995. Adapting North American agriculture to climate change: A review and assessment of the issues, methods and prospects. Special issue of *Agric. and For. Meteorol.* (in press).

Book Chapters

*Easterling, W. E., P. R. Crosson, N. J. Rosenberg, M. S. McKenney and K. D. Frederick. 1992. Methodology for assessing regional impacts of and responses to climate change: The MINK study. In J. M. Reilly and M. Anderson (eds.), *Economic Issues in Global Climate Change*, Westview Press, Boulder, CO. pp. 168-199.

*Rosenberg, N. J., P. R. Crosson, W. E. Easterling, III, M. S. McKenney, K. D. Frederick and M. Bowes. 1992. A methodology for assessing regional economic impacts of and responses to climate change: The MINK study. In J. Schmandt and J. Clarkson (eds.), *The Regions and Global Warming*, Oxford Univ. Press, Oxford. pp. 132-153.

Easterling, W. E. 1993. Assessing the regional consequences of drought: Putting the MINK methodology to work on today's problems. In D. A. Wilhite (ed.), *Drought Assessment, Management and Planning: Theory and Case Studies*, Kluwer Academic Publishers, Dordrecht, The Netherlands. pp. 49-64.

Easterling, W. E. 1994. Adapting North American Agriculture to Climate Change. In Brklacich, M., D. McNabb and J. Dumanski (eds.), *Agricultural Adaptation to Climatic Variation and Change*, Department of Geography, Carleton University, Ottawa.

Sources of Funds:

Funds to support research on this project came from the Agricultural Research Division and external sources. The external funding is outlined below.

U.S. Forest Service. April 1, 1992-Open. $64,134 for research. The Role of Trees in Semi-Arid Regions under Climate Change. W. E. Easterling, Principal Investigator.

U.S. Department of Energy, Great Plains Regional Center for Global Environmental Change. July 1, 1993-June 30, 1995. $168,400. Assessment of the Effects of Climate Change on a Mixed Agricultural Landscape on the North American Great Plains. W. E. Easterling and J. A. Brandle, Co-Principal Investigators.

U.S. Department of Energy, Great Plains Regional Center for Global Environmental Change. July 1, 1993-June 30, 1995. $72,000. Development of a Nested Regional Model for the Conterminous United States and Formation of High Resolution Climate Change Scenarios with an Application to Crop Climate Models. W. E. Easterling, A. Weiss, and L. O. Mearns, Co-Principal Investigators.

Agroecosystem Modeling

Project Number: NEB-27-009

Project Title: Climate and Agroecosystem Modeling: Developing Information for Decision Making

Leader: Albert Weiss

Project Duration: December 13, 1990-December 12, 1995

Objectives:

1. To determine the applicability of a generic crop model to accurately predict phenology and yield.

2. To evaluate the ability of a generic model to respond to pest (weeds, pathogens, arthropods) pressures, so as to enhance the predictive ability of these models.

3. To develop and evaluate climate-based information for decision making.

Publications (Since the previous review):

Journal Articles

Weiss, A. and E. D. Kerr. 1989. Evaluating the use of pest management information by growers: An example using Cercospora leaf spot of sugarbeet. *Appl. Agric. Res.* 4:168-172.

Weiss, A., D. L. Lukens, J. M. Norman and J. R. Steadman. 1989. Leaf wetness in dry beans under semi-arid conditions. *Agric. and For. Meteorol.* 48:149-162.

Weiss, A. and J. G. Robb. 1989. Challenge for the future: Incorporating systems into the agricultural infrastructure. *J. Prod. Agric.* 2:287-289.

Weiss, A. 1990. The role of climate-related information in pest management. *Theor. Appl. Climatol.* 41:87-92.

Piper, E. L. and A. Weiss. 1990. Evaluating CERES-Maize for reduction in plant population or leaf area during the growing season. *Agric. Systems* 33:199-213.

Weiss, A. 1990. Leaf wetness: Measurements and models. *Remote Sensing Reviews* 5:215-224.

Kerr, E. D. and A. Weiss. 1990. Fungicide efficacy and yield responses to fungicide treatments based on predictions of Cercospora leaf spot of sugar beet. *J. Sugar Beet Res.* 27:58-71.

Weiss, A. 1991. Information dissemination for short-term decisions: The potential role of audiotex. *J. Prod. Agric.* 4:633-634.

Weiss, A. and E. L. Piper. 1992. Modifying the response to defoliation during vegetative growth in CERES-Maize. *Agric. Systems* 40:379-392.

Piper, E. L. and A. Weiss. 1993. Defoliation during vegetative growth of corn: The shoot:root ratio and yield implications. *Field Crops Res.* 31:145-153.

Smart, J. R., A. Weiss and D. A. Mortensen. 1993. Modeling the influence of postdirected sethoxydim on corn yields. *Agron. J.* 85:1204-1209.

Arkebauer, T. J., A. Weiss, T. R. Sinclair and A. Blum. 1994. In defense of radiation use efficiency: A response to Demetriades-Shah et al. (1992). *Agric. and For. Meteorol.* 68:221-227.

Preciado-Ortiz, R., A. Weiss and B. E. Johnson. 1995. Developing prototype corn hybrids by crop modeling for specific rainfed regions. *Maydica* (in press).

Weiss, A., N. Budak and P. S. Baenziger. 1995. Using transpiration to characterize plant height in winter wheat in different environments: A simulation study. *Canadian J. of Plant Sci.* (in press).

Book Chapters/Edited Proceedings

Pereira, L. M. R., A. Weiss and F. R. Bidinger. 1993. Analysis of climatic data to determine the frequency of water stress occurrence in Pearl Millet (*Pennisetum americanum* [L.] Leeke). In Proceedings of the Third Annual Scientific Conference of the SADC-Land and Water Management Research Programme, M. Kronen (ed.). SADC-L&WMRP, Gaborone. pp. 52-61.

Weiss, A. 1994. From crop modeling to information systems for decision-making. In J. F. Griffiths (ed.), *Handbook of Agricultural Meteorology*. Oxford University Press, New York. pp. 285-290.

Theses and Dissertations

Boedhram, N. 1992. A comparison of grain yield components between a flex and fixed ear corn hybrid. M.S. Thesis, University of Nebraska-Lincoln.

Sources of Funds:

Funds to support research on this project came from the Agricultural Research Division and external sources. The external funding is outlined below.

U.S. Department of Energy, National Institute for Global Environmental Change, Great Plains Regional Center. July 1, 1993-June 30, 1995. $72,000. Development of a Nested Regional Model for the Conterminous United States and Formation of High Resolution Climate Change Scenarios with an Application to Crop Climate Models. A. Weiss, W. E. Easterling, and L. O. Mearns, Co-Principal Investigators.

Remote Sensing

Project Number: NEB-27-004

Project Title: Remotely Sensed Estimates of Productivity, Energy Exchange Processes and Water Stress in Vegetation

Leaders: Blaine L. Blad and Elizabeth A. Walter-Shea

Project Duration: August 1, 1989-July 31, 1999 (Revised August 1, 1994)

Objectives:

1. Use emitted and reflected radiation from vegetative canopies to detect biophysical properties of vegetation and evaluate plant water stress. Develop equations to describe relationships between spectral responses and biophysical properties and processes.

2. Use remotely sensed data to evaluate the productivity of managed and natural ecosystems; to identify the influence of vegetative community, canopy geometry and illumination angle on reflected and emitted radiation streams; and to utilize spectral data to estimate fluxes of radiation, mass and energy.

Publications (Since the previous review):

Journal Articles

Hall, F. G., P. J. Sellers, I. McPherson, R. D. Kelly, S. Verma, B. Markham, B. Blad, J. Wang and D. E. Strebel. 1989. FIFE: Analysis and Results -- A Review. *Adv. Space Res.* 9:275-293.

Walter-Shea, E. A., J. M. Norman, B. L. Blad and N. Goel. 1989. Leaf bidirectional reflectance and transmittance in corn and soybean. *Remote Sens. Environ.* 29:161-174.

Wiegand, C. L., A. H. Gerbermann, K. P. Gallo, B. L. Blad and D. Dusek. 1990. Multisite analyses of spectral-biophysical data for corn. *Remote Sens. Environ.* 33:1-16.

Walter-Shea, E. A., J. M. Norman, B. L. Blad and B. F. Robinson. 1991. Leaf reflectance and transmittance on soybean and corn. *Agron. J.* 83:631-636.

Starks, P. J., J. M. Norman, B. L. Blad, E. A. Walter-Shea and C. L. Walthall. 1991. Estimation of shortwave hemispherical reflectance (albedo) from bidirectionally reflected radiance data. *Remote Sens. Environ.* 38:123-134.

Murphy, R. E., P. J. Sellers, F. G. Hall, G. Asrar, B. L. Blad, E. T. Kanemasu, R. D. Kelly, B. Markham, D. Strebel and J. R. Wang. 1991. An overview of the FIFE-87 and FIFE-89 Campaigns. *Adv. Space Res.* 11:143-150.

Walter-Shea, E. A., B. L. Blad, C. J. Hays, M. A. Mesarch, D. W. Deering and E. M. Middleton. 1992. Biophysical properties that affect canopy reflectance and estimates of the fraction of absorbed photosynthetically active radiation. *J. Geophys. Res.* 97:18,925-18,934.

Major, D. J., G. B. Schaalje, C. Wiegand and B. L. Blad. 1992. Accuracy and sensitivity analyses of SAIL model-predicted reflectance of Maize. *Remote Sens. Environ.* 41:61-70.

Blad, B. L. and D. S. Schimel. 1992. Measuring and estimating surface reflectances, emittances, and biological processes: A surface radiances and biology group overview. *J. Geophys. Res.* 97:18,829-18,835.

Vining, R. C. and B. L. Blad. 1992. Estimation of sensible heat flux from remotely sensed canopy temperatures. *J. Geophys. Res.* 97:18,951-18,954.

Deering, D. W., E. M. Middleton, B. L. Blad, E. A. Walter-Shea, J. Irons, C. L. Walthall and C. J. Hays. 1992. Prairie grassland bidirectional reflectances measured by different instruments at the FIFE site. *J. Geophys. Res.* 97:18,887-18,904.

Walter-Shea, E. A., B. L. Blad, M. A. Mesarch, C. J. Hays, D. W. Deering and T. F. Eck. 1995. Absorbed photosynthetically active radiation and sun-view geometry effects on remote sensing relationships. *Remote Sens. Rev.* (accepted).

Blad, B. L., E. A. Walter-Shea, M. A. Mesarch, C. J. Hays, P. J. Starks, D. W. Deering and T. F. Eck. 1995. Estimating net radiation with remotely sensed data: Results from KUREX-91 and FIFE Studies. *Remote Sens. Rev.* (accepted).

Mesarch, M. A., E. A. Walter-Shea, B. L. Blad, and E. M. Middleton. 1995. Comparing biophysical properties of the Streletskaya Steppe Reserve and the Konza Prairie. *Remote Sens. Rev.* (accepted).

Starks, P. J., B. L. Blad, E. A. Walter-Shea, C. J. Hays and M. A. Mesarch. 1995. Estimating emitted longwave components of the radiation balance in the KUREX-91 and FIFE studies. *Remote Sens. Rev.* (accepted).

Book Chapters/Refereed Symposium Proceedings

Blad, B. L. 1994. Micro-scale patterns of the climatic elements. In J. F. Griffiths (ed.), *Handbook of Agricultural Meteorology*. Oxford University Press, London. pp. 148-153.

Blad, B. L. 1995. Agricultural meteorology. *McGraw-Hill Encyclopedia of Science and Technology* (in press).

Blad, B. L. 1995. Biometeorology. *McGraw-Hill Encyclopedia of Science and Technology* (in press).

Blad, B. L. 1993. Climatic stresses on plants. Proceedings of Stress Symposia. Mechanisms, Responses, Management; May 24-25, 1993, South Dakota State University, Brookings, South Dakota, pp. 161-163.

Theses and Dissertations

Starks, P. J. 1990. Measured and modeled radiation fluxes from prairie vegetation at the FIFE study site. Ph.D. Dissertation, University of Nebraska-Lincoln.

Zara, P. M. 1992. Towards large area application of remotely sensed surface temperature. Ph.D. Dissertation, University of Nebraska-Lincoln.

Sources of Funds:

Funds to support research on this project come from the Agricultural Research Division and external sources. The external funding is outlined below.

National Aeronautics and Space Administration - Contract. 1987-1994. $619,132. Measuring and modeling near surface reflected and emitted radiation fluxes at the FIFE site. B. L. Blad, J. M. Norman, and E. A. Walter-Shea, Co-Principal Investigators.

National Aeronautics and Space Administration. 1991-1994. $130,525. Surface biophysical properties at the Kursk experiment site. B. L. Blad and E. A. Walter-Shea, Co-Principal Investigators.

Lincoln Water System. 1991-1995. $42,000. Evaluation of residential water utilization under an evaluation and conservation program. B. L. Blad, S. J. Meyer, G. L. Horst, and D. H. Steinegger, Co-Principal Investigators.

National Aeronautics and Space Administration. 1993-1994. $11,453. Konza Prairie Background Bidirectional Reflectance Characterization. E. A. Walter-Shea and B. L. Blad, Co-Principal Investigators.

National Oceanic and Atmospheric Administration. 1993-1995. $300,000. Radiation and Gas Exchange of Canopy Elements in a Boreal Forest. E. A. Walter-Shea, T. J. Arkebauer, and B. L. Blad, Co-Principal Investigators.

National Aeronautics and Space Administration. 1994-1995. $7,329. Laboratory Equipment for the BOREAS Southern Study Area. E. A. Walter-Shea and B. L. Blad, Co-Principal Investigators.

Project Number: NEB-27-011

Project Title: Relationships between Remotely-Sensed Spectral Properties of Vegetative Surfaces and Biophysical Properties

Leader: Elizabeth A. Walter-Shea

Project Duration: December 1, 1991-November 30, 1996

Objectives:

The overall objective of the project is to relate remotely-sensed spectral properties of selected vegetative surfaces to biophysical properties as a means of providing reliable estimates of surface characteristics. To achieve this objective, three subobjectives have been defined:

1. Develop mechanisms using optical spectra for reliably estimating leaf area index and the fraction of absorbed photosynthetically active radiation that are independent of view direction and background of the target scene.

2. Determine statistical correlation between remotely-sensed spectral properties of phytoelements and photosynthesis, stomatal conductance, leaf water potential and chlorophyll content.

3. Develop method of estimating leaf angle distribution from canopy bidirectional reflectance.

Publications (Since the previous review):

Journal Articles

Walter-Shea, E.A., B.L. Blad, C.J. Hays, M.A. Mesarch, D.W. Deering and E.M. Middleton. 1992. Biophysical properties that affect canopy reflectance and estimates of the fraction of absorbed photosynthetically active radiation. *J. Geophys. Res.* 97:18,925-18,934.

Polley, H.W., J.M. Norman, T.J. Arkebauer, E.A. Walter-Shea, D.H. Greegor Jr., and B. Bramer. 1992. Leaf gas exchange of *Andropogon gerardii* Vitman, *Panicum virgatum* L., and *Sorghastrum nutans* (L.) Nash in a tallgrass prairie. *J. Geophys. Res.* 97:18,837-18,844.

Deering, D.W., E.M. Middleton, B.L. Blad, E.A. Walter-Shea, J. Irons, C.L. Walthall and C.J. Hays. 1992. Prairie grassland bidirectional reflectances measured by different instruments at the FIFE site. *J. Geophys. Res.* 97:18,887-18,904.

Walter-Shea, E.A., C.J. Hays, M.A. Mesarch and R.D. Jackson. 1993. An improved goniometer system for calibrating field reference-reflectance panels. *Remote Sens. Environ.* 43:131-138.

Starks, P.J., E.A. Walter-Shea, F. Schebe and B. Markham. 1995. Characterization of the temperature sensitivity of a silicon-detector-based spectroradiometer. *Remote Sens. Environ.* 51:385-389.

Walter-Shea, E.A., B.L. Blad, M.A. Mesarch, C.J. Hays, D.W. Deering and T.F. Eck. 1995. Absorbed photosynthetically active radiation and sun-view geometry effects on remote sensing relationships. *Remote Sens. Rev.* (accepted).

Blad, B.L., E.A. Walter-Shea, M.A. Mesarch, C.J. Hays, P.J. Starks, D.W. Deering and T.F. Eck. 1995. Estimating net radiation with remotely sensed data: Results from KUREX-91 and FIFE Studies. *Remote Sens. Rev.* (accepted).

Mesarch, M.A., E.A. Walter-Shea, B.L. Blad and E.M. Middleton. 1995. Comparing biophysical properties of the Streletskaya Steppe Reserve and the Konza Prairie. *Remote Sens. Rev.* (accepted).

Starks, P.J., B.L. Blad, E.A. Walter-Shea, C.J. Hays and M.A. Mesarch. 1995. Estimating emitted longwave components of the radiation balance in the KUREX-91 and FIFE studies. *Remote Sens. Rev.* (accepted).

Book Chapters

Walter-Shea, E.A. and J.M. Norman. 1991. Leaf optical properties. In R.B. Myneni and J. Ross (eds.), *Photon-Vegetation Interactions: Applications in Optical Remote Sensing and Plant Ecology*, Springer-Verlag. pp. 229-251.

Theses and Dissertations

Cornell, D. 1991. Sun-view-target geometry effects on spectrally-derived vegetation index estimates of absorbed radiation and leaf area. M.S. Thesis, University of Nebraska-Lincoln.

Sources of Funds:

Funds to support research on this project come from the Agricultural Research Division and external sources. The external funding is outlined below.

National Aeronautics and Space Administration. September 15, 1991-September 14, 1993. $130,525. Surface Biophysical Properties at the Kursk Experiment Site. Invited Scientist Program of US/USSR Joint Working Group. E.A. Walter-Shea and B.L. Blad, Co-Principal Investigators.

National Aeronautics and Space Administration. May 1, 1993-April 30, 1994. $11,453. Konza Prairie Background Bidirectional Reflectance Characterization. E.A. Walter-Shea, Principal Investigator.

National Oceanic and Atmospheric Administration. July 1, 1993-June 30, 1995. $300,000. Radiation and Gas Exchange of Canopy Elements in a Boreal Forest. Climate and Global Change Program. E.A. Walter-Shea and T.J. Arkebauer, Co-Principal Investigators.

National Aeronautics and Space Administration. June 14, 1994-June 13, 1995. $7,329. Laboratory Equipment for the BOREAS Southern Study Area. E.A. Walter-Shea, Principal Investigator.

Special ARD Grant Funds:

"Innovative and High Risk Research" Grants Program. July 1, 1993-June 30, 1994. $14,980. Ultraviolet Radiation Interactions in a Vegetative Canopy.

Trace Gas Dynamics

Project Number: NEB-27-003

Project Title: Exchange of Carbon Dioxide and Other Atmospheric Trace Gases in Vegetated Ecosystems

Leader: Shashi B. Verma

Project Duration: April 1988-March 1993
April 1993-March 1998 (Revised)

Objectives:

The overall objective is to improve the understanding of surface fluxes of CO_2 and other atmospheric trace gases (e.g., methane) in selected ecosystems. This effort includes the following subobjectives:

1. Quantify surface exchange rates of carbon dioxide and other trace gases (*e.g.*, methane) in key naturally occurring and managed vegetated ecosystems in order to provide information on seasonal and annual budgets.

2. Evaluate essential microclimatic characteristics (e.g., air temperature, humidity, solar radiation, wind speed, and soil temperature and moisture) in addition to the components of energy budget and mechanisms of turbulent transport of carbon dioxide and other trace gases, to develop a fuller understanding of surface exchange processes in these ecosystems.

Publications (Since the previous review):

Journal Articles

Verma, S. B., J. Kim and R. J. Clement. 1989. Carbon dioxide, water vapor and sensible heat exchanges of a tallgrass prairie. *Boundary-Layer Meteorol.* 46:53-67.

Verma, S. B. 1989. Aerodynamic resistances to transfers of heat, mass and momentum. In *Estimation of Areal Evapotranspiration*. International Association of Hydrological Sciences Publication No. 177, pp. 13-20.

Kim, J., S. B. Verma and N. J. Rosenberg. 1989. Energy balance and water use of cereal crops. *Agric. and For. Meteorol.* 48:135-147.

Hall, F. G., P. J. Sellers, I. McPherson, R. D. Kelly, S. B. Verma, B. Markham, B. L. Blad, J. Wang and D. E. Strebel. 1989. FIFE: Analysis and Results—A Review. *Adv. in Space Res.* (Cospar Publication) 9:275-293.

Kim, J., and S. B. Verma. 1990. Components of surface energy balance in a temperate grassland ecosystem. *Boundary-Layer Meteorol.* 51:401-417.

Verma, S. B. 1990. Micrometeorological methods for measuring surface fluxes of mass and energy. In N. S. Goel and J. M. Norman (eds.), *Instrumentation for Studying Vegetation Canopies for Remote Sensing in Optical and Thermal Infrared Regions*, Special Issue of *Remote Sens. Rev.* 5(1):99-115.

Kim, J. and S. B. Verma. 1990. Carbon dioxide exchange in a temperate grassland ecosystem. *Boundary-Layer Meteorol.* 52:135-149.

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Kim, J. and S. B. Verma. 1991. Modeling canopy photosynthesis: Scaling up from a leaf to canopy in a temperate grassland ecosystem. *Agric. and For. Meteorol.* 57:187-208.

Verma, S. B., F. G. Ullman, D. Billesbach, R. J. Clement and J. Kim. 1992. Eddy correlation measurements of methane flux in a northern peatland ecosystem. *Boundary-Layer Meteorol.* 58:289-304.

Moncrieff, J. B., S. B. Verma and D. R. Cook. 1992. Intercomparison of eddy correlation carbon dioxide sensors during FIFE-1989. *J. Geophys. Res.* 97:18,725-18,730.

Stewart, J. B. and S. B. Verma. 1992. Comparison of surfaces fluxes and conductance at two contrasting sites within the FIFE area. *J. Geophys. Res.* 97:18,623-18,628.

Smith, E. A., A. Y. Hsu, W. L. Crosson, R. T. Field, L. J. Fritschen, R. J. Gurney, E. T. Kanemasu, W. P. Kustas, D. Nie, W. J. Shuttleworth, J. B. Stewart, S. B. Verma, H. L. Weaver and M. L. Wesely. 1992. Area averaged surface fluxes and their time-space variability over the FIFE experimental domain. *J. Geophys. Res.* 97:18,599-18,622.

Kim, J., S. B. Verma and R. J. Clement. 1992. Carbon dioxide budget in a temperate grassland ecosystem. *J. Geophys. Res.* 97(D5):6057-6063.

Norman, J. M., R. Garcia and S. B. Verma. 1992. Soil surface CO_2 fluxes and the carbon budget of a grassland. *J. Geophys. Res.* 97:18,845-18,854.

Desjardins, R. L., R. L. Hart, J. I. MacPherson, P. H. Schuepp and S. B. Verma. 1992. Aircraft and tower-based fluxes of carbon dioxide, latent heat and sensible heat. *J. Geophys. Res.* 97:18,477-18,486.

Nie, D., E. T. Kanemasu, L. J. Fritschen, H. Weaver, E. A. Smith, S. B. Verma, R. T. Field, W. Kustas and J. B. Stewart. 1992. An intercomparison of surface energy flux measurement systems used during FIFE-1987. *J. Geophys. Res.* 97:18,715-18,724.

Kanemasu, E. T., S. B. Verma, E. A. Smith, L. J. Fritschen, M. Wesely, R. T. Field, W. P. Kustas, H. Weaver, J. B. Stewart, R. Gurney, G. Panin and J. B. Moncrieff. 1992. Surface flux measurements in FIFE: An overview. *J. Geophys. Res.* 97:18,547-18,556.

Verma, S. B., J. Kim and R. J. Clement. 1992. Momentum, water vapor and carbon dioxide exchange at a centrally located prairie site during FIFE. *J. Geophys. Res.* 97:18,629-18,640.

Kim, J. and S. B. Verma. 1992. Soil surface CO_2 flux in a Minnesota peatland. *Biogeochem.* 18:37-51.

Verma, S. B., P. J. Sellers, C. L. Walthall, F. G. Hall, J. Kim and S. J. Goetz. 1993. Photosynthesis and stomatal conductance related to reflectance on the canopy scale. *Remote Sens. Environ.* 44:103-116.

Suyker, A. E. and S. B. Verma. 1993. Eddy correlation measurement of CO_2 flux using a closed-path sensor: Theory and field tests against an open-path sensor. *Boundary-Layer Meteorol.* 64:391-407.

Verma, S. B., F. G. Ullman, N. J. Shurpali, R. J. Clement, J. Kim and D. P. Billesbach. 1993. Micrometeorological measurements of methane and energy fluxes in a Minnesota peatland. *SUO* (published by Finnish Peatland Society) 43:285-288.

Shurpali, N. J., S. B. Verma, R. J. Clement and D. P. Billesbach. 1993. Seasonal distribution of methane flux in a Minnesota peatland measured by eddy correlation. *J. Geophys. Res.* 98:20,649-20,655.

Verma, S. B., J. Kim, R. J. Clement, N. J. Shurpali and D. P. Billesbach. 1995. Trace gas and energy fluxes—micrometeorological perspectives. pp. 361-376. In R. Lal, J. Kimble, E. Levine and B. A. Stewart (eds.), *Soils and Global Change*. Lewis Publishers, Chelsea, MI. 440 pp.

Shurpali, N. J., S. B. Verma, J. Kim and T. J. Arkebauer. 1995. Carbon dioxide exchange in a peatland ecosystem. *J. Geophys. Res.* (in press).

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Book Chapters

Verma, S. B. 1994. Measurement of the exchange of heat and mass between the atmosphere and a crop. In J. F. Griffiths (ed.), *Handbook of Agricultural Meteorology*. Oxford University Press, New York. pp. 115-118.

Theses and Dissertations

Kim, J. 1990. Carbon dioxide and energy exchanges in a temperate grassland ecosystem. Ph.D. Dissertation, University of Nebraska-Lincoln.

Garcia, R. 1991. Assimilation and allocation of carbon in the determinate and indeterminate soybeans. Ph.D. Dissertation, University of Nebraska-Lincoln.

Suyker, A. 1992. Eddy correlation measurement of carbon dioxide flux using a closed path sensor. M.S. Thesis, University of Nebraska-Lincoln.

Sources of Funds:

This work has been supported by funds from Agricultural Research Division, Center for Laser-Analytical Studies of Trace Gas Dynamics (Nebraska Research Initiative), and external sources. The external funding is outlined below.

National Science Foundation, Division of Atmospheric Sciences. May 1, 1986-April 30, 1990. $391,750. Carbon Dioxide Exchange and Energy Balance in a Grassland Ecosystem. S. B. Verma, Principal Investigator (co-recipient with N. J. Rosenberg and M. D. Jawson).

National Aeronautics and Space Administration, Goddard Space Flight Center. April 15, 1987-January 14, 1990. $327,000. Measurement and Analysis of Latent and Sensible Heat Flux by Eddy Correlation and Bowen Ratio and of Aerodynamic Characteristics of Vegetation at the FIFE Site. S. B. Verma, Principal Investigator.

National Aeronautics and Space Administration, Goddard Space Flight Center. February 1, 1990-January 31, 1992. $175,995. Investigation of Surface Mass and Energy Fluxes during FIFE. S. B. Verma, Principal Investigator.

National Science Foundation, Atmospheric Chemistry Program. September 1, 1990-August 30, 1993. $493,800. Measurement and Analysis of Methane Fluxes in a Northern Peatland Ecosystem. S. B. Verma, Principal Investigator (co-recipient with F. G. Ullman).

National Institute for Global Environmental Change. July 1, 1993-June 30, 1994. $139,110. A Field Study of Methane and Carbon Dioxide Fluxes in a Boreal Wetland Ecosystem: Measurement and Analysis. S. B. Verma, Principal Investigator (co-recipient with F. G. Ullman).

National Science Foundation and National Aeronautics and Space Administration. May 1, 1993-April 30, 1996. $591,000. Field Micrometeorological Measurements, Process-level Studies and Modeling of Methane and Carbon Dioxide Fluxes in a Boreal Wetland Ecosystem. S. B. Verma, Principal Investigator (co-recipient with F. G. Ullman, T. J. Arkebauer, W. J. Parton, D. S. Schimel and D. W. Valentine).

National Institute for Global Environmental Change, the Great Plains Regional Center. July 1, 1993-June 30, 1996. $438,000. An Integrated Investigation of Methane and Carbon Dioxide in Mid-latitude Prairie Wetlands: Micrometeorological Measurements, Process-level Studies and Modeling. S. B. Verma, Principal Investigator (co-recipient with F. G. Ullman, T. J. Arkebauer, D. S. Schimel, E. A. Holland and D. W. Valentine).

Project Number: NEB-27-008

Project Title: Variables in Agricultural-Weather Information Systems (1990-1994) Climate and Agricultural Landscape Productivity Analysis and Assessment in the North Central Region (1995-1999)

Leader: Kenneth G. Hubbard

Project Duration: October 1990-September 1999

Objectives (1990-1994):

1. Determine spatial and temporal variability and long-term trends of standard and derived climatic variables.

2. Determine the effects of weather and climate variability and change on biological systems and agricultural sustainability.

3. Evaluate potential components and technologies pertinent to improved weather and climate systems.

Objectives (1995-1999):

1.a. Determine the extent, timing, and frequency of anomalous climate events using long-term observation resources in the North Central Region.

1.b. Analyze the climate record for stability and persistence and develop new technologies associated with regional climate resources, instrumentation, and analytical methods.

2. Analyze the climate and soils from the perspective of agricultural landscape structure and diversity in the North Central Region and determine the relationships of climate and soils on agricultural production including: i) spatial and temporal analysis of climate, soils and crop characteristics, and ii) analysis and interpretation of the interrelationships between climate, soils, and crop production.

Publications:

Journal Articles

Robinson, J. M. and K. G. Hubbard. 1990. Soil water assessment model for several crops in the High Plains. *Agron. J.* 82(6):1141-1148.

Meyer, S. J., K. G. Hubbard and D. A. Wilhite. 1991. The relationship of climatic indices and variables to corn (maize) yields: A principal components analysis. *Agric. and For. Meteorol.* 55:59-84.

Hubbard, K. G. 1992. Climatic factors that limit daily evapotranspiration in sorghum. *Climate Res.* 2:(1)73-80.

Meyer, S. J. and K. G. Hubbard. 1992. Nonfederal automated weather stations and networks in the United States and Canada: A preliminary summary. *Bull. Amer. Meteorol. Soc.* 73:449-457.

Meyer, S. J., K. G. Hubbard and D. A. Wilhite. 1993. A crop specific drought index for corn. I. Model development and validation. *Agron. J.* 85:388-395.

Meyer, S. J., K. G. Hubbard and D. A. Wilhite. 1993. A crop specific drought index for corn. II. Application in drought monitoring and assessment. *Agron. J.* 85:396-399.

Hubbard, K. G. 1994. Spatial variability of daily weather variables in the high plains of the USA. *Agric. and For. Meteorol.* 68:29-41.

Hubbard, K. G. and F. J. Flores-Mendoza. 1995. Relating United States cropland use to natural resources and climate change. *J. Climate* 8:329-335.

Deshpande, R. Y., K. G. Hubbard, D. P. Coyne, J. R. Steadman and A. M. Parkhurst. 1995. Estimating leaf wetness in dry bean canopies as a prerequisite to evaluating white mold disease. *Agron. J.* (in press).

Burnside, O. C., R. G. Wilson, S. Weisberg and K. G. Hubbard. 1995. Longevity of buried weed seed in eastern and western Nebraska. *Weed Sci.* (accepted).

Snyder, R. L., P. W. Brown, K. G. Hubbard and S. J. Meyer. 1995. Automated weather station networks. *Advances in Bioclimatology* (in press).

Book Chapters

Hubbard, K. G. 1994. Measurement systems for agricultural meteorology. In J. F. Griffiths (ed.), *Handbook of Agricultural Meteorology*. Oxford University Press, New York. pp. 76-81.

Theses and Dissertations (See Project No. NEB-27-005)

Sources of Funds:

Resources to support research on this project come from the allotments of the Regional Research Fund and the High Plains Climate Center.

Project Number: NEB-27-010

Project Title: Respiratory Release of CO_2 from the Soil under Field Conditions Contributing to the Regional Research Project Number NE-175, Environmental and Genotypic Control of Assimilate Allocation in Grain Crops

Leaders: Shashi B. Verma, Department of Agricultural Meteorology
Timothy J. Arkebauer, Department of Agronomy

Project Duration: October 1, 1990-September 30, 1995

Objectives:

1. To estimate respiratory releases of CO_2 from the soil in selected agricultural crops, native prairie vegetation and other selected terrestrial ecosystems.

2. To measure relevant environmental conditions (aboveground and belowground) that influence soil respiration and analyze their effects on soil respiration rates.

3. To identify the major sources of carbon, both biological and physical, for the CO_2 flux.

4. To develop and test a simulation model of soil respiration that uses the environmental, biological, and physical information identified above to predict the soil surface CO_2 flux.

Sources of Funds:

Resources to support research on this project come from the allotments of the Regional Research Fund.

Project Number: NEB-27-012

Project Title: NRSP-3, The National Atmospheric Deposition Program (NADP) - A Long-term Monitoring Program in Support of Research on the Effects of Atmospheric Chemical Deposition

Leaders: Shashi B. Verma and Mark A. Mesarch

Project Duration: October 1, 1992-September 30, 1997

Objectives:

The overall objective of the National Atmospheric Deposition Program (NRSP-3) is to provide the scientific community, resource managers, and policy makers with information of the highest possible quality on the exposure of both natural and managed ecosystems to biologically important chemical deposition and other stresses resulting from changes in the chemical climate. The specific Nebraska objective is to monitor and analyze the supply of selected chemical substances in precipitation in eastern Nebraska, as part of a national network in cooperation with the NADP (NRSP-3).

Sources of Funds:

Resources to support research on this project come from the allotments of the Regional Research Fund.

Summary of Research Accomplishments

Publications Summary (1990-1995)

Journal Articles (Refereed):

Name of Journal	Number of Publications
Advances in Soil Science, Soils & Global Change	1
Advances in Space Research	3
Agricultural and Forest Meteorology	14
Agricultural Systems	2
Agronomy Journal	8
Biogeochemistry	1
Boundary-Layer Meteorology	4
Bulletin of the American Meteorological Society	3
Canadian Journal of Plant Sciences	1
Climate Research	1
Climatic Change	3
Climatological Bulletin	1
Environmental Entomology	1
Field Crops Research	1
Hydro-Review	1
International Journal of Environmental Studies	1
Journal of Climate	1
Journal of Geophysical Research	15
Journal of Production Agriculture	1
Journal of Sugar Beet Research	1
Journal of Wilderness & Environmental Medicine	1
Maydica	1
Remote Sensing of Environment	6
Remote Sensing Reviews	6
SUO, Published by Finnish Peatland Society	1
Theoretical & Applied Climatology	1
Water International	1
Water Resources Bulletin	1
TOTAL	82

Books/Book Chapters:

Books/Monographs/Edited Proceedings	9
Book Chapters	24

Theses/Dissertations:

M.S. Theses	5
Ph.D. Dissertations	10

Research Citations

The Institute for Scientific Information (ISI) Science Citation Index (SCI) was used to find the number of citations (listed below) of journal articles, books, book chapters, and a few government reports for faculty members for 1990-1994. The SCI is an index to the journal literature of the sciences it covers (i.e., 3,300 major journals across 100 scientific disciplines). It indexes every article in every publication it covers.

Year	Number of Citations
1990	117
1991	137
1992	225
1993	195
1994	219

(External) Research Grants (1990-1995)

Grantor	Number of Grants	Funding ($)
Environment Canada	2	40,000
Lincoln Department of Public Works	4	18,267
Lincoln Water System	2	46,767
National Aeronautics and Space Administration	6	995,434
National Oceanic and Atmospheric Administration	10	773,019
National Science Foundation	6	*1,757,800
United Nations Environmental Programs	2	70,000
United States Department of Agriculture	5	584,845
United States Department of Commerce	5	2,397,000
United States Department of Energy/ National Institute for Global Environmental Change	6	1,069,510
United States Forest Service	1	64,134
Western Regional Climate Center	1	8,700
Winrock International	1	22,887
World Meteorological Organization	2	19,000
TOTAL	**53**	**7,867,363**

* Includes $300,000 for renovation of research laboratories in Chase Hall.

Active Collaboration with Other Institutions (1990-1995)

Institution	Scientists
Battelle/Pacific Northwest Laboratories	N. Rosenberg
Blacklands Research Station, Texas A&M University	P. Dyke
Bureau of Reclamation	T. Phillips
Carnegie Institution of Washington, Stanford, CA	J. Berry
Colorado State University	D. Valentine, T. McKee, D. Ojima, W. Parton, T. Kittel, T. Seastadt, G. Peterson, J. Loftis
Cornell University	W. Knapp
Corps of Engineers	W. Werick, R. Brumbaugh
Environment Canada	A. Malinauskas, J. Masterton, etc.
Environmental Protection Agency	E. Cooter
Illinois State Water Survey	S. Changnon, K. Kunkel
International Institute for Sustainable Development	A. Tyrchniewicz, A. Hanson
International University for Business and Agricultural Technology	A. Miyan
Iowa State University	E. Takle
Kansas State University	J. Ham, S. Welch
Louisiana State University	R. Muller
Michigan State University	S. Gage
National Aeronautics and Space Administration, Goddard Space Flight Center	C. Walthall, D. Deering, E. Middleton, P. Sellers, F. Hall, F. Huemmrich, J. Privette
National Center for Atmospheric Research	D. Schimel, E. Holland, L. Mearns, F. Giorgi, M. Glantz, S. Rhodes, K. Miller, R. Katz
National Oceanic and Atmospheric Administration	W. Bolhofer, D. Rodenhuis, B. Bermowitz
Natural Resources Conservation Service	W. Waltman, C. Walker, D. Johnson, K. Jones, P. Pasteris
Nebraska State Agencies	A. Bleed, M. Bansal, D. Williamson
New Mexico State University	A. Peters
North Dakota State University	J. Enz
Prairie Farm Rehabilitation Administration	R. Herrington
South Carolina Water Resources Commission	D. Smith
United Nations Environment Program	P. Usher
United Nations Sudano-Sahelian Office	T. Jallow
United States Department of Agriculture, Water Conservation Laboratory, Phoenix, Arizona	R. Jackson
United States Department of Agriculture, Agricultural Research Service, University of Florida	T. Sinclair
United States Department of Agriculture, Agricultural Research Service, Durant, OK	P. Starks
United States Department of Agriculture, Forest Service, Grand Rapids, MN	E. Verry
University of Minnesota	D. Baker, M. Seeley
University of Wisconsin	J. Norman
Western Regional Climate Center/Desert Research Institute	R. Reinhardt, K. Redmond
World Meteorological Organization	V. Boldirev, D. Rijks, G. Kove
York University	J. Miller

Challenges and Concerns

Continued and Enhanced Support for Current Programs

Our research program is recognized for its excellence within the University, the state, the nation, and in many foreign nations. This program is consistent with the IANR Strategic Plan. The department's primary research goal is to maintain current programs at a level of excellence. To accomplish this goal will require continued and increased financial support from IANR, including an increase in technician support and operating funds. Maintaining excellence in these programs and enhancing financial support is the department's highest priority.

Heavy Dependence on Grant Funds

The strength of the department's research program is heavily dependent on external funding. Given the quality of our faculty and their collective research programs, we are optimistic about future funding opportunities. However, we are also well aware of the current budget climate and the vulnerability of our research programs to reductions in funding. This heavy reliance on external funding may have serious implications for our ability to maintain continuity in research programs. We are therefore requesting the IANR administration to develop a contingency plan that, in the event of reduced funding, provides program support on a temporary basis while adequate funding is sought.

Suggested New Programs

We have identified two new programs that will enhance and expand our research capabilities and expertise. These programs are Ecosystem Carbon Cycle Modeling and Bio-Environmental Meteorology (see section 10 under departmental action plans for more detailed descriptions of these programs). We welcome any insight and counsel the review team might provide us on these programs.

Interdisciplinary Activities

Faculty in the department have a history of working with colleagues from within and outside the University of Nebraska. It is our view that greater coordination of programs in agricultural meteorology, meteorology, hydrology, remote sensing, and geographic information systems would enhance research funding opportunities and strengthen academic programs at the University of Nebraska. It is our intent to continue to pursue the development of such a program and provide leadership as necessary. We welcome the insight and counsel of the review team on this matter.

Graduate Students

We would like to expand the number of graduate research assistantships in the department, support for which would come mostly from externally funded projects. Given some of the current concerns about the recruitment and future placement of graduate students, we invite any insight and counsel the review team can provide us regarding the desirability of increasing our graduate student numbers. Would we be better off instead to strengthen our programs for postdoctoral fellows, research technologists, and visiting scientists?

Space and Facilities

Even with recent and planned changes, the department will have inadequate office and laboratory space. Additional space would also enhance the activities and visibility of the five centers housed in the department. We need a new building or a significant portion of some renovated space to bring the department together in one location and to eliminate overcrowding conditions. We invite suggestions from the panel on dealing with this issue.

Academic Program

Personnel

Faculty

Dr. Blaine L. Blad, Head and Professor	(0.10 FTE)
Dr. William E. Easterling, Associate Professor	(0.00 FTE)
Dr. Kenneth G. Hubbard, Professor	(0.10 FTE)
Dr. Shashi B. Verma, Professor	(0.15 FTE)
Dr. Elizabeth A. Walter-Shea, Associate Professor	(0.15 FTE)
Dr. Albert Weiss, Professor	(0.15 FTE)
Dr. Donald A. Wilhite, Professor	(0.15 FTE)

Staff

Ms. Deanna Batty, Secretary	(0.00 FTE)
Mrs. Lois J. Erickson, Accounting Clerk	(0.04 FTE)
Mr. Mark A. Mesarch, Technologist	(0.00 FTE)

Introduction

The Department of Agricultural Meteorology has an assigned FTE for teaching of 0.74. Recent calculations by the College of Agricultural Sciences and Natural Resources show that we teach the equivalent of 1.4 FTE. We offer three undergraduate/graduate classes, four graduate classes, research-related courses (such as Independent Study in Agricultural Meteorology, Masters Thesis, Doctoral Dissertation, etc.) and a seminar. The department has M.S. and Ph.D. degree programs, usually administered through the Department of Agronomy, which has recently added a specialization in Agricultural Meteorology. Students who enter our program with an engineering degree may be admitted through the Department of Biological Systems Engineering.

In consultation with their faculty advisor, students select their own graduate committee (usually three faculty members for the M.S. degree and five for the Ph.D. degree). The committee members reflect the student's research interests. At least one member of the committee must represent an outside department. Soon after the formation of a student's committee, the student is required to present a detailed proposal of his/her research program to the committee. The student also presents research progress to fellow students, staff, and faculty at least once a year, generally at a spring seminar.

In keeping with goals outlined in the 1989 Self-Study Report, the department has added Climate Impacts on Society, Bio-Atmospheric Instrumentation, and Crop Growth and Yield Modeling. The Agricultural Climatology course has been revised and taught. Course materials for Bio-Environmental Climatology are being developed. Laboratory facilities and equipment are being

obtained for the Bio-Atmospheric Instrumentation course. We now have our program listed in the University of Nebraska Admissions Guide and the Graduate Studies Bulletin (see section 10 for details). We have developed new brochures for recruitment and have appointed a formal recruitment committee. We are developing a departmental home page on the World Wide Web, which will also help in our recruitment efforts.

Departmental Courses

408/808. Microclimate: The Biological Environment (also Agron, FF&W, Geog, Hort; BioSci 457/857; Water Sci 408), 3 cr (offered fall semester every year). Prereq: Math 106 or equivalent, 5 hrs physics and junior standing in any of the physical or biological sciences or engineering, or by permission. The physical factors that create the biological environment. Radiation and energy balances of earth's surfaces, terrestrial, and marine. Temperature, humidity, and wind regimes near the surface. Control of the physical environment through irrigation, windbreaks, frost protection, manipulation of light, and radiation. Applications to air pollution research. Instruments for measuring environmental conditions and remote sensing of the environment.

Year	AgMet Students	Other Graduates	Undergraduates	Total
1990				20
1991	1	14	18	33
1992	3	16	5	24
1993	5	20	10	35
1994	1	27	9	37

Instructors: Dr. Blaine L. Blad; Dr. Shashi B. Verma; Dr. Elizabeth A. Walter-Shea

450/850. Climate and Society (also Agron., Geog., MSysMgt), 3 cr (offered second semester odd-numbered calendar years). Prereq: Geog 252 or Geog 350 or equivalent or permission of instructor. Junior standing in agriculture, any of the physical or biological sciences or engineering, or by permission. Identify the impact of climate and extreme climatic events on society and societal responses to those events. The course is global in scope and interdisciplinary.

Year	AgMet Majors	Other Graduate	Undergraduate	Total
1988	6	0	0	6
1991	4	1	4	9
1993	6	2	6	14
1995	5	7	6	18

Instructor: Dr. Donald A. Wilhite

469/869. Bio-Atmospheric Instrumentation (also Agron, FF&W, Geog, MSysMgt 469/869; Hort 407/807) 3 cr (offered fall semester of odd-numbered calendar years) (Lec 2/Lab 1) Prereq: Math 106, 4 hrs physics and junior standing as physical or biological science major. Discussion and hands-on application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.

Year	AgMet Majors	Other Departments	Non Registered	Total
1991	3	7	6	16
1993	7	4	1	12

Instructor: Dr. Kenneth G. Hubbard

496/896. Independent study in Agricultural Meteorology (1-5 cr I, II, III). Prereq: 9 hrs agricultural meteorology or closely-related fields and permission. Individual or group projects in research, literature review, or extension of course work under supervision and evaluation of a departmental faculty member.

Instructors: Entire faculty in Department of Agricultural Meteorology

899. Masters Thesis (6-10 cr) P/N only.

Instructors: Entire faculty in Department of Agricultural Meteorology

906. Crop Growth and Yield Modeling (also Agron, FF&W 906). 3 cr (Lec 2, lab 2 (offered spring semester of even-numbered calendar years). Descriptive and explanatory crop growth and yield models will be studied in detail. Descriptive models will focus on yield predictions using easily available inputs while the processes that lead to yield will be examined in explanatory models. Prereq: AgMet 408/808 (also Agron, FF&W, Geog, Hort, BioSci 457/857) or equivalent; experience in programming in a high-level computer language.

Year	AgMet Majors	Other Graduates	Total
1991	1	4	5
1992	5	3	8
1994	4	1	5

Instructor: Dr. Albert Weiss

907. **Agricultural Climatology** (also Agron, FF&W, Hort 907; Geog 952) 3 Cr 2 hr lec, 2 hr lab (offered spring semester of odd-numbered calendar years). Analysis and use of climatological data as applied to agricultural activities and the use of climatological information to assist in decision making. Prereq: AgMet, Agron, FF&W, Geog, Hort; Water Sci 408; BioSci 457/857; Biomet 801 or equivalent or by permission.

Year	AgMet Majors	Other Graduates	Total
1993	6	5	11
1995	5	3	8

Instructors: Dr. William E. Easterling; Dr. Albert Weiss

908. **Solar Radiation Interactions at the Earth's Surface** (also Agron, FF&W, Geog, Hort 908), 3 cr II (Offered spring semester of even-numbered calendar years). Prereq: Math 208, AgMet 408/808 (also Agron, FF&W, Geog, Hort; BioSci 457/857; Water Sci 408) or equivalent or by permission. Quantitative study of radiative transfer to the earth's surface and subsequent interactions of radiation with vegetative components and underlying surfaces. Applications of canopy radiative modeling and remote sensing techniques, particularly in understanding land-surface processes, are discussed.

Year	AgMet Majors	Other Graduates	Total
1990	8	4	12
1992	2	6	8
1994	5	2	7

Instructor: Dr. Elizabeth Walter-Shea

909. **Seminar in Agricultural Meteorology**, 1 cr per year, max 3 cr I, II. Prereq: Agron 901A or equivalent and permission. Presentation of special non-thesis topics, presentation of research plans and procedures, and presentation of M.S. and Ph.D. thesis research. Required of all AgMet graduate students.

Instructors: Entire faculty in Department of Agricultural Meteorology, seminar chair on a rotating basis.

958. Turbulent Transfer in the Atmospheric Surface Layer, 3 cr (offered in second semester odd-numbered calendar years). Prereq: Math 220 or 221, MEngr 318 or MechAg 808, or equivalent or permission. Detailed study of turbulence mechanisms and characteristics needed to evaluate the exchanges of energy and matter in the atmospheric surface layer. Mass, momentum, and energy balance equations. Turbulent kinetic energy balance. Stratified flows. Stability parameters. Special emphasis will be placed on turbulent transport over natural and vegetated surfaces. Flux-profile relationships. Turbulence spectra. Experimental observations. Discussion of pertinent applications, e.g., aerial dispersal of pollutants and spores, aerial application of chemicals, wind energy. Instrumentation and data-logging in turbulence research.

Year	AgMet Majors	Other Graduates	Total
1988	3	1	4
1991	5	2	7
1993	2	3	5
1995	4	1	5

Instructor: Dr. Shashi B. Verma

996. Non-dissertation Research and Special Problems in Agricultural Meteorology; 1-6 cr, I, II, III. Prereq: Permission. Supervised non-dissertation research and independent study.

Instructors: Entire faculty in Department of Agricultural Meteorology

999. Doctoral Dissertation (cr arr). P/N only.

Instructors: Entire faculty in Department of Agricultural Meteorology

Graduate Program and Information

Graduate Student Information (Comparing 1990 with 1994 and 1995)

Number of assistantships available and stipends

Year	Assistantships		Average Stipend	
	State	Grant	MS	PhD.
5 years ago (1990)	0	8	$ 9,900	$11,400
Last year (1994)	1	10	$10,060	$11,500
Current year (1995)	1	10	$11,150	$12,900

Number of majors at M.S. and Ph.D. levels

Year	MS Degree	Ph.D. Degree
5 years ago (1990)	6	8
Last Year (1994)	4	10
Current year (1995)	6	8

Number of domestic and foreign students

Year	MS Degree	Ph.D. Degree
5 years ago (1990)	4 (domestic) 2 (foreign)	4 (domestic) 4 (foreign)
Last Year (1994)	1 (domestic) 3 (foreign)	3 (domestic) 7 (foreign)
Current year (1995)	2 (domestic) 4 (foreign)	3 (domestic) 7 (foreign)

Number of degrees awarded

Year	MS Degree	Ph.D. Degree
5 years ago (1990)	0	3
Last year (1994)	1	1
Current year (1995)	2	1

First Job of Students Who Completed M.S. and Ph.D. Degrees During the Last Five Years

M.S.

Active duty in the Air Force (2 students)
Ph.D. program - Department of Agricultural Meteorology, UNL
Ph.D. program - Department of Agronomy, UNL
Office of Naval Research, Antarctic Research
Natural Resources Commission, State of Nebraska

Ph.D.

Post-doctoral research associates - Department of Agricultural Meteorology, UNL (2 students)
Post-doctoral research associate - South Central Research & Extension Center, UNL
Post-doctoral research associate - USDA-ARS, Phoenix, AZ
Tennessee Valley Authority, Muscle Shoals, AL
Instituto Agronomico de Campinas, Seção de Climatologia Agrícola, Campinas, Sao Paulo, BRAZIL
Universidad de Guadalajara, Centro Universitario de Ciencias Biologicas y Agropecuarias, Guadalajara, Jalisco, MEXICO
NOAA, Climate Applications Branch, University of Missouri-Columbia

Challenges and Concerns

Challenges

- Develop a Global Climate Change course and a Bio-Environmental Climatology course.
- Establish a M.S. degree program.
- Offer an undergraduate minor in Bio-Atmospheric Sciences.
- Recruit highly qualified, motivated students with a wide diversity of cultural backgrounds from several different academic disciplines.
- Incorporate latest research findings in all courses.
- Continually update course material and incorporate various teaching methods as appropriate to provide a classroom environment that promotes active learning.
- Provide more opportunities for graduate students to gain practical experience in teaching and proposal writing.

Concerns

- Many faculty have small percentages of FTE allocated to teaching. Professional improvement activities, such as incorporating computer technology into the classroom, and revision of course content require an effort that will likely exceed the FTE assigned to teaching. How does one maintain an active, high quality teaching program without neglecting other components of one's appointment?
- Courses in this department attract students from many other disciplines with varied backgrounds. Considering this wide variation in backgrounds and types of courses these students have taken, how can we teach our courses at levels appropriate for these students?
- How do we overcome the pragmatic but narrow view of students (particularly undergraduate) who want to obtain "what they perceive they need to know to get a job"? How do we broaden their critical thinking skills for synthesizing information?
- What can be done to attract additional teaching funds to support current and future course offerings.
- Should we add additional FTE in teaching considering the impact that this will have on our research and outreach programs? Should we seek a teaching assistantship to enhance graduate student participation in departmental courses?

Outreach Programs (Extension Education and Scholarly Service)

CES[1] and SS[2] Personnel

Faculty

Dr. Blaine L. Blad, Professor	(0.10 FTE - CES)
Dr. William E. Easterling, Associate Professor	(0.15 FTE - CES)
Dr. Michael J. Hayes, Assistant Professor	(0.40 FTE - SS)
Dr. Kenneth G. Hubbard, Professor	(0.20 FTE - CES, 0.20 FTE - SS)
Dr. Steven J. Meyer, Assistant Professor	(0.50 FTE - CES)
Dr. David E. Stooksbury, Assistant Professor	(0.60 FTE - SS)
Dr. Albert Weiss, Professor	(0.15 FTE - CES)
Dr. Donald A. Wilhite, Professor	(0.35 FTE - SS)

Staff

Mr. Soheil Ameri, Computer Programmer/Analyst
Mrs. Deanna Batty, Secretary
Mr. Karl Blauvelt, Electronics Technician
Mr. John Draves, Research Technologist
Mr. Allen Dutcher, State Climatologist/Operations Climatologist
Mrs. Lois Erickson, Accounting Clerk
Mrs. Shellie Hanneman, Data Technician
Ms. Cindy Hays, Research Technologist
Mr. James Hines, Computer Systems Analyst
Mrs. Sharon Kelly, Secretary
Mrs. Kelly Smith, Information Specialist
Mr. Mark Svoboda, Climate/Water Resources Specialist
Mr. Mathew Werner, Climate Resources Specialist
Mrs. Vicki Wilcox, Secretary
Ms. Deborah Wood, Editorial Assistant

Cooperative Extension Program

The Cooperative Extension System (CES) is a partnership between the U.S. Department of Agriculture and the land-grant universities established by the Smith-Lever Act of 1914. In the last decade CES has changed its focus from service to education. The elements of CES are

[1]CES is the Cooperative Extension System.

[2]SS is the Scholarly Service program.

program planning, evaluation, delivery, and reporting. Faculty activities are aimed at achieving the goals of one or more Education Action Plans. Evaluation is used to determine if a program met desired outcomes, identify program impact, establish documentation and provide accountability. The state counties are grouped into Education Programming Units (EPUs) which are arranged in districts. The program delivery model for Nebraska involves both Extension specialists and Extension educators working together on the development, delivery, and evaluation of programs. Faculty in the Department with CES appointments are "Specialists". Specialists provide educational opportunities, develop materials and program guidance via Education Action Plans, provide leadership for the delivery of joint programs, build coalitions at district, state and multi-state levels, and translate and interpret research data for educational use. "Educators", formerly county agents, participate in program development and delivery, provide UNL representation at local levels, build coalitions between EPUs, and create awareness in clientele by applying knowledge, skills, and education at the local level. This team effort in Nebraska delivers in-depth educational programs within the EPUs and districts. Specialists report their contacts in a monthly statistical report and their significant accomplishments in the CES section of the Annual Report of Faculty Activities. Specialists also participate in the preparation of annual reports for those Education Action Plans wherein they had involvement.

CES Specialists in the Department of Agricultural Meteorology apply their efforts within the statewide plan of work comprised of all Education Action Plans. Departmental faculty have been involved in the following specific Education Action Plans:

- Agricultural competitiveness and profitability
- Crop production efficiency-culture and fertility
- Natural resources and environmental management
- Natural resources and environmental education related to youth
- Plant protection-disease, insect, and weed management
- Safe and adequate domestic water supply
- Soil water conservation
- Sustainable agricultural systems
- Youth science and technology programs

The Cooperative Extension System is now engaged in planning for the next four year cycle of activities. Current action plans end on September 30, 1995. From listening sessions held across the state, six action areas have been identified:

- agricultural profitability and sustainability
- strengthen Nebraska communities
- water quality
- food safety and quality
- children, youth and families at risk
- waste management

A workshop was held on April 13, 1995 to discuss these areas and to identify themes and desired outcomes for the action plans for the next four year cycle. Writing teams have drafted 15 action plans now being circulated for comments and the formation of implementation teams. The 15 new action plans are:

Integrated Crop Management
Integrated Animal Systems Management
Sustainable Families
Work/Family Policy to Support Families/Communities
Youth Learning Personal Responsibility
Assuring Safety of Processed Food
Education for a Safe Food Supply
Health Policy
Prevention & Avoiding High Risk
Economic Development
Leadership Development
Community Development
Ag & Natural Resources Policy
Residential Environment
Natural Resources & Environmental Management

Scholarly Service Program

Appointments in scholarly service are administered through the Agricultural Research Division. Scholarly service appointments are given for essential service areas that require creativity and leadership which do not fit into traditional research, teaching, and extension appointments. Individuals with scholarly service (SS) appointments are expected to conceptualize, collect, and disseminate data and information and provide training to appropriate clientele. Clientele include colleagues in the department, institute, or university as well as members of the state, national, and international communities. Some of the goals of the SS program are to:

- develop and disseminate information relevant to drought assessment, response, and mitigation activities,
- develop, test and implement data collection systems,
- monitor and interpret the impact of climate on natural resources (e.g., wind and solar energy development),
- conduct information delivery and education on preventive actions that reduce the risk of drought

Faculty CES and SS Programs

Blaine L. Blad

GOALS

My role in outreach is totally administrative, although I participate in 3 or 4 outreach events each year such as Groundwater Festivals, State Fair Exhibits, and Girl Scout Demonstrations. My main goal is to help the department develop a strong, coordinated outreach program. I am interested, particularly, in promoting and being involved in K-12 and urban programs.

AUDIENCE

My audience is primarily administration and faculty, teachers and students in K-12, and the public interested in urban water conservation programs.

PROGRAM DELIVERY

My interactions are mainly face-to-face in small group presentations. Some information is provided through news media and through computer interfaces.

ACTIVITIES AND IMPACTS

The department's primary CES and SS goal is to strengthen its role and efficiency in delivery of climate information to the general public, K-12 students and teachers, and policy makers. The urban water conservation program is designed to help municipalities adopt conservation practices that will lead to savings in energy, water and financial resources.

SOURCE(S) OF FUNDS

Appropriated.

William E. Easterling

GOALS

My goals are to provide the expanding network of natural resource managers/decision makers, extension specialists and educators, policy makers and the public (in Nebraska, the Great Plains, and at the national and international level) with an understanding of the facts, uncertainties and risks concerning possible future climate change; and to expand the body of documentable evidence focusing on global environmental change, which builds on programmatic thrusts of the Great Plains Regional Center for Global Environmental Change (GPRC).

Most activities are reported under the action plans on Promoting Sustainable Agricultural Systems, with the remainder being reported under Soil and Water Conservation, Natural

Resources and Environmental Management, and Provide Safe and Adequate Domestic Water Supply. I am especially interested in portraying climate as a renewable natural resource to be understood and managed accordingly.

AUDIENCE

The audience includes resource managers (e.g., foresters, Natural Resource District staff, conservation practitioners), cooperative extension personnel, agricultural producers, government decision makers (e.g., Natural Resources Commission,), and scientists.

PROGRAM DELIVERY

Program delivery is achieved through semi-technical written reports, oral presentations, and the use of physical models.

ACTIVITIES AND IMPACTS

- Developed a sound, peer-reviewed program on the consequences of climate change for the Great Plains region through the GPRC. Several proposals to develop outreach protocols have been developed.

- Integrated interlinking elements of the GPRC to develop an outreach component through a workshop of funded PIs. Discussions have been initiated with CES faculty to develop a GLOBE project to train high school teachers on issues of global change using GPRC funds.

- Developed physical models of climate-vegetation and climate-renewable energy systems for use at fairs, groundwater festivals, field days and the like. These models have received positive feedback from audiences.

- Initiated projects on the implications of climate change for Nebraska's agriculture and natural resources, based on discussions with IANR-R&E faculty.

- Assisted in the organization and conduct of a workshop for practitioners and researchers on sustainable development in the North American Great Plains.

- Co-organized and helped lead IANR Earthbound activities.

SOURCES OF FUNDS

The primary source of funds are appropriated funds supplemented with some support from the National Institute for Global Environmental Change in the Office of Health and Environmental Research of the U. S. Department of Energy and the U.S.D.A. Forest Service.

Michael J. Hayes

GOALS

My goals are to develop user products on drought mitigation and preparedness technologies for individuals in the public and private sectors; assist in the development of information delivery systems; routinely disseminate information on drought mitigation technologies and climate impact assessment procedures; and train users in the application of drought mitigation technologies for management of natural resources.

AUDIENCE

The primary audiences for this program are local, state, and federal government officials, regional organizations, universities, environmental and special interest groups, and the private sector.

PROGRAM DELIVERY

Delivery will be through the National Drought Mitigation Center's WWW home page, user workshops, conferences, publications, and personal contacts.

ACTIVITIES AND IMPACTS

This program was initiated August 1995. An assessment of impacts is premature.

SOURCES OF FUNDS

The primary sources of funds for this activity are the National Drought Mitigation Center and International Drought Information Center, and state and federal agencies.

Kenneth G. Hubbard

GOALS

My primary goal is to increase the availability of quality climate data in the High Plains region and encourage the use of climate information for the purpose of gaining economic and intrinsic benefits. In large part, I do this by administering and participating in the programs of the High Plains Climate Center (HPCC) (see section 9). My appointment is divided into extension and scholarly service.

I have participated in extension activities under the Promote Sustainable Agricultural Systems and the Natural Resources and Environmental Management action plans. I am primarily interested in using climate data to identify practices that are environmentally sound and profitable and in assessing the potential for atmospheric (wind and solar) renewable resources.

In scholarly service I have designed, tested, and implemented data collection systems for use by university researchers and other scientists.

AUDIENCE

The audience includes decision makers, planners, and scientists in agricultural, construction, energy, legal, recreation, transportation, and water sectors.

PROGRAM DELIVERY

Delivery mechanisms include newsletters, presentations, workshops, and special computer interfaces like WWW home page and HPCC WEATHER Online System. Articles in magazines and journals as well as HPCC reports provide new information to targeted audiences.

ACTIVITIES AND IMPACTS

- Provided successful administration of the High Plains Climate Center. Have assembled an effective staff and provided useful climate services.

- Developed computer access (telephone and internet) to recent weather data and information. Clientele regularly access (6,000/year) and use this information in decision making.

- Developed interactive computer access (telephone and internet) to historical climate data. Interest is high in this new system and accesses should increase to record levels.

- Delivered lawn water use estimates to urban audiences through the WeatherChannel. Homeowners and businesses have access to quantitative data on lawn water use enabling them to save water energy and money.

- Organized and co-hosted the Workshop on Long-Lead Climate Forecasts Out to a Year for the High Plains Region. Approximately 50 individuals were trained in the use of long-lead climate forecasts so that they will be able to conduct better long-range, weather-related planning.

- Developed robots for scanning canopies and canopy components. Students and colleagues have used this new automated system.

- Developed special monitoring systems for use in livestock feeding, aquaculture, leaf wetness, and windbreak studies. Research has benefitted from the analysis of the resulting data sets, which will result in improved recommendations.

- Managed a special, regional weather network for environmental monitoring. Over 130 stations have been assembled and used to collect data for climate impacts statements.

- Co-organized Earthlink Satellite Video Conference to inform about 60 educators about the latest developments in global change.

SOURCES OF FUNDS

The major funding sources are Department of Commerce, NOAA/NWS grants to the High Plains Climate Center, and appropriated funds. Other funding sources include the USDA Global Change Office. Many small grants ($1,000/year) from local and state government agencies support automated weather stations.

Steven J. Meyer

GOALS

My primary goals are to inform the public of weather and climate impacts on the region's agriculture and water supply; to provide information that will help with decision making processes that depend, to a great extent, on weather and climate; to enhance Nebraskans' understanding of the role of weather and climate in the development of the state's natural environment, and to increase public awareness (particularly Nebraska's youth) of environmental issues and Nebraska's natural resource base and management of its environment.

My extension activities are reported under the Natural Resources and Environmental Management and Natural Resources and Environmental Education Related to Youth action plans. I also have some involvement with the Agricultural Competitiveness and Profitability and 4-H Youth Science and Technology Program action plans.

AUDIENCE

My audience includes farmers and ranchers; businesses with a special interest in High Plains agriculture; policy makers; scientists in the agricultural, energy, and water sectors; K-12 students, teachers and parents; and the general public.

PROGRAM DELIVERY

Delivery systems include: a monthly newsletter (*Climatic Impacts in the High Plains*) describing the general climatic conditions and the impact of climate on High Plains agriculture and the region's water supply; workshops to demonstrate how to generate and use climatic probabilities in decision making processes; the development of NebGuides and NebFacts, extension literature, to provide practical, applied information; presentations to school children at annual water festivals; a Weather Club which meets weekly for one hour after school; and a weather exhibit at Pioneers Park Nature Center. Information is provided through newsletters, workshops, presentations, exhibits, and new and revised publications such as NebGuides and NebFacts.

ACTIVITIES AND IMPACTS

- Published the *Climatic Impacts in the High Plains* newsletter to keep 360 individuals informed on a monthly basis about the affect of climate on the region's agriculture and water supply.

- Co-organized and presented several sessions at the *Long-Lead Seasonal Climate Outlook Workshop*. This led to the education of approximately 60 potential users of the National Weather Service's new product.

- Prepared NebGuides and NebFacts to inform and update Nebraska's county extension educators and the public.

- Described climatic aspects of the hydrologic cycle at 4-6 children's water festivals each year, thereby helping 1000-1500 children to understand the importance of Nebraska's groundwater resources.

- Enriched the science unit on weather for 24 fifth and sixth graders at West Lincoln Elementary School by developing a Weather Club to provide opportunities for atmospheric lab experiments, hands-on computer demonstrations, care and handling of instruments, and taking weather observations.

- Enhanced Nebraskans' understanding of the role of weather and climate in the development of the state's natural environment by developing a weather exhibit at Lincoln's Pioneers Park Nature Center.

SOURCES OF FUNDS

Support is provided from appropriated funds, Department of Commerce NOAA/NWS grants to the High Plains Climate Center, and the Cooperative Extension/4-H Youth Program.

David E. Stooksbury

GOALS

My primary goal is to provide climate impact information and interpretation for the energy sector in the High Plains region, with concentration on the impact of climate on wind and solar energy development. Other goals are related to the impact that climate has on environmental and resource management.

AUDIENCE

My primary audience is the energy sector organizations in the High Plains region along with K-12 teachers and citizens groups.

PROGRAM DELIVERY

Information is provided through personal contacts, newsletters, presentations (K-12 teachers and civic groups), NebGuides, NebFacts, and workshops.

ACTIVITIES AND IMPACTS

- Worked with Nebraska Power Association (NPA) to monitor wind at eight sites. Data will be available to the public via the HPCC Online system. Presented information on wind energy to civic and educational groups to encourage more use of wind power in Nebraska.

- Delivered weekly and monthly Heating Degree Days (HDD) summaries and weekly HDD forecasts on DTN. This information will lead to reduced energy use and financial savings for industry and homeowners.

- Assisted in planning and conducting the Workshop on Long-Lead Climate Forecasts.

SOURCES OF FUNDS

The primary source of funding is from Department of Commerce NOAA/NWS grants to the High Plains Climate Center, supplemented with funds from the NPA wind energy monitoring program.

Albert Weiss

GOALS

My primary goal is to supply climate information during the growing season to agricultural specialists on campus and at the Research and Extension Centers, state (Natural Resources Commission, Department of Agriculture, Governor's Policy Research Office) and federal agencies (ASCS and Nebraska Agricultural Statistics). I report my activities under the Crop Production Efficiency - Culture and Fertility and Plant Protection - Disease, Insect, and Weed Management action plans.

AUDIENCE

The audience consists of specialists and other information providers in state and federal agencies.

PROGRAM DELIVERY

A major output is a weekly summary of the influence of climate on agricultural activities across the state sent via facsimile to the above audience late Monday afternoon. Summaries of the past week's weather data from the AWDN and reports from specialists throughout the state are reviewed for the most salient features and information developed into a two- or three-paragraph report. Also included in this report are weather forecasts from the National Weather Service for periods of 1-2 days, 3-5 days, and 6-10 days.

ACTIVITIES AND IMPACTS

- Prepared news releases and radio tapes. The public is better able to make informed choices and planning efforts are more efficient due to increased knowledge.

- Participated in the satellite TV program "Ag Briefings" for two years.

- Co-authored a NebGuide on Cercospora leaf spot in sugarbeet and its prediction. As a result, sugar beet growers are better able to treat for this disease.

- Chaired the Ag Climate Situation Committee and furnished the Ag Climate Update for 22 departments and agencies since 1992. (1995 Survey indicates strong support for continuation of Ag Climate Update.). Summaries were published in papers and special radio tapes were recorded. As a result, the producers were able to solve planting management and harvesting operations.

SOURCE OF FUNDS

Appropriated funds.

Donald A. Wilhite

GOALS

My goal is to motivate clientele to develop and implement anticipatory or preventive actions that reduce the risk associated with drought. These actions are intended to promote self-reliance and, ultimately, reduce vulnerability to future drought events and the need for government intervention in the form of disaster relief.

AUDIENCE

The audience is local, state, and federal agencies, regional organizations, scientists, special interest groups, and the private sector. My audience also includes international and nongovernmental organizations, foreign governments, and scientists.

PROGRAM DELIVERY

Information is delivered through programs of the International Drought Information Center (IDIC) and the National Drought Mitigation Center (NDMC). Primary delivery mechanisms include a newsletter (*Drought Network News)*, a home page, seminars, workshops, and conferences.

ACTIVITIES AND IMPACTS

- Organized and conducted three regional training seminars on drought management and preparedness in the developing countries of Africa, Latin America, and Asia.

Workshops have made governments and regional/international organizations more aware of drought issues, and preparedness strategies and methodologies, and have stimulated the organization of some national seminars (e.g., Brazil, the Philippines, China, South Africa, and Uruguay).

- Wrote a guidebook on drought preparedness for developing countries for the U.N. Environment Program. This book has served as a guide for the development of proactive drought management plans.

- Assisted in the initiation of a water conservation program for the City of Lincoln. This program has promoted water savings for the City of Lincoln through educational programs directed at K-12 and adult groups, through partnerships with local nurseries to "plant water wise", and by disseminating lawn watering information to homeowners.

- Developed a framework for drought preparedness for the U.N. Sudano-Sahelian Office, which was used in preparation for the International Convention on Desertification, held in Paris in June 1994. Advised the WMO World Climate Program on drought and desertification issues in preparation for this convention.

- Organized and conducted national and regional conferences on drought management. These conferences stimulated networking on the part of state and federal water/drought officials and contributed to the development of the National Drought Mitigation Center. Discussions continue on the development of an integrated climate monitoring system for the western United States.

- Developed and modified a 10-step planning process for a model to develop drought preparedness plans. This process has been and is being used by several states in formulating state drought plans.

- Assisted regional organizations (e.g., SUDENE, SARCCUS, and CORECA) in drought planning strategies.

- Organized and hosted a joint U.S./Canadian symposium, *Planning for a Sustainable Future: The Case of the North American Great Plains*, in May 1995, aimed at helping provide for a sustainable future for the Great Plains region. The IDIC and NDMC are working with numerous U.S. and Canadian organizations in this planning process.

- Served on the External Advisory Panel for the Congressional Office of Technology Assessment's study, *Preparing for an Uncertain Climate*, and wrote drought policy recommendations. Recommendations of the panel are being used by Congress to establish or modify existing policies and programs in response to concern about projected changes in climate.

- Advised the U.K.'s drought mitigation working group, formed in response to the U.N.'s International Decade on Natural Disaster Reduction. The IDIC and NDMC continues work with this group in program development.

- Advised the Organization of American States on drought mitigation programs in Central and South America. The IDIC is working with Costa Rica and Guatemala in the development of drought management plans in response to continuing drought conditions.

- Developed an electronic, interactive information system (WWW home page) to provide information to users in the public and private sectors on drought mitigation and preparedness methodologies.

SOURCES OF FUNDS

The primary sources of funds for the scholarly service activities have been through the Department of Commerce/NOAA, U.N. Environment Program, CSREES/USDA, Natural Resources Conservation Service/USDA, Western Regional Climate Center/UCAR, Environment Canada, Office of Global Programs/USDA, and the World Meteorological Organization. Numerous smaller grants have been received from various sources.

Centers in the Department with Education and Service Missions

Centers within the department provide a major source of funding for special appointments and staff in support of outreach activities (see section 8).

Significant Accomplishments

The department through individual faculty programs and center activities has achieved a number of milestones in our outreach programs. We have developed educational programs and systems that permit us to be more proactive rather than reactive in dealing with climate and weather situations.

Providing Weather Data and Climate Information

The Agricultural Climate Situation Committee provided timely information to crop producers in the 80's and early 90's. Although no longer active, many of the committee's functions have evolved to serve new audiences. Climate summaries are now available electronically through the WEATHER dial-up service or by commercial broadcasts of DTN (Data Transmission Network). Advisories and special summaries are distributed in IANR's Crop Watch Newsletter and the Ag. Climate Update. The department has shown leadership in monitoring and early warning systems. Particularly noteworthy are the participation in the formation and development of the state's Climate Assessment and Response Team and the region-wide network of stations for support of weather-related decisions such as irrigation scheduling. The department has developed a wind power monitoring network.

The department is serving new audiences including agricultural consultants, agricultural producers, urban communities, and K-12 students and teachers. Outreach to the K-12 audience has included presentations and demonstrations at the Lincoln Children's Museum, Groundwater and Environmental Festivals, Girl Scout Meetings, and the State Fair. Other efforts have

resulted in distribution of water management information on lawns and grounds to golf courses and individual lawn owners via dial-up and Weather Channel delivery. Faculty have participated in IANR training and update programs for aerial applicators, agricultural consultants, and agricultural chemical dealers.

A substantial support staff is engaged in answering full service climate requests. The State Climatologist and Regional Climatologists with technical support staff answer more than 600 full service requests and about 6,000 self service requests annually for use in operational planning, long-range planning, specific past event analysis, research, and other interests.

We are striving to obtain feedback from participants in our programs with respect to satisfaction with delivery mechanisms, formats, and user assessment of program impact.

Organizing and Conducting Symposia, Conferences, and Workshops

Faculty have played key roles in organizing and hosting various workshops, conferences, and symposia aimed at providing educational opportunities. Workshop topics include drought preparedness, groundwater planning, climate change, long-lead climate forecasting, and sustainability. For such meetings as well as for project Earthbound at the State Fair, departmental faculty have developed physical models and accompanying displays. A model of sand dunes was developed to illustrate the role of climate in forming and maintaining the Sandhills. A model-scale wind turbine and village was developed to show the role that wind power can play in providing energy. A display to illustrate the role of turf and trees in beneficially modifying the microclimate near buildings has been constructed and used.

Challenges and Concerns

Enhancing Program Visibility

Faculty should integrate departmental programs with the new Cooperative Extension action plans to ensure that information dissemination activities, such as DTN, and outreach programs, such as global and environmental change, achieve their full potential. Are our proposed activities appropriate? Are there gaps in our extension/scholarly service programs that we should be addressing, but are not? How involved should we be in developing extension and scholarly service action plans?

Serving an Expanded Clientele

It remains a challenge to fully tap the potential benefits of educating the public on weather and climate related information. The department needs to avail itself of opportunities to work with managers and technical staff in agriculture, transportation, recreation, energy, water resources, etc. in the state, region, nation, and in other countries. Demonstration projects need to be developed as necessary to suggest ways that models and research can be applied to serve the needs of a particular sector. The department must keep pace with technological advances to

reach new audiences and improve information delivery systems. A WWW home page is being developed and an interactive climate data system for internet is being developed. It appears that future advances in communication will offer additional challenges to CES and SS programs in the department. Are we making adequate use of modern communication technologies or should we be using other mechanisms to disseminate usable weather and climate information to resource managers and the public?

External Funding

Scholarly Service has undergone rapid growth in the department during the past five years. The increase in faculty and support staff in SS has provided the department with greatly increased productivity in service programs. There is currently widespread support for SS programs among participating agencies, however, we are concerned with possible budget cuts and their potential impact since continued grant support is essential for maintaining successful SS programs. We welcome any insights that the review team can offer in helping us maintain support for our extension and scholarly service programs.

Linking Nebraska's Climate-related Concerns to the National and Global Setting

The globalization of agriculture and environmental change argues strongly for broadening our applied understanding of climate and climate impacts beyond the borders of Nebraska. A program of outreach is being developed which focuses on the implications of environmental changes occurring outside of Nebraska, which will influence the well being of the state's natural resource base. Can the review team help articulate a process for integrating the notion of globalization into traditional extension objectives?

Development of Departmental Outreach Plan

Although activities in planning and coordination in the department have increased, it will be necessary to continue this effort in order to realize an efficient and effective program. An overall plan should be developed by the department. All programs should be a part of this program, including the new program in global environmental change. What insights and suggestions can the review team offer in helping us develop a comprehensive departmental outreach plan?

Notes

Research commitments large for # of faculty

Space – labs
\ offices

their emphasis
** Uncertainty of future grant funds

Outreach

global change outreach - unique
state of art delivery methods
max. educ. efforts ie teachers, educators

concerns:

lack of coordination of outreach program
lack of evaluation of impact
Climate impact - limited distribution, duplication

Education concerns

small # courses, limit student opp. to teach
title does not reflect training
* subject matter - duplication ?
their emphasis
** potential overload if new courses

Recommendations:

Students take course in research management
their emphasis
** Over commitment - needs to be balanced - more personal?

* need for training provided ?

e-mail as official communication of department
indiv achievements as well as interdisc efforts

International Activities

Research

Drs. Blad, Kim, Verma, and Walter-Shea have conducted research in several NASA-sponsored international research programs since 1989. They participated in FIFE-89, an international, interdisciplinary experiment conducted on a prairie near Manhattan, KS. The objective of FIFE was to explore methods for using satellite data to quantify important biophysical states and rates for model input. Dr. Walter-Shea also collaborated with Dr. Forrest Hall (NASA/GSFC) in 1993 during the FIFE Follow-On study. Drs. Blad and Walter-Shea conducted research studies during KUREX-91 (the 1991 Kursk Experiment) as part of a cooperative exchange between the U.S.A (NASA as the lead agency) and the USSR (USSR Academy of Sciences as the lead agency) conducted on a prairie preserve near Kursk, Russia. KUREX-91 was part of a larger Soviet effort to develop and validate models for global environmental change with an emphasis on retrieval of various parameters of the soil-vegetation system using remote sensing and ground-based techniques. Drs. Verma and Walter-Shea are currently conducting research as part of BOREAS (Boreal Ecosystem-Atmosphere Study) in the boreal forest of Saskatchewan, Canada. BOREAS is an international, interdisciplinary scientific study designed to improve our understanding of the interactions between the boreal forest biome and the atmosphere in order to clarify their roles in global change. BOREAS is a joint U.S.-Canadian venture. The effort is being led by the National Aeronautics and Space Administration, with participation from the National Oceanic and Atmospheric Administration, the National Science Foundation, the United States Geological Survey and the Environmental Protection Agency. Participating Canadian agencies include the Canada Centre for Remote Sensing, Environment Canada, Natural Sciences and Engineering Council, Agriculture Canada, national Research Council and the Canadian Forest Service.

An important component of the training seminars and symposia organized by Dr. Wilhite (see the section below on outreach and scholarly service) includes the identification of principal research needs and information gaps related to improving drought management and preparedness or developing national or regional sustainable development plans. This exercise leads to the development of a research agenda for governments and international organizations to follow in addressing these critical issues. For example, a joint U.S./Canadian research project on the potential impacts of climate variability and change on the North American Great Plains will likely emerge from the sustainability symposium held in May 1995.

Outreach

Faculty from the Department have continued active involvement in international outreach and service activities since the last self-study.

Dr. Easterling has served as advisor to Agriculture Canada on a project focusing on adapting North American agriculture to climate change. He also has served as a member on the scientific review committee for Agroecosystem Health: Characterization, Diagnosis, and Management,

sponsored by Eco-Research of the Tri-Council Secretariat of Canada. He chaired a discussion panel at a recent WMO-sponsored meeting on the Global Climate Observing System.

Dr. Hubbard has conducted several workshops in India as part of the All India Agrometeorological Project (with assistance from Dr. Meyer), co-organized a US/Canadian climatic change study and served as rapporteur on soya crop for WMO. Dr. Verma presented a series of lectures at the Centre of Advanced Studies in Agricultural Meteorology in Pune, India and worked with scientists in India to develop a research program in micrometeorology.

Dr. Wilhite organized and conducted training seminars on drought management and preparedness for eastern and southern Africa, Asian and Pacific region (with assistance from Dr. Meyer and Dr. Easterling), and South and Central America and the Caribbean region (with assistance from Dr. Easterling) and West Africa. These workshops have been co-sponsored by the International Drought Information Center, NOAA, UNEP, and WMO. In addition, the Organization of American States co-sponsored the seminar for South and Central America. Additional seminars may be offered for South Asia and North Africa/Mid-East. The International Drought Information Center also assisted China, the Philippines, Brazil, South Africa, and various regional and international organizations in the development of drought workshops or seminars. The IDIC was the principal organizer for the joint U.S./Canadian symposium on Planning for a Sustainable Future: The Case of the North American Great Plains, held in Lincoln in May 1995. There will be a series of ongoing activities in association with this activity.

Dr. Wilhite has presented papers or lectures in Canada, Switzerland, Brazil, China, and South Africa. He has advised government officials and scientists on drought mitigation/preparedness strategies in Guatemala, Costa Rica, Canada, China, Brazil, Switzerland, United Kingdom, Uruguay, and South Africa. He has participated or assisted in organizing and/or conducting workshops in Gambia, Uruguay, Hungary, Brazil, Philippines, Thailand, South Africa, and Botswana. He has attended in lectures, conferences and workshops under sponsorship of organizations such as WMO, Organization of American States, Oxford University, Royal Geographical Society, UNEP, USAID/OFDA, Institute of Water Conservancy and Hydrologic Resources Center (Chinese Academy of Sciences), NOAA, United Nations Development Program, and the Meteorological Foundation of Ceara. He also chaired informal expert meetings on desertification and drought, and drought monitoring and preparedness in Switzerland, sponsored by WMO and the U.N. Commission on Sustainable Development.

Education of International Students

Most faculty have served or are currently serving as advisors to international students. Seven international students (from India, Mexico, Brazil, South Korea, Canada, and the Philippines) have received graduate degrees through our program since 1989. Another eleven international students (from Venezuela, Russia, Canada, China, and Brazil) are currently working toward their degree in our department. Thirteen of our previous or current international students received funding through research grant funds. The remaining five were funded through their government or international agencies. However, all operating funds for their research programs originate from our department (state and/or federal funds).

Visiting International Scientists

A number of international scientists have visited our department for extended periods of time from one to six months, including:

- Dr. Renhua Zhang (Institute of Geography, Chinese Academy of Sciences, Peoples Republic of China) in 1994
- Dr. M.B. Savani (GAU, S.K. Nagar, India) and Mr. K.K. Rao (Anantapur, India) in 1991
- Dr. James M. DeJager (Department of Agrometeorology, University of Orange Free State, South Africa), Dr. N.V.K. Chakravarty (Indian Agricultural Resource Institute, New Delhi, India), Dr. M.B. Rajegowda (University of Agricultural Sciences GKVK, Bangalore, India) in 1990
- Mr. T.R.V. Naidu (Centre of Advanced Studies in Agricultural Meteorology, Mahatma Phule Agricultural University, Pune, India) in 1989.

Other international scientists have also been hosted for short periods of 1-3 days.

Future International Activities

Future activities in our international program include the following:

Dr. Blad will re-examine the agreement with the Post Graduate College in Chapingo, Mexico to determine whether we should try to foster joint research and graduate student activities.

Dr. Easterling has proposed collaboration between the Great Plains Regional Center and the United Nations Development Program to establish an exchange program with Asian countries in order to transfer knowledge on global environmental change research done at the regional level.

Dr. Hubbard will conduct a workshop on meteorological applications in agriculture as part of the United Nations Development Programme in New Delhi, India in 1996.

Drs. Verma and Walter-Shea will participate in BOREAS for the next few years. Collaboration with international scientists from BOREAS is planned. The scientists include Drs. Darwin Anderson and Holly Rask (University of Saskatchewan), Drs. Jill Bubier and Tim Moore (McGill University), Drs. Peter Lefleur and John Miller (York University), Dr. Harry McCaughey (Queen's University), Drs. Ray Desjardins and Elizabeth Pattey (Agriculture Canada), and Dr. Paul Jarvis (University of Edinburgh).

The IDIC and the NDMC (directed by Dr. Wilhite) will continue to develop a research/services program in drought mitigation and preparedness. Ultimately, the IDIC and the NDMC may be merged into the International Drought Mitigation Center (IDMC). Funding is being sought from several international organizations to accomplish this goal.

Also, Dr. Wilhite plans to:

- serve as advisor/consultant to WMO, U.N. Sudano-Sahelian Office, U.N. Environment Program, World Bank, U.N. Commission on Sustainable Development, and others on a variety of drought tasks;

- assist governments and regional organizations in Central and South America in the development of drought management/preparedness plans under sponsorship of the Organization of American States and the U.N. Development Program;

- serve as co-organizer/resource person for a proposed training seminar on drought management and preparedness for South Asia with the International University of Business and Agricultural Technology in Dhaka, Bangladesh;

- collaborate with David White of the Australian Bureau of Resource Sciences on the development of a comparative drought mitigation and preparedness program between the U.S. and Australia;

- develop a network node for drought-related information for the western hemisphere under the authority of the Inter-American Water Resources Network (IWRN) of the Inter-American Dialog on Water Management (under the leadership of the Organization of American States);

- serve as a member of the IWRN Advisory Board.

Challenges and Concerns

Issues we wish to have the review team respond to include:

- Should we target a specific ratio of international graduate students to domestic students?

- Should we conduct individual or group "training" activities for international scientists?

- Are there international organizations we should be working with other than those previously mentioned?

- Should we host more international scientists for extended visits, to possibly include teaching of special research seminars? Presently, Dr. Wilhite is negotiating with four scientists, with funding for one scientist granted and funding likely for the others. Should other faculty seek such opportunities?

- Should our faculty seek more opportunities for involvement with scientists from other countries through short- to moderate-term leaves?

Departmental Centers

The department has five centers: the High Plains Climate Center, one of six regional climate centers supported by NOAA; the Great Plains Regional Center for Global Environmental Change, one of six regional centers supported by the Department of Energy through its National Institute for Global Environmental Change; the Center for Laser-Analytical Studies of Trace Gas Dynamics, an engineering research center, jointly administered by this department and Electrical Engineering and supported by the Nebraska Research Initiative; the National Drought Mitigation Center, recently established with funds from USDA and NOAA; and the International Drought Information Center, funded by various national and international agencies. A significant portion of the funds for operating various programs within the department come through the successful funding received by the directors of these centers. Information about these centers, as provided by the directors, follows.

High Plains Climate Center

BACKGROUND

The High Plains Climate Center (HPCC) was initiated in 1987 in response to needs to improve climate services at the local, state, and regional levels and to improve the nation's climate-information supply while simultaneously stimulating applied research in climate-related areas. HPCC is one of six regional climate centers that serve the U.S. The HPCC's primary responsibility is to the states of Colorado, Iowa, Kansas, Nebraska, North Dakota, South Dakota, and Wyoming. The six center directors have made a multi-pronged effort to develop climate services in the nation. Working with congressional representatives, the directors have been successful in obtaining special funding to build these centers. The directors have also worked with the National Weather Service to build a framework for a nationwide climate applications system. In March 1995 the directors formed the Consortium for Regional Climate Services to enhance the national program of regional climate services dedicated to increasing the nation's economic advantage through improved resource management and decision making in the context of sustainable development.

MISSION

The **mission** of the HPCC is to increase the availability of quality climate data in the High Plains region and to encourage the use of climate information for the purpose of gaining economic and intrinsic benefits for the citizens of the region.

The premise of applied climatology is that wise and timely use of climate data and information will be of significant benefit to citizens. For example, use of these data by managers of water and soil natural resources will lead to optimal irrigation strategies and tillage systems that protect against erosion. Climate data are also essential for many types of decisions. Engineering applications such as the design of flood control systems, evaporation ponds, water delivery,

snow removal, and heating and cooling systems, to name a few, are dependent on accurate climate information.

OBJECTIVES

To accomplish the mission of the High Plains Climate Center, the following general objectives have been formulated:

1. Maintain and improve weather data networks that serve as a source of climate data in the region.

2. Develop and maintain a regional climate data archive and high-speed linkages to federal and special regional data sources.

3. Identify and prepare (where possible) important climate information products[1] and climate impact statements for the region.

4. Investigate the role played by climate, climate variability, and climate change in the commerce of the region and develop appropriate simulation techniques to estimate current and future climate impacts.

5. Develop and maintain reliable and timely information dissemination systems.

6. Develop educational programs to address climate issues and the proper use of available climate-related products.

PERSONNEL

Name	Title
Dr. Kenneth G. Hubbard	Director/Professor
Dr. Steven J. Meyer	Regional Climatologist/Assistant Professor
Dr. David E. Stooksbury	Regional Climatologist/Assistant Professor
Mr. Allen L. Dutcher	Climatologist
Mr. James R. Hines	Computer Systems Analyst
Mr. Soheil Ameri	Computer Programmer
Ms. Deb Wood	Editorial Assistant
Mr. Mathew D. Werner	Climate Data Specialist
Mr. John Draves	Research Technologist
Mrs. Shellie Hanneman	Climate Clerk
Mr. Karl E. Blauvelt	Electronics Technician

[1]The term "climate product" is used throughout this report and should be interpreted to mean any representation of climate data or information in the form of a listing, table, graph, map, report, statement, or publication. Products can take many forms, including hardcopy, digital, microform, and audio/video recording.

CLIENTELE/USERS

Clientele fit into two general groups: those who use the self-service facilities of the center and those who require full service of the HPCC staff. A recent survey showed that about half of the clientele indicate they use the data in planning activities, and a third use the data in real-time decision making. Clients indicate they are using the data and information for research, scheduling irrigation, newsletters, broadcasting, insurance claims, crop growth predictions, construction projects, litigation, general planning, cropping decisions, teaching, and hobbies.

HPCC plans to hold annual educational workshops to discuss regional climate issues and impacts, add support staff for clients with full-service needs, improve its bulletin board system (BBS) with a user fee, and develop and circulate educational materials on what HPCC has to offer.

FACILITIES AND RESOURCES

Many of the HPCC staff will be housed in the renovated research laboratories of the Chase Hall basement. Computer systems developed by HPCC are networked to provide fully interactive access to users. The newly released On-Line User Interactive system provides conventional modem access as well as internet access.

SOURCES OF FUNDS

Primary support for the HPCC has been through special appropriation from Congress. Additional support has been contributed by the participating states. Some funds have been obtained from local government for the support of automated weather monitoring sites. Staff have also secured funding for other activities such as wind power monitoring in the region.

Great Plains Regional Center for Global Environmental Change

BACKGROUND

The Great Plains Regional Center (GPRC) for Global Environmental Change is one of six regional centers forming the National Institute for Global Environmental Change (NIGEC). NIGEC was established in 1989 by act of Congress, and the GPRC joined the NIGEC consortium in November 1992. Other centers include the Northeast at Harvard University, Southeast at the University of Alabama, South Central at Tulane University, Midwest at Indiana University and West at the University of California-Davis. The NIGEC mission is to assist the U.S. Department of Energy (DOE) in meeting the objectives specified for DOE by the U.S. Global Change Research Program through the funding of coordinated research by regional networks of universities. Specifically, NIGEC has been requested to focus on research that contributes to the development of integrated assessment models of climate change.

MISSION

The **mission** of the GPRC is to construct a "regionally integrated" assessment of the implications of climate change for the Great Plains. The term regionally integrated is defined here as an "end-to-end" assessment that identifies, and where possible, quantifies explicit linkages between climate change, basic biophysical processes (e.g., surface hydrology, photosynthesis, evapotranspiration, albedo), managed and unmanaged ecosystem function (e.g., biogeochemical cycling, net primary productivity, adaptive capacity), and socioeconomic activity, including feedbacks (e.g., climate change-induced change in land use, land cover, and with linkages to soil organic matter and trace gas fluxes).

OBJECTIVES

The major objectives of the GPRC incorporate the following research thrusts:

1. Measurement and modeling of fluxes of trace gases from terrestrial ecosystems to the atmosphere, particularly in grassland regions.

2. Quantification of the consequences of climate change for managed and unmanaged ecosystems of importance to human activity in the Great Plains, including assessment of the adaptive capacity of such ecosystems and feedbacks, if any, to thrust #1.

Individual projects funded by the GPRC are to be linked conceptually and through data and information exchanges to build an integrated program of research that provides a policy analysis tool to DOE.

PERSONNEL

Name	Title
Dr. William E. Easterling	Director/Assoc. Professor
Dr. Blaine L. Blad	Associate Director/Head & Professor
Ms. Cynthia J. Hays	Research Technologist
Mrs. Jan Schinstock	Project Assistant

PARTICIPANTS/CLIENTELE

Participants in the GPRC research program come principally from the major research universities and nonprofit institutes of the Great Plains region, defined as Minnesota, North and South Dakota, Iowa, Nebraska, Kansas, Missouri, Montana and Wyoming. Colorado is shared with the South Central Regional Center. Proposals are accepted, however, from any university so long as their objectives are consistent with those of the GPRC.

The principal user of GPRC program results is the U.S. DOE. GPRC research products should facilitate climate change-related policy decisions made by DOE in overseeing the energy resources of the United States.

SOURCES OF FUNDS

The U.S. Department of Energy has been the sole source of funds for the management and research funding by the GPRC. Separate budgets are maintained for administering the GPRC and for the funding of individual projects.

Center for Laser-Analytical Studies of Trace Gas Dynamics (CLAS)

BACKGROUND

Understanding the causes and effects of the increasing atmospheric concentrations of atmospheric trace gases, such as carbon dioxide, methane, and nitrous oxide, represents one of the foremost scientific, technological, and economic challenges of our times. Current modeling efforts predict significant climatic changes associated with these increasing concentrations. These models, however, are based on major assumptions concerning the annual budgets (net annual exchange) and source and sink strengths of key trace gases in various ecosystems. Greater knowledge of trace gas dynamics is required to: (a) rationally resolve the climatic effects of increasing atmospheric concentrations of important trace gases, (b) determine whether observed trends are likely to continue, and (c) provide information for extrapolation to regional and global scales.

Sensitive instrumentation is required for improved measurements of the trace gas fluxes. Certain sensors and techniques (e.g., chamber methods) are now available. Chamber methods are limited to small areas. Development and testing of new and improved sensors is urgently needed for more accurate and larger scale, spatially-integrated measurements. The development and testing of **micrometeorological** sensors for measurement of trace gas fluxes has been highly recommended by national and international panels on global change. The advantage of micrometeorological techniques (e.g., eddy correlation) is that they are *in situ* and cause minimum disturbance to the microenvironment of the ecosystem being studied. These techniques provide "areally-integrated" fluxes (usually over several hectares). Thus, the atmospheric trace gas studies undertaken by CLAS constitute high priority research areas identified in national and international panel meetings and workshops on global tropospheric chemistry and atmosphere-biosphere interactions. The Global Tropospheric Chemistry Panel (National Research Council, 1984, *Global Tropospheric Chemistry: A Plan for Action*: National Academy Press, Washington, DC. 194 pp.) recommended **"to determine the necessary CH_4 fluxes, at least two parallel efforts would be required. The first would simply extend the current data base using available techniques. For the second, it would be necessary to complete the development and employ a state-of-the-art, meteorologically-based flux measurement technique using turbulence-correlation or gradient measurements."** One major reason for the establishment of CLAS was to respond to this need for sensor development and application to suitable flux measurement techniques. These instrumentation developments are also applicable to other important trace gas problems. Thus, the creation of a research center dedicated to trace gas research was timely and responsive to present and future needs of Nebraska, the nation and the world.

MISSION

Predicted significant climatic changes associated with increasing concentrations of atmospheric trace gases have serious implications for the future productivity of the agricultural lands in Nebraska and the surrounding region. Accurate assessment of the possible causes and effects of these increasing trace gas concentrations is essential for the development of future economic strategies for our state, and the world. More quantitative information on these gases is needed to make this assessment possible. The Center for Laser-Analytical Studies of Trace Gas Dynamics (one of the six engineering research centers) was created to develop appropriate measurement techniques and to improve the understanding of the dynamics of important trace gases. The center also seeks to apply this developed technology to other scientific and engineering problems (e.g., the study of trace gases in engine exhaust emissions, important for the evaluation of alternate fuels, and the identification of trace constituents in gas discharge plasmas used for semiconductor processing).

OBJECTIVES

1. Develop and field test rapid response eddy correlation sensors, employing tunable diode laser spectroscopy (TDLS), for measurements of the surface fluxes of important trace gases (e.g., CH_4).

2. Quantify surface fluxes of important trace gases (e.g., CH_4, CO_2) in order to provide information on seasonal and annual budgets of the target gases in key ecosystems.

3. Extend the tunable laser technology to other engineering problems (e.g., develop an on-line system for detection of aldehydes in engine exhausts).

4. Identify other trace gas research problems and develop relevant investigations such as determining the amount of atrazine entering the atmosphere at the time of application and its mechanism of transport into the atmosphere.

5. Use tunable laser absorption spectroscopy to identify trace constituents in gas discharge plasmas used for semiconductor processing.

6. Identify sources of external funding and maintain a continuing effort to solicit funding for the center's projects from these sources.

7. Develop collaborations with other scientists and engineers that will broaden and enhance center research.

8. Develop interactions with industry of mutual benefit to the center's research and industry's objectives.

9. Provide training of students (graduate and undergraduate) in trace gas measurement technology.

PERSONNEL

Name	Title	Department
Dr. Shashi B. Verma	Co-Director/Professor	Agricultural Meteorology
Dr. Frank G. Ullman	Co-Director/Professor	Electrical Engineering
Dr. David P. Billesbach	Research Assistant Professor	Electrical Engineering
Dr. Joon Kim (left 08/01/95)	Research Assistant Professor	Agricultural Meteorology
Mr. Robert J. Clement	Research Technologist I	Agricultural Meteorology
Mr. James R. Hines	Computer Systems Analyst	Agricultural Meteorology
Mr. Howard D. Earl	Laboratory Manager	Agricultural Meteorology
Mr. Sheldon D. Sharp	Technician	Agricultural Meteorology
Mr. Eric Hasselbalch	Technician	Electrical Engineering
	Adjunct Faculty	
Dr. Timothy J. Arkebauer	Assistant Professor	Agronomy
Dr. James D. Carr	Professor	Chemistry
Dr. Rodney O. Dillon	Associate Professor	Electrical Engineering
Dr. Natale J. Ianno	Professor	Electrical Engineering
Dr. Louis I. Leviticus	Professor	Biological Systems Engineering
Dr. P. Frazer Williams	Professor	Electrical Engineering

SOURCES OF FUNDS

Nebraska Research Initiative through engineering research centers.

International Drought Information Center

BACKGROUND

The International Drought Information Center (IDIC) was created in September 1988 in response to recommendations emanating from the *International Symposium and Workshop on Drought*, held at the University of Nebraska-Lincoln in the fall of 1986. The center has been under the direction of Dr. Donald A. Wilhite since its inception.

MISSION

The purpose of the IDIC is to build greater awareness and understanding of drought as a policy issue in the international community by networking scientists and policy makers.

OBJECTIVES

The objectives of the IDIC are:

1. To collect, analyze, package, and disseminate current information on drought events; response, mitigation, and planning activities of governments and international organizations; and new technologies relating to drought management and planning.

2. To conduct research on drought management and preparedness techniques to mitigate impacts, reduce conflicts between water users and others, and promote the sustainable use of natural resources.

3. To foster drought preparedness at the state, regional, and national levels of government in the United States and elsewhere.

4. To train persons from developed and developing countries in the science of drought management and preparedness.

PERSONNEL

Name	Title
Dr. Donald A. Wilhite	Director/Professor
Ms. Deborah A. Wood	Editorial Assistant and Graphics Specialist
Mr. Jim Hines	Computer Systems Analyst

FUNDING SOURCES

Principal funding has been provided on a project-specific basis from the International Affairs Division of NOAA, National Climate Program Office/NOAA, NRCS/USDA, Western Regional Climate Center, U.N. Environment Program, and World Meteorological Organization.

National Drought Mitigation Center

BACKGROUND

The National Drought Mitigation Center (NDMC) was established at the University of Nebraska-Lincoln in the Department of Agricultural Meteorology in the spring of 1995. Creation of this center was recommended in a March 1993 report to the Soil Conservation Service by the International Drought Information Center. This recommendation emerged from a cooperative agreement with SCS that assessed the current status of drought mitigation technologies in the United States, including recommendations for future federal program initiatives. This recommendation was included in the Office of Technology Assessment's report to Congress in December 1993 as a potential federal action to reduce impacts of future drought events. The concept of a national drought mitigation center was discussed further at the May 1994 conference *Drought Management in a Changing West: New Directions for Water Policy*. Participants of this meeting strongly recommended that such a center be created.

MISSION

The NDMC's mission is to develop a comprehensive program aimed at lessening societal vulnerability to drought by conducting and promoting research on drought mitigation and preparedness technologies, improving coordination of drought-related activities and actions within and between levels of government, and assisting in the development, dissemination, and implementation of appropriate mitigation and preparedness technologies in the public and private sectors. Emphasis is directed toward research projects, mitigation and management strategies, and service/outreach programs that stress preventive as opposed to reactive actions.

OBJECTIVES

The objectives of the NDMC are:

1. To conduct research leading to the creation of a national information clearinghouse on drought assessment, mitigation, preparedness, and response options for decision makers in the public and private sectors.

2. To conduct and foster collaborative research on drought impact assessment, mitigation, and preparedness techniques and methodologies with regional climate centers, universities, state and federal agencies, and the private sector.

3. To help state and federal agencies and regional organizations develop and integrate regional and national assessments of drought severity and impacts.

4. To foster coordination and cooperation on drought-related activities within and between levels of government and with the private sector.

5. To serve in an advisory capacity to policy makers and others by providing scientific and policy-relevant information, as requested, on drought and water management issues.

6. To develop partnerships with industry and others in the private sector to promote the development, dissemination, and implementation of drought mitigation and preparedness technologies.

PERSONNEL

Name	Title
Dr. Donald A. Wilhite	Director/Professor
Dr. Michael J. Hayes	Climate Impacts Specialist/Assistant Professor
Mr. Mark Svoboda	Water/Climate Resources Specialist
Mrs. Kelly Smith	Information Specialist
Ms. Deborah Wood	Editorial Assistant and Computer Graphics Specialist
Mr. Jim Hines	Computer Systems Analyst
Mr. John Ansorge	Computer Specialist
Mrs. Vicki Wilcox	Secretary

FUNDING SOURCES

The NDMC is funded from grants received from the Climate Prediction Center/NOAA and the Cooperative State Research, Education, and Extension Service.

Appendices

Biosketches

Blaine L. Blad, Head, Professor, Associate Director of GPRC

Education

B.S.	1964	Brigham Young University Chemistry
M.S.	1968	University of Minnesota Soil Science (Microclimatology)
Ph.D.	1970	University of Minnesota Soil Science (Microclimatology)

Professional Experience

Head, Department of Agricultural Meteorology, University of Nebraska, July 1989-present.

Associate Director, Great Plains Regional Center of the National Institute for Global Environmental Change, November 1, 1992-present.

Director, Center for Agricultural Meteorology and Climatology, University of Nebraska, September 1987-July 1989.

Professor of Agricultural Meteorology, Center for Agricultural Meteorology and Climatology (became Department of Agricultural Meteorology in July 1989), University of Nebraska, July 1982-present.

Professor, Departments of Agronomy and Agricultural Engineering (Courtesy Appointment), University of Nebraska, July 1982-present.

Associate Professor of Agricultural Meteorology, Center for Agricultural Meteorology and Climatology, University of Nebraska, 1976-1982.

Assistant Professor of Agricultural Meteorology, Center for Agricultural Meteorology and Climatology, University of Nebraska, 1970-1976.

Research Assistant, University of Minnesota, 1967-1970.

Technician, University of Minnesota, 1966-1970.

NDEA Fellow, University of Minnesota, 1964-1967.

Chemistry Lab Instructor, Brigham Young University, 1962-1964.

Courses Taught

AMET 408/808. Microclimate: The Biological Environment

Thesis and Dissertation Committees Chaired (since 1989)

Starks, Pat. 1990. Measured and modeled radiation fluxes (Ph.D.).
Zara, Pedro. 1992. Towards large area application of remotely sensed surface temperature (Ph.D).
Leavitt, Bryan. In progress. Use of radar and Vis/IR remote sensing of a marsh environment to determine vegetation parameters and characteristics (Ph.D.; co-advisor, Donald C. Rundquist).

Professional Affiliations, Awards and Honors

American Agronomy Society
American Meteorological Society
Crops Science Society of America
Gamma Sigma Delta
American Men and Women in Science
Cited in Who's Who in America
Men of Achievement
Two Thousand Notable Americans
International Directory of Distinguished Leadership
Fellow, American Society of Agronomy, 1988
Board of Scientific Advisors, American Council on Science and Health; New York, NY, 1986-date
Nebraska Representative to University Corporation for Atmospheric Research, 1987-date
Chair, Program Review for USDA National Agricultural Water Quality Laboratory, 1994-95

Grants & Publications (see Section 5)

Goals for the Next 5 Years

Administrative

- Improve departmental academic programs by working with faculty to add two or more new courses, develop an undergraduate minor and institute an M.S. degree program.
- Recruit and retain high quality graduate students with emphasis on those from culturally diverse backgrounds.
- Support and enhance current departmental programs
- Help institute new programs in the department such as the proposed programs in ecosystem carbon cycle modeling and bio-environmental engineering.

Non-administrative

- Assist in development and teaching of one or more new courses
- Begin revision of book - Microclimate: The Biological Environment
- Serve on an average of at least five graduate student committees per year
- Be active in departmental outreach activities, especially to K-12 audiences
- Complete manuscripts describing results of research activities.

William E. Easterling, Associate Professor, Director of GPRC

Education

B.A.	1976	University of North Carolina Geography and History
M.A.	1980	University of North Carolina Economic Geography
Ph.D.	1984	University of North Carolina Geography-Climatology

Professional Experience

Associate Professor of Agricultural Meteorology, Graduate Faculty Member and Director, Great Plains Regional Center for Global Environmental Change, University of Nebraska-Lincoln. Also Adjunct Associate Professor of Geography, University of Nebraska-Lincoln, and University of Illinois - Champaign-Urbana, 1993 to present.

Assistant Professor of Agricultural Meteorology, University of Nebraska-Lincoln; and Adjunct Assistant Professor of Geography, University of Illinois - Champaign-Urbana, 1991-1993.

Fellow, Climate Resources Program, Resources for the Future (RFF), Adjunct Assistant Professor of Geography, University of Illinois - Champaign-Urbana; and Adjunct Assistant Professor of Agricultural Meteorology, University of Nebraska-Lincoln, 1987-1991.

Professional Scientist, Climate and Meteorology Section, Illinois State Water Survey, Champaign, IL and Adjunct Assistant Professor of Geography, University of Illinois - Champaign-Urbana, 1987.

Associate Professional Scientist, Climate and Meteorology Section, Illinois State Water Survey, Champaign, IL and Adjunct Assistant Professor of Geography, University of Illinois - Champaign-Urbana, 1984-1986.

Fellow-in-Residence, Board on Atmospheric Sciences and Climate, National Academy of Sciences/National Research Council, Washington, DC, 1983-1984.

Instructor, Department of Geography, University of North Carolina, 1981-1982.

Academic Advisor, Evening College, University of North Carolina, 1980-1983.

Instructor, Correspondence Instruction, University of North Carolina, 1980-1983.

Research Assistant, Institute for Research in the Social Sciences, University of North Carolina, 1980.

Instructor, Evening College, University of North Carolina, 1979-1981.

Student Assistant, University of North Carolina, 1975-1977.

Courses Taught

AGRO 907.	Agricultural Climatology
AGRO 896.	Independent Study
GEOG 897.	Internship in Geography

Thesis and Dissertation Committees Chaired (since 1991)

Tsvetsinskaya, Elena. In progress. Evaluation of dynamic components of biosphere-atmosphere interactions for modeling meso-scale climate (Ph.D.; co-advisor, Donald A. Wilhite).

Professional Affiliations, Awards and Honors

Member, Association of American Geographers
Member, Regional Science Association
Member, American Meteorological Society
Member, American Association for the Advancement of Science
American Water Resources Association's W.R. Boggess Award for the Most Outstanding Paper published in *The Water Resources Bulletin* in 1989, January 1991.
Andrew Mellon Foundation Fellowship, National Research Council, Washington, DC., 1983-84.
Smith Award, University of North Carolina, 1981.
Graduate Faculty Member, 1993-date.
Fellow, Center for Great Plains Studies, 1993-date.
Associate, Center for Grassland Studies, 1994-date.
Advisor, Agriculture Canada's "Adapting North American Agriculture to Climate Change" study, 1993-date.
Member, Scientific Advisory Committee, NASA's Consortium for Integrated Earth Systems Information Network, 1994.
Member, Nominations Committee, Center for Great Plains Studies, 1994.
Member, Advisory Committee, Canadian Tri-Council Eco-Research-sponsored project "Agroecosystem Health: Characterization, Diagnosis and Management", 1994-date.

Grants & Publications (see Section 5)

Goals for the Next 5 Years

- Continue development of research program focusing on interactions of climate with systems of natural resources, especially the role of land use change influences on regional processes of net carbon exchange.

- Continue development of a regionally integrated ("end-to-end") assessment of the consequences of climate change for the Great Plains as the core research program of the GPRC.

- As part of the GPRC program, the development of a strong outreach capability that transfers usable knowledge of global environmental change to decision makers and the public in Nebraska.

- Develop and teach a course on global environmental change, in addition to team-teaching agricultural climatology.

Michael J. Hayes, Assistant Professor

Education

B.S.	1986	University of Wisconsin-Madison Meteorology
M.S.	1989	University of Missouri-Columbia Atmospheric Science
Ph.D.	1994	University of Missouri-Columbia Atmospheric Science

Professional Experience

Assistant Professor, University of Nebraska, Department of Agricultural Meteorology, July, 1995-date.
Physical Scientist, AScI Corporation, February-July, 1995.
Graduate Research Assistant, University of Missouri, Department of Atmospheric Science, 1987-1994.

Professional Affiliations, Awards and Honors

Member of the American Meteorological Society
Phi Beta Kappa Honor Society
Gamma Sigma Delta Honor Society
William H. Hatch Graduate Fellowship

Goals for the Next 5 Years

- To monitor current weather conditions and routinely distribute information to interested authorities on the potential for developing drought conditions, as well as provide guidance during actual drought situations.

- To examine and modify existing early warning drought assessment techniques and investigate new techniques, if necessary.

- To interact and inform local, state and federal officials, regional organizations, universities, environmental and special interest groups, and the private sector of drought preparedness ad drought mitigation issues. This could lead to international interaction with governmental agencies and universities involved in drought monitoring and desertification, especially in third-world nations.

- To analyze drought plans and prepare post-drought assessments, examining the impacts of climate, particularly drought, on various sectors of society.

- To develop a station project which would incorporate research concerning drought mitigation technologies (see section 5).

Kenneth G. Hubbard, Professor

Education

B.S.	1971	Chadron State College (NE) Math and Physics
M.S.	1973	South Dakota School of Mines and Technology Meteorology
Ph.D.	1981	Utah State University Soil Science and Biometeorology

Professional Experience

Professor, University of Nebraska-Lincoln, 1993-date.
Director, High Plains Climate Center, University of Nebraska-Lincoln, 1987-date.
Associate Professor, University of Nebraska-Lincoln, 1986-1993.
Assistant Professor, University of Nebraska-Lincoln, 1981-1986.
State Climatologist, University of Nebraska-Lincoln, 1981-1987.
Assistant State Climatologist, Utah Department of Agriculture, 1977-1981.
Research Scientist-Meteorologist, Utah Water Research Laboratory, 1974-1977.
Meteorologist, Geophysical Fluid Dynamics Laboratory, NOAA/ERL, 1973-1974.

Courses Taught

AMET 469/869. Bio-Atmospheric Instrumentation

Thesis and Dissertation Committees Chaired (since 1989)

Meyer, Steven. 1990. The development of a crop specific drought index for corn (Ph.D.).
Deshpande, Rohini. 1992. Effect of plant architecture on microclimate, white mold and yield of dry beans (Ph.D.).
Paes de Camargo, Marcelo. 1993. Determination of the water balance components and drought sensitivity indices for a sorghum crop (Ph.D.).
Flores-Mendoza, Francisco. 1993. The effect of sensor position and sunlit and shaded patterns on composite radiative temperatures over sorghum (Ph.D.).
Idso, Craig. In progress. Climatic temperature trends in clear and cloudy stratifications (M.S.).
Dutcher, Allen. In progress. Weather and the national crop insurance program (Ph.D.).
Xu, Meng. In progress. Wheat microclimate and subsequent baking quality (Ph.D.).
Xiaomao, Lin. In progress. Systematic temperature differences in different shelters (Ph.D.).

Professional Affiliations, Awards and Honors

Lambda Delta Lambda (science)
Kappa Mu Epsilon (mathematics)
Gamma Sigma Delta (agriculture)
Sigma Delta Nu (education)
American Meteorological Society
AMS Committee on Planned and Inadvertent Weather Modification
American Association of State Climatologists
American Association for the Advancement of Science
Center for Great Plains Studies
Consultant to WMO and USAID
American Society of Agronomy
Graduate Faculty Fellow at the University of Nebraska
Who's Who in Science and Engineering, 1994/95.

Grants and Publications (see Section 5)

Goals for the Next 5 Years

- Develop research methods to a) study spatially distributed data, b) evaluate sensor measurement errors, and c) improve transpiration estimates.
- Expand dissemination of existing climate information products and develop new products for decision makers in agriculture, transportation, water and other sectors.
- Develop the new Bio-Atmospheric Instrumentation (469/869) teaching laboratory.
- Obtain quantitative information on the impacts of research and outreach programs.
- Develop further insights into my personal qualities and raise my awareness of how I am perceived by others.

Steven J. Meyer, Assistant Professor

Education

B.S.	1983	Northern Illinois University Geography/Meteorology
M.S.	1986	University of Nebraska-Lincoln Agronomy/Agricultural Meteorology
Ph.D.	1990	University of Nebraska-Lincoln. Agronomy/Agricultural Meteorology

Professional Experience

Assistant Professor, University of Nebraska, Department of Agricultural Meteorology, 1993-present.

Postdoctoral Research Associate, University of Nebraska-Lincoln, High Plains Climate Center, Department of Agricultural Meteorology, 1990-93.

Project Assistant, University of Nebraska-Lincoln, International Drought Information Center, Department of Agricultural Meteorology, 1988-90.

Professional Affiliations, Awards and Honors

Member of the American Meteorological Society
Member of the American Society of Agronomy
Sigma Xi
Gamma Sigma Delta
Gamma Theta Upsilon
Graduate Faculty Member at the University of Nebraska

Grants and Publications (see Section 5)

Goals for the Next 5 Years

- Strive to improve grantsmanship in seeking support for research.
- Explore research opportunities involving the use of crop models and climatic probabilities in decision making.
- Develop stronger ties with colleagues who share an interest in strengthen-ing K-12 involvement in global change through teacher training.
- Revise the out-of-date extension literature (NebGuides) and produce new informative literature.
- Develop an undergraduate course in Applied Environmental Climatology.

David E. Stooksbury, Assistant Professor (Special Appointment)

Education

B.S.A.	1979	University of Georgia Plant Genetics
B.S.P.A.	1982	University of Georgia Physics and Astronomy
M.S.	1985	University of Georgia Agronomy
Ph.D.	1992	University of Virginia Environmental Sciences

Professional Experience

Assistant Professor (Special Appointment), University of Nebraska, Department of Agricultural Meteorology, 1993-present.

Professional Affiliations, Awards and Honors

American Meteorological Society
Associate Member of the American Association of State Climatologists
American Society of Agronomy
Crop Science Society of American
Astronomical Society of the Pacific
Sigma Xi
Graduate Faculty Member

Grants and Publications (see Section 5)

Goals for the Next 5 Years

- A tenure track position (40% teaching, 40% research, and 20% service).
- Become an expert in climate impacts on solar and wind energy.
- Develop a research program that has a field research component.
- Integrate GIS as a tool into my research program.

Shashi B. Verma, Professor

Education

B.S.	1965	Ranchi University, Ranchi, India Mechanical Engineering
M.S.	1967	University of Colorado, Boulder Mechanical Engineering
Ph.D.	1971	Colorado State University, Ft. Collins Micrometeorology, Atmos. Fluid Dynamics

Professional Experience

Professor, Department of Agricultural Meteorology, 1984-date. Tenured 1981.
Co-Director (with F.G. Ullman), Center for Laser-Analytical Studies of Trace Gas Dynamics, April 1988-date.
Associate Professor, Center for Agricultural Meteorology and Climatology, 1978-84.
Assistant Professor, Center for Agricultural Meteorology and Climatology and Department of Agricultural Engineering, 1974-78.
Staff Meteorologist, Dames and Moore, San Francisco, California, 1974.
Postdoctoral Research Associate, Agricultural Meteorology Section, Horticulture & Forestry Department, University of Nebraska, Lincoln, 1972-74.
Postdoctoral Fellow, Colorado State University, Fort Collins, CO, 1971-72.

Courses Taught

AMET 408/808.	Microclimate: The Biological Environment
AMET 958.	Turbulent Transfer in the Atmospheric Surface Layer

Thesis and Dissertation Committees Chaired (since 1989)

Kim, Joon. 1990. Carbon dioxide and energy exchanges in a temperate grassland ecosystem (Ph.D.).
Garcia, Richard. 1991. Assimilation and allocation of carbon in the determinate and indeterminate soybeans (Ph.D.).
Suyker, Andrew. 1992. Eddy correlation measurement of carbon dioxide flux using a closed path sensor (M.S.).
Shurpali, Narasinha. 1995. Methane and carbon dioxide exchange in a peatland ecosystem in north central Minnesota (Ph.D.).
Burba, Georgiy. In progress. Surface energy budget in a mid-latitude prairie wetland ecosystem (M.S.).
Mielnick, Patricia. In progress. Quantification of soil CO_2 flux in an agricultural ecosystem (Ph.D.).
Suyker, Andrew. In progress. Exchange of methane and carbon dioxide in a boreal wetland ecosystem (Ph.D.).

Professional Affiliations, Awards and Honors

American Meteorological Society Committee on Agricultural and Forest Meteorology, 1983-1986.
Council for Agricultural Science and Technology (CAST) Task Force on Improving Irrigation Efficiency, 1986-1987.
Advisory Panel for the National Center for Atmospheric Research Field Observing Facility, 1986-1989.
ESCOP (Experiment Station Committee on Organization and Policy) Agricultural Weather Issues Subcommittee, Member, 1991-1993.
Board of Scientific Advisors, American Council on Science and Health, New York, NY, 1988-date.
Board of Editors, Agricultural and Forest Meteorology, An International Journal, 1994-date.
American Meteorological Society
American Association for the Advancement of Science
American Society of Agronomy
Sigma Xi
Gamma Sigma Delta
Registered Professional Engineer in Nebraska
Graduate Faculty Fellow, University of Nebraska

Grants and Publications (see Section 5)

Goals for the Next 5 Years

(1-2 Years)

- Completion of two major ongoing projects on trace gas exchange:
  (a) Boreal Wetland Study (BOREAS) and
  (b) Mid-latitude Wetland Study

(1-5 Years)

- Comparative study of CO_2 and water vapor exchanges in adjacent grassland and agricultural ecosystem using concurrent, year-round measurements.

Teaching

- Update overall course material to incorporate latest research results in the two courses I teach: (a) AgMet 958 and (b) AgMet 408/808 (team taught with Drs. Blad and Walter-Shea).

Elizabeth A. Walter-Shea, Associate Professor

Education

B.S.	1978	University of Central Arkansas Geography/Biology
M.S.	1981	Texas A&M University Geography
Ph.D.	1987	University of Nebraska-Lincoln Agronomy/Agricultural Meteorology

Professional Experience

Associate Professor, University of Nebraska, Department of Agricultural Meteorology, 1995-date.
Assistant Professor, University of Nebraska, Department of Agricultural Meteorology, 1989-95.
Assistant Professor, University of Nebraska, Department of Agronomy, 1987-89.
Graduate Research Assistant, University of Nebraska, Department of Agronomy, 1983-1987.

Courses Taught

AMET 408/808.	Microclimate: The Biological Environment
AMET 908.	Solar Radiation Interactions at the Earth's Surface

Thesis and Dissertation Committees Chaired (since 1989)

Cornell, Daniel. 1991. Sun-view-target effects on remotely-derived spectral indices estimates of absorbed radiation and leaf area (M.S.).
Antunes, Mauro. In progress. Remote sensing of canopy processes: Photosynthesis and stomatal conductance (Ph.D.).
Chen, Liqiang. In progress. Radiation interactions of canopy elements in a boreal forest (Ph.D.).

Professional Affiliations, Awards and Honors

Member of the American Society of Agronomy
Member of the American Society for Photogrammetry and Remote Sensing
Member of the American Meteorological Society
Associate Member of the Institute of Electrical and Electronics Engineers
Gamma Sigma Delta
Graduate Faculty Fellow at the University of Nebraska
Invited presentations

Grants and Publications (see Section 5)

Goals for the Next 5 Years

- Improve teaching through continual updating of lecture material and methods, and through attentive graduate student advising.
- Further develop collaboration with scientists in research in the use of remotely-sensed spectral properties of vegetated surfaces in estimating biophysical properties.
- Continue to pursue funding in support of research.
- Maintain good working relations with technical personnel.
- Apply time and stress management practices at home and at the office to maintain a balance between work and family life.

Albert Weiss, Professor

Education

B.S.	1962	City College of New York Meteorology
M.S.	1969	Rutgers University Climatology
Ph.D.	1975	Cornell University Micrometeorology

Professional Experience

Professor, University of Nebraska, Department of Agricultural Meteorology, 1992-date.
Associate Professor, University of Nebraska, Department of Agricultural Meteorology, 1985-1992.
Associate Professor, University of Nebraska, Panhandle Research and Extension Center, 1981-1985.
Assistant Professor, University of Nebraska, Panhandle Research and Extension Center, 1974-1981.

Courses Taught

AMET 906.	Crop Growth and Yield Modeling
AMET 907.	Agricultural Climatology

Thesis and Dissertation Committees Chaired (since 1989)

Pollonais, Steve. 1989. Agrometeorological inputs into the management and production of rice in a developing nation (M.S.).
Boedhram, Nandkishor. 1992. A comparison of grain yield components between a flex and fixed ear corn hybrid (M.S.).
Moreno, Alex. In progress. Gas exchange characteristics of maize leaves as a function of age and abiotic stress (M.S.).

Professional Affiliations, Awards and Honors

American Society of Agronomy
American Association for the Advancement of Science
Sigma Xi
Graduate Faculty Fellow

Grants and Publications (see Section 5)

Goals for the Next 5 Years

My overall goal is to gain and transmit an increased understanding of agricultural ecosystems. Specifically,

- Explore the use of fractals in numerical simulations of crop growth and yield to quantify above and below ground components.
- Enhance the concept of radiation use efficiency by the incorporation of abiotic and biotic stresses.
- Using field, controlled-environment, and numerical simulators, develop characteristics of prototype crop genotypes for different environmental conduction.

Donald A. Wilhite, Professor

Education

B.S.	1967	Central Missouri State University-Warrensburg Geography
M.A.	1969	Arizona State University-Tempe Geography/Climatology
Ph.D.	1975	University of Nebraska-Lincoln Geography/Agricultural Climatology/Water Resources

Professional Experience

Professor, Department of Agricultural Meteorology, 1992-date.
Director, National Drought Mitigation Center, April 1995-date.
Director, International Drought Information Center, September 1988-date.
Associate Professor, Center for Agricultural Meteorology and Climatology, 1985-1992. Tenured 1987.
Adjunct Scientist, Environmental and Societal Impacts Program/NCAR, 1984-date.
Assistant Professor, Center for Agricultural Meteorology and Climatology, 1979-1985.
Water Resources Management Specialist, Water Resources Center, University of Nebraska-Lincoln, 1977-1979.
Research Associate, Department of Agronomy, University of Missouri-Columbia, 1977.
Agricultural Climatologist, Agricultural Meteorology Section, Soil and Irrigation Research Institute, Pretoria, South Africa, 1976.
Instructor, Department of Geography, Mankato State University, Minnesota, 1969-1971.
Instructor, Department of Geography, Arizona State University, Tempe, 1969.

Courses Taught (UNL)

AMET 450/850. Climate and Society

Thesis and Dissertation Committees Chaired (since 1989)

Meyer, Steven. 1990. The development of a crop specific drought index for corn (Ph.D.; Co-advisor, Kenneth G. Hubbard).
Klinedinst, Peggy. 1991. Potential effects of climate change on milk production and conception rate in dairy cattle in the United States and Europe (M.S.).
Held, Angela. 1994. M.S. student, non-thesis option. Graduated December.
Chen, Xiafen. 1995. M.S. student, non-thesis option. Graduated May.
Tsvetsinskaya, Elena. In progress. Linking nested regional climate models with landscape-scale agroecosystem simulations (Ph.D.; Co-advisor, with William E. Easterling).
Najarian, Polly Ann. In progress. State-level drought plans and risk management (M.S.).

Professional Affiliations, Awards and Honors

Recipient of the 1992 American Water Resources Association Boggess Award for the best paper to appear in *Water Resources Bulletin* during 1991 (Planning for Drought: A Process for State Government).
Chair, Committee on Applied Climatology, American Meteorological Society, 1992-94.
Committee on Applied Climatology, American Meteorological Society, 3-year term beginning January 1990.
Academic Senate Executive Committee, University of Nebraska-Lincoln, elected 1994 for 3-year term.
Academic Senate Member, elected 1990 for 3-year term. Reelected 1993 for a second term. University of Nebraska-Lincoln.
Member, Overseas Advisory Council, International University of Business Agriculture and Technology, Dhaka, Bangladesh, 1992-Present.
Editorial Board, *Natural Hazards* (Journal of the International Society for the Prevention and Mitigation of Natural Hazards, 1992-present.
Editorial Board, *Idöjárás* (Journal of the Hungarian Meteorological Service), 1991-present.
Board of Governors, Center for Great Plains Studies, University of Nebraska-Lincoln, 1987-1990.
American Meteorological Society
American Geophysical Union
American Water Resources Association
International Water Resources Association
International Society for the Prevention and Mitigation of Natural Hazards
IGU Study Group on Critical Zones in Global Environmental Change
Gamma Sigma Delta
Graduate Faculty Fellow, University of Nebraska

Grants and Publications (see Section 5)

Goals for the Next 5 Years

- To continue to improve awareness and understanding of drought worldwide through a comprehensive research and scholarly service program.

- To aggressively pursue funding opportunities in support of a comprehensive research and scholarly service program in drought mitigation and preparedness.

- To collaborate with governments and international organizations in the development of programs in drought mitigation and preparedness.

- To revise and update course materials for **Climate and Society** and seek to incorporate active learning techniques into the instructional design.

- To explore and evaluate new research and administrative opportunities as they become available.

Agricultural Meteorology Action Plan
for Teaching and Graduate Degree Program

Action Statement: The Department of Agricultural Meteorology will strengthen its curriculum in Agricultural Meteorology and Climatology and develop a graduate degree program.

Background: With growing emphasis on natural resource management, the environment, and sustainable agriculture, there is an increasing need to educate students about biospheric-atmospheric interactions and the importance of weather and climate in agricultural and natural ecosystems. There has been a strong national and internationally recognized graduate program in Agricultural Meteorology at UNL, but our students have had to receive their degrees through Agronomy, Horticulture or Biological Systems Engineering. Fruitful discussions have previously been held with faculty and administrators in IANR and the College of Arts and Sciences to explore potential mechanisms for offering a graduate degree program in Agricultural Meteorology.

Objectives:

1. Establish a graduate degree-granting program in agricultural meteorology.

2. Strengthen the agricultural meteorology and climatology curriculum by teaching new and/or revised courses in agricultural climatology, environmental instrumentation, crop growth and yield modeling, solar radiation and earth surface interactions, bioenvironmental meteorology and climatology, global environmental change, and seminars and special problems.

Anticipated Results: This program will further enhance the already strong image of the department and IANR as leaders in educating and training students in agricultural meteorology and related fields. It will give increased identity to students graduating from the department and, at the same time, give increased visibility, especially internationally, to the department. It will strengthen the current program in Agricultural Meteorology and provide a strong base from which to build an even stronger program in the future. It will complement and strengthen other programs in IANR by providing students with increased knowledge of the role of weather and climate and biospheric-atmospheric interactions in managed and natural ecosystems. This will lead to improved management decisions and better scientific judgments on many important environmental issues.

Leadership: The head of Agricultural Meteorology, with support of departmental faculty, will assist in developing the proposed program. They will work closely with other units, e.g. Geography, Agronomy, Horticulture, Biological Systems Engineering, etc.

Time Schedule: Materials for new and revised courses will be submitted, and approval sought from appropriate committees by the end of 1992. A plan for the graduate degree program will be sent to the appropriate administrator and committees during the fall of 1992, with the goal of approval in 1993.

Resources Committed: Time and resources for revision or development of course syllabi and outlines have already been made available from existing departmental appropriated and overhead funds.

Resources Required: Establishment of the graduate degree program should require little, if any, additional appropriated funds. However, full implementation of the proposed curriculum additions would require $50-$75,000. Funds to buy laboratory instruments for the Environmental Instrumentation and to support development of the Bioenvironmental Meteorology and Climatology courses are being sought from NSF, EPA and the UN Foundation. Some funds from reallocated, appropriated or redirected sources may also be needed.

UNIT ACTION PLAN REPORT
IANR Strategic Plan
1992-1995

COPY

I. ADMINISTRATIVE UNIT: Agricultural Meteorology

II. ACTION PLAN TITLE: Teaching and Graduate Degree Programs

III. MAJOR ACCOMPLISHMENTS, OUTCOMES, IMPACTS: (Please state so readily understood by the general public -- customer oriented.)

1. Revised, updated and received approval for the following AgMet courses: AMET 408/808 - Microclimate: The Biological Environment, AMET 907 - Agricultural Climatology, AMET 908 - Solar Radiation Interactions at the Earth's Surface.

2. Developed, submitted and received approval to add the following new courses: AMET 450/850 - Climate and Society, AMET 469-869 - Bio-Atmospheric Instrumentation, AMET 496/896 - Independent Study in Agricultural Meteorology, AMET 906 - Crop Growth and Yield Modeling and AMET 909 - Seminar in Agricultural Meteorology.

3. Have made drafts of potential course outlines and materials to be covered in two new courses that we are developing.

4. The above mentioned changes and proposed changes will provide students in our department and other UNL departments with course material that addresses many relevant issues for today, especially those relating to monitoring and understanding the biosphere, making decisions for better management of natural resources and those which relate to the impacts of climate change and variability on the environment, agriculture, natural resources and society in general.

5.

IV. ESTIMATED INCREASE SUPPORT ALLOCATED TO THIS ACTION PLAN: (Be as specific as possible regarding amounts, sources and uses. Self-explanation will be important.)

Redirected about 0.25 FTE to teaching from research and extension. The only funds used were those to pay for the redirected salaries.

V. COMMENTS:

Plans are being developed for an M.S. degree program and a minor in Agricultural Meteorology.

July 6, 1995
Date

Blaine L. Blad
Person Preparing Report

Agricultural Meteorology Action Plan for Establishment of Great Plains Center for Global Environmental Change

Action Statement: Agricultural Meteorology, in cooperation with several departments in IANR, the College of Arts and Sciences and the College of Engineering, will establish a Great Plains Center for Global Environmental Change.

Background: Considerable expertise already exists at UNL for studying many aspects of global environmental change. Discussions have been held between faculty in Agricultural Meteorology; Geography; CALMIT; Agronomy; Forestry, Fisheries and Wildlife; Electrical Engineering and Civil Engineering; and selected faculty at UNO and UNK. Some discussions have been held with key political leaders and with several funding agencies concerning potential funding for establishment of the Great Plains Center for Global Environmental Change.

Objectives:

1. Establish a Great Plains Center for Global Environmental Change and secure financial support for the operation of the proposed center.

2. Improve our understanding of the causes and potential impacts of global change in the Great Plains environment, improve our ability to monitor these changes and develop strategies for dealing with global change.

Anticipated Results: The establishment of the proposed center will lead to increased cooperation and coordinated efforts between departments in several colleges within UNL, UNO and UNK. It will put them in a strong position to secure external funds for conduct of research on many issues pertaining to global environmental change, especially in the Great Plains environment. The proposed program will be a major component of the proposed Earth Atmosphere Systems Program and will lead to an enhanced undergraduate and graduate curriculum and program at UNL. It will put UNL in a stronger position to attract outstanding faculty and graduate students. It will improve the collection and dissemination of information to our clientele concerning global change and the impact of global change on the natural resource base of the Great Plains.

Leadership: Leadership will come from the committee formed to develop the NSF EPSCoR proposal with Dr. William Easterling as the committee coordinator. The assistance of key IANR and UNL administrators is also required.

Time Schedule: Hold discussions with key political leaders and funding agencies to secure funds for establishment of the Great Plains Center for Global Environmental Change in fall 1992 or spring 1993. Develop proposals to secure funds to carry out programs of the Center on an ongoing basis beginning in 1992.

Resources Committed: Some research and extension overhead funds have been and will be committed to cover travel costs for visits to agencies and the Nebraska congressional delegation to establish the Great Plains Center for Global Environmental Change.

Resources Needed: The proposed Great Plains Center for Global Environmental Change will need funds to cover basic administration and operating expenses. To be fully effective it should have funds for supporting research, teaching and extension/service programs. These funds should come from one or more of the following sources: appropriated funds, research initiative funds, external grants, contracts and UN Foundation funds. It will require an annual budget of about $1.25-2,000,000.

UNIT ACTION PLAN REPORT
IANR Strategic Plan
1992-1995

COPY

I. **ADMINISTRATIVE UNIT:** Agricultural Meteorology

II. **ACTION PLAN TITLE:** Great Plains Center for Global Environmental Change

III. **MAJOR ACCOMPLISHMENTS, OUTCOMES, IMPACTS:** (Please state so readily understood by the general public -- customer oriented.)

1. The Great Plains Center for Global Environmental Change was formally established as a UNL center. An annual budget of about $1.6 million was secured from the Department of Energy. Dr. William Easterling was appointed director of the Center and Dr. Blaine Blad as associate director.

2. The Center has awarded more than $3.0 million dollars in grants to UNL scientists and scientists from other institutions in the Great Plains during the last two years and has held one workshop bringing together a large group of scientists to discuss issues and develop research relating to potential global environmental changes and their impacts on the Great Plains.

3. Studies are being conducted which will enable farmers/ranchers and natural resource and ecosystem managers to prepare for and adapt to global environmental change.

4. The establishment of the Center has also resulted in sufficient salary savings to hire 0.5 FTE of a faculty member to help carry out the extension plans and mission of the department.

5. Establishment of the Center has provided a focal point for scientists at UNL who are working on issues and problems related to global environmental change.

IV. **ESTIMATED INCREASE SUPPORT ALLOCATED TO THIS ACTION PLAN:** (Be as specific as possible regarding amounts, sources and uses. Self-explanation will be important.)

No appropriated support for this program but we have an annual budget of slightly more than $1.6 million from DOE to support the program.

V. **COMMENTS:**

July 6, 1995
Date

Blaine L. Blad
Person Preparing Report

Agricultural Meteorology Action Plan for Establishing a Program in Hydrometeorology/Water and Air Quality

Action Statement: The Department of Agricultural Meteorology will develop a program to examine and evaluate atmospheric and climatic factors which affect the movement of chemicals within the soil and from the soil surface into the atmosphere.

Background: The fate of various chemicals applied to soils and vegetated surfaces is controlled to a considerable degree by atmospheric and climatic factors such as precipitation, wind and turbulence, and temperature. There is increasing concern about water quality, gases leaving the surface and going into the atmosphere, the volatilization of certain applied chemicals, the proper application of chemicals, etc. The role that various climatic and atmospheric processes play in determining the rates at which chemicals and gases move into the soil and into the atmosphere from soil and vegetative surfaces has not been adequately defined or quantified. Because of increasing environmental concerns, there is clearly a need to do so, but we currently have neither the time nor the expertise to adequately address this need.

Objectives:

1. Establish a research program to evaluate and quantify the role of climatic and atmospheric factors in determining the fate of chemicals applied to the surface.

2. Provide education and training for our clientele, including students, in the use of meteorological and climatological data and information for determining the fate of applied chemicals and the methodologies needed to make proper management decisions based on such data and information.

3. Develop atmospheric information for making management decisions leading to improved efficiency in the application of chemicals and elimination or reduction of the environmental impacts of chemicals used for agricultural and non-agricultural purposes and make this information available to the public.

Anticipated Results: Establishment of this program will strengthen the position of the Department of Agricultural Meteorology as a national and international leader. More importantly, it will enable the department to address some critical needs on various agricultural and environmental issues that are receiving inadequate attention at the present time. It will strengthen and improve linkages between Agricultural Meteorology and several IANR/UNL units, will help various groups to increase their understanding of the fate of applied chemicals, and will improve recommendations and information given to various user groups concerning the proper management of chemicals for agricultural and urban purposes.

Leadership: Leadership for the proposed program will come from a scientist hired to direct this program since the department does not currently have adequate expertise, personnel or resources. Success of the program will be enhanced by close cooperation with several units, including the Water Center, Agronomy, Biological Systems Engineering, Plant Pathology and Entomology.

Time Schedule: Hire a hydrometeorologist (chemist) by July, 1994.

Resources Needed: This is a new program and we do not have adequate resources to support existing programs. All funds to support this program will have to come from newly appropriated, reallocated, or external sources. It is estimated that it would take about $125,000 per year to establish and support this program.

COPY

UNIT ACTION PLAN REPORT
IANR Strategic Plan
1992-1995

I. **ADMINISTRATIVE UNIT:** Agricultural Meteorology

II. **ACTION PLAN TITLE:** Hydrometeorology/Water and Air Quality

III. **MAJOR ACCOMPLISHMENTS, OUTCOMES, IMPACTS:** (Please state so readily understood by the general public -- customer oriented.)

1.

2.

3.

4.

5.

IV. **ESTIMATED INCREASE SUPPORT ALLOCATED TO THIS ACTION PLAN:** (Be as specific as possible regarding amounts, sources and uses. Self-explanation will be important.)

None

V. **COMMENTS:**

Little has been accomplished on this action plan. Elements of this action plan will be incorporated into our 1995-99 Departmental action plans. This program was identified as one of the multidisciplinary program thrust areas in the Report of the Natural Resources Strategic Planning Committee to Vice Chancellor Omtvedt dated September 15, 1994.

July 5, 1995
Date

Blaine L Blad
Person Preparing Report

Agricultural Meteorology Action Plan for Soil Moisture and Vegetative Condition Monitoring and Modeling

Action Statement: The Department of Agricultural Meteorology, in conjunction with Agronomy and CALMIT, will enhance the state's present soil moisture monitoring and modeling capability and install and operate a system to receive, analyze, and disseminate AVHRR data to provide more timely information on soil moisture and vegetative conditions, respectively, during droughts and other climate-related events.

Background: The Department of Agricultural Meteorology is actively involved in providing timely and reliable climate and climate-related information to decision makers in Nebraska and the surrounding region. The department operates and maintains an automated weather data network of nearly 100 stations. Departmental faculty work with the Governor's Drought Assessment and Response Team (DART) for improvement of the state's early warning and information dissemination capability for climatic events, especially droughts. Currently, very little soil moisture information is available to decision makers. AVHRR data provide an opportunity to monitor changes in potential photosynthetic activity due to changes in soil moisture conditions over large geographical areas in near-real time.

The Nebraska Natural Resources Commission (NRC), as part of its 1990 Nebraska Soil and Water Conservation Strategy Action Plan, has proposed that the Department of Agricultural Meteorology prepare a program description and budget to be presented to the IANR/UNL administration and DART with a request to give this program high priority. Once this priority is given, NRC and DART will support legislation to authorize and fund the acquisition of the necessary equipment and personnel. Once funding is approved through the legislative process, NRC will subcontract this work to the Department of Agricultural Meteorology, CALMIT and the Department of Agronomy who will work with research and extension centers to accomplish the soil moisture monitoring portion of the proposed program.

Objectives:

1. To expand the existing soil moisture monitoring and modeling program in cooperation with district research and extension centers.

2. To develop a statewide and regional monitoring program using AVHRR digital data.

Anticipated Results: The program will strengthen the programs of the three units by providing personnel and operating funds to collect, analyze and disseminate this important information. The program will provide much needed information to the governor, state and federal decision makers, NRDs, agricultural producers, media and others for making climate-sensitive decisions. The information provided by this program will be used in the state's current drought plan and the developing climate response plan. Information gathered through this program will also be utilized by the Agricultural Climate Situation Committee in developing advisories to the agricultural community.

Leadership: Drs. Donald A. Wilhite and Kenneth G. Hubbard from Agricultural Meteorology, Dr. Donald C. Rundquist from CALMIT and Dr. Alice J. Jones from Agronomy will provide leadership for the proposed program and will serve as liaison personnel to the Natural Resources Commission.

Time Schedule: Development and implementation of this program is dependent on IANR/UNL administration and the Board of Regents establishing it as a priority. The priority setting process should be completed by the late fall of 1992 to allow time for the NRC and DART to request funding during the 1993 legislative session. The program would be implemented in the fall of 1993 or spring of 1994, if funds are available.

Resources Committed: Appropriated or reallocated funds are not requested for support of this program.

Resources Needed: The NRC and DART will request funds for the acquisition of the necessary equipment and personnel. The proposed work will be subcontracted to the appropriate departments by the NRC.

COPY

UNIT ACTION PLAN REPORT
IANR Strategic Plan
1992-1995

I. **ADMINISTRATIVE UNIT:** Agricultural Meteorology

II. **ACTION PLAN TITLE:** Soil Moisture/Vegetative Condition Monitoring and Modeling

III. **MAJOR ACCOMPLISHMENTS, OUTCOMES, IMPACTS:** (Please state so readily understood by the general public -- customer oriented.)

1.

2.

3.

4.

5.

IV. **ESTIMATED INCREASE SUPPORT ALLOCATED TO THIS ACTION PLAN:** (Be as specific as possible regarding amounts, sources and uses. Self-explanation will be important.)

V. **COMMENTS:**

The accomplishment of this action plan was dependent on the Nebraska Natural Resources Commission to receive funds to support this program as part of their Nebraska Soil and Water Conservation-Strategy Action Plan. Funds to support this program were not forthcoming.

July 5, 1995
Date

Blaine L Blad
Person Preparing Report

1995-99 UNIT PROGRAM ACTION PLAN

Unit Agricultural Meteorology
Action Plan No. 1
Date July 7, 1995

I. ACTION PLAN TITLE: Strengthen Academic Program in Agricultural Meteorology

II. ACTION STATEMENT: The department will strengthen its academic program by: (1) Developing two or more new courses; (2) Offering an undergraduate minor in Bio-Atmospheric Sciences; and (3) Establishing an M.S. degree program.

III. BACKGROUND INFORMATION: The department has revised and developed several new courses in the past five years. We now wish to develop a new course in Global Climate Change and Environmental Climatology. With the recent and proposed additions to our departmental course offerings we are in a position to establish an M.S. degree and to offer an undergraduate minor in Bio-Atmospheric Sciences.

IV. OBJECTIVE(S): (1) Develop two or more new courses in Agricultural Meteorology; (2) Establish a M.S. degree program; (3) Offer an undergraduate minor in Bio-Atmospheric Sciences.

V. ANTICIPATED RESULT(S)/IMPACT(S): These actions will provide students with courses that will help them understand and make educated decisions on issues related to global environmental change and the impacts and interactions of climate with the biosphere and different natural and managed ecosystems. They will also provide students with an opportunity to minor in Bio-Atmospheric Sciences and to receive a M.S. degree in Agricultural Meteorology. Eventually we hope to offer a Ph.D. degree.

VI. ACTION PLAN LEADERSHIP: Leadership will be provided by the department head, the departmental graduate faculty committee and specific faculty members who will develop materials for and who will teach the proposed courses.

VII. TIME SCHEDULE OF KEY EVENTS: Develop materials for new courses by fall, 1996. Submit materials for undergraduate minor and M.S. degree by spring, 1996.

VIII. RESOURCES--COMMITTED REDIRECTED: Some adjustments in teaching FTE will be needed to develop and teach new courses. A small increase in teaching operating funds is also needed for new courses. Other actions will require no additional resources.

1995-99 UNIT PROGRAM ACTION PLAN
IMPLICATIONS, CONSIDERATIONS

Unit: Agricultural Meteorology

Action Plan No. 1

	INCLUSION			COMMENTS RELATED TO THIS ACTION PLAN
	YES	NO	NA	
IANR OVERARCHING OBJECTIVES				
* Student Programs: Recruitment/Retention/Placement	X			This action plan will help make the department program more attractive to potential graduate students and will strengthen the quality of their education.
* Distance Education	?			We may use some distance education capabilities in the future to deliver course offerings and will use such things as WWW Home Page to describe department and departmental programs. New courses will broaden the scope of our academic programs and teach material currently unavailable to UNL students.
* Program Balance	X			
IANR OPERATIONAL PRIORITIES				
* Faculty and Staff Development	X			Will require some redirection and training to develop course materials.
* Diversity and Gender Equity		X		
* Enhance Communications and Communicating Program Impacts		X		
* Program Linkages	X			Will provide course material to cover issues of importance to several IANR and other UNL departments.
* Organizational Effectiveness		X		
OTHER CONSIDERATIONS/CONCERNS				
* Policy Issues	?			Courses will discuss information that will address issues and concerns that will impact society and the environment. Information covered in courses will provide background and information that could influence policy decisions.
* Environmental Concerns/Impacts	X			
* Societal Concerns/Impacts	X			
* Establish Partnerships		?		

ADDITIONAL COMMENTS RELATED TO THIS ACTION PLAN:

1995-99 UNIT PROGRAM ACTION PLAN

Unit Agricultural Meteorology
Action Plan No. 2
Date July 7, 1995

I. ACTION PLAN TITLE: Development of a Program in BioEnvironmental Meteorology.

II. ACTION STATEMENT: The department will seek support to develop a program in BioEnvironmental Meteorology to examine the role that climate plays in determining the rates at which chemicals move into the soil and atmosphere from soil and vegetation and how such movement affects climate, air quality and water quality. When financial resources are obtained the program will be established.

III. BACKGROUND INFORMATION: The fate of many chemicals and gases in the biosphere is controlled to a large extent by atmospheric processes. Often these chemicals and gases will influence the climate as well as the quality of air and water. There is currently a lack of expertise at UNL to address these issues which are of major importance and concern for society. While the major expertise in this program should come from a position in Agricultural Meteorology the total program would incorporate expertise from microbiology, soil chemistry, water science and other disciplines.

IV. **OBJECTIVE(S):** (1) Determine potential sources of funds for support of the proposed program and put together appropriate requests for funds, (2) When funds are obtained establish the program working in conjunction with other appropriate departments.

V. ANTICIPATED RESULT(S)/IMPACT(S): Successful establishment of the program will strengthen UNL programs that deal with water and air quality and provide needed expertise that is currently unavailable. Will strengthen IANR as a leader in addressing issues of primary concern to improving the environment and managing natural resources in an environmentally sound manner. Has potential to attract new students and to provide other students with improved understanding of basic atmospheric processes and how they influence the fate of man-applied and naturally occurring chemicals.

VI. **ACTION PLAN LEADERSHIP:** Leadership in initial establishment of program will come from department head and a departmental committee composed of faculty members who would interface with the program. Once established, leadership for the program would come from the scientist hired to direct the program.

VII. **TIME SCHEDULE OF KEY EVENTS:** Assess potential funding sources in late 1995 and early 1996. Seek funds for program in 1996. Hire scientist in early 1997 if funds are available.

VIII. **RESOURCES--COMMITTED REDIRECTED:** Will require new resources. Should take about $150,000 per year to establish and maintain program. A modest amount of departmental funds may be redirected to help establish and support this program.

1995-99 UNIT PROGRAM ACTION PLAN
IMPLICATIONS, CONSIDERATIONS

Unit: Agricultural Meteorology

Action Plan No. 2

	INCLUSION			COMMENTS RELATED TO THIS ACTION PLAN
	YES	NO	NA	
IANR OVERARCHING OBJECTIVES				Establishment of this program has potential to attract new students.
* Student Programs: Recruitment/Retention/Placement	X			
* Distance Education	?			
* Program Balance	X			Program would interact with many programs and would fill a current void.
IANR OPERATIONAL PRIORITIES				
* Faculty and Staff Development		X		
* Diversity and Gender Equity	?			This issue would be addressed as part of hiring procedure
* Enhance Communications and Communicating Program Impacts	X			Information gained and transmitted through this program would focus on impacts of various management practices on agriculture and natural resources.
* Program Linkages	X			
* Organizational Effectiveness		X		Has potential for strengthening working relationships between internal and external groups.
OTHER CONSIDERATIONS/CONCERNS				Program would develop information that would address several environmental concerns of high priority to today's society. It would provide information and input for making rational public policies.
* Policy Issues	X			
* Environmental Concerns/Impacts	X			
* Societal Concerns/Impacts	X			
* Establish Partnerships		X		

ADDITIONAL COMMENTS RELATED TO THIS ACTION PLAN:

1995-99 UNIT PROGRAM ACTION PLAN

Unit Agricultural Meteorology
Action Plan No. 3
Date July 7, 1995

I. ACTION PLAN TITLE: Development of a Program in Ecosystem Carbon Cycle Modeling.

II. ACTION STATEMENT: Department will actively pursue funding for establishing a program in Ecosystem Carbon Cycle Modeling and will develop this program if adequate funding can be secured.

III. BACKGROUND INFORMATION: Understanding long-term processes of net carbon exchange between terrestrial ecosystems and the atmosphere is a major frontier in the science of global environmental change. The simultaneous capture, storage and release of carbon by such ecosystems is regulated partly by natural processes (e.g., atmospheric conditions, surface hydrology, biological productivity, land cover composition) and partly by human activity (e.g., land use conversion, changes in intensity of land use). Climate variability (e.g., drought, interannual excursions like El Nino-Southern Oscillation events) and change (greenhouse warming) strongly influence soil processes (e.g., nutrient cycling, respiration), plant physiology (e.g., photosynthesis, plant water relations, root-to-shoot ratios), competition and succession (e.g., changes in abundancce and diversity of species), economic yield (e.g., range, crop and forest productivity) and adaptive land use decisions (e.g., changes in cropping systems, forest management, grazing practices) which in turn influence the terrestrial carbon cycle. At present, the Department has three areas of strength on the above issues: (1) the measurement and modeling of trace gas exchange between terrestrial ecosystems and the atmosphere; (2) human-induced changes in land-cover characteristics; and (3) the impacts of climate variability and change on renewable natural resource systems, especially agroecosystems and society. The key missing link is expertise in modeling of carbon within those ecosystems.

IV. OBJECTIVE(S): (1) Determine potential sources of funds to establish the program, (2) When funding is obtained hire a systems ecologist/carbon cycle modeler to lead the program.

V. ANTICIPATED RESULT(S)/IMPACT(S): The establishment of this program will complement several programs in the department and will integrate information generated from these current programs. Through this it will enhance the ability of the department to address issues of major interest and importance for understanding and addressing global environmental change. It will also strengthen interactions with other departments or groups such as CALMIT, FF&W, Agronomy and Biological Sciences.

VI. ACTION PLAN LEADERSHIP: Initial leadership will be provided by Dr. Easterling and Dr. Verma working in concert with the department Head. Eventual leadership for the program will come from the scientist hired to direct the program.

VII. TIME SCHEDULE OF KEY EVENTS: Determine potential funding sources in 1995 and early 1996. Seek funding for position in 1996. Fill position in late 1996 or early 1997.

VIII. RESOURCES--COMMITTED REDIRECTED: Almost all funds for this program will need to be generated from new sources. We anticipate that it will take about $150,000 per year to establish and maintain program. A modest amount of departmental funds might be redirected to establish and support this program.

1995-99 UNIT PROGRAM ACTION PLAN
IMPLICATIONS, CONSIDERATIONS

Unit: Agricultural Meteorology

Action Plan No. 3

	INCLUSION			COMMENTS RELATED TO THIS ACTION PLAN
	YES	NO	NA	
IANR OVERARCHING OBJECTIVES				
* Student Programs: Recruitment/Retention/Placement	X			Would broaden current departmental programs and likely attract some additional students.
* Distance Education	?			Would complement current programs in department and provide opportunities for working with other departments.
* Program Balance	X			
IANR OPERATIONAL PRIORITIES				
* Faculty and Staff Development		X		
* Diversity and Gender Equity	?			Issue would be addressed during hiring process
* Enhance Communications and Communicating Program Impacts		X		
* Program Linkages	X			Would improve linkages with other UNL departments and perhaps other Universities.
* Organizational Effectiveness				
OTHER CONSIDERATIONS/CONCERNS				
* Policy Issues	X			Would generate information that would be helpful in understanding issues associated with global environmental change and the impact of such potential change on managed and unmanaged ecosystems. May provide information needed to make informed policy decisions.
* Environmental Concerns/Impacts	X			
* Societal Concerns/Impacts	X			
* Establish Partnerships		X		

ADDITIONAL COMMENTS RELATED TO THIS ACTION PLAN:

COMPREHENSIVE CSRS REVIEW OF PROGRAMS

University of Nebraska

Department of Agricultural Meteorology

September 12-14, 1989

FOREWORD

This review process began with a request for the review in a letter dated July 14, 1988, from the Interim Director of the Nebraska Agricultural Experiment Station, Dr. Dale H. Vanderholm.

Reviews have been and continue to be an important component of the administration of the Institute of Agriculture and Natural Resources (IANR) at the University of Nebraska. The normal period between reviews for most departments is five to six years. The most recent review of the Center for Agricultural Meteorology and Climatology (CAMaC) was conducted in 1983. In July, 1989, CAMaC was terminated, and the Department of Agricultural Meteorology was formed. The necessity of making many important decisions related to personnel, research program thrusts, teaching programs, and extension programs indicated that this was an important time for an external review.

A Review Team was chosen with three persons from the University and three scientists from other organizations, in addition to the Cooperative State Research Service (CSRS) scientist who chaired the Review Team. The review was made on September 12-14, 1989. Members of the Review Team are as follows:

Dr. Paul W. Brown	Extension Specialist in Biometeorology Soil and Water Department University of Arizona
Dr. Stanley A. Chagnon	Chief, Atmospheric Section Illinois State Waster Survey
Dr. Glenn J. Hoffman	Head, Department of Agricultural Engineering University of Nebraska-Lincoln
Dr. William E. Marlatt	Professor of Air Resources Department of Earth Resources Colorado State University
Mr. Steven Meyer	Center for Agricultural Meteorology University of Nebraska, Lincoln
Dr. Steven W. Waller	Department of Agronomy University of Nebraska-Lincoln

GENERAL COMMENTS
University or Institution

Academic Environment

The academic environment for supporting the Department of Agricultural Meteorology appears to be very supportive. Research support, based on the number of technicians, is excellent, being well above the average for IANR. The number of people in office support appears to be low, but neither the secretaries nor the faculty expressed displeasure with the workload or the productivity. In view of the excellent comments from the leaders of cooperating departments, there is strong support for Agricultural Meteorology and a desire to increase the level of interdisciplinary programs.

Administration

The administrators of IANR are very approachable, good listeners, and very adept in their judgment. Goals and objectives of a department are typically initiated within the department. Administrative responses to new objectives are constructive and obviously within a vision of a long-term plan. Considering the large number of new leaders of administrative units in IANR, the formation of new centers and departments, and the development of strategic and action plans, the administration is obviously very effective in achieving their goals.

RESEARCH PROGRAM STATUS

History

The importance of weather and climate to high plains agriculture dates back at least to the 1940's when Dr. Gooding instilled an appreciation of plant/climate interactions to his students in Agronomy 101. The modern era of agricultural meteorology, however, began when Dr. Norman Rosenberg joined the faculty of the Department of Horticulture and Forestry at the invitation of then Chairman Dr. J. O. Young.

In addition to being a sound scientist, Dr. Rosenberg was both a strong leader and a visionary. Under his guidance and leadership, and in spite of a number of changes in parent departments within IANR, the agricultural meteorology program grew and thrived. In 1979, he became the leader of a small but very capable group of scientists in the newly formed Center for Agricultural Meteorology and Climatology (CAMaC). While CAMaC was established as a separate, independent entity within IANR to fill the needs for expanded research and service for the State of Nebraska and adjacent high plains regions, each of the professional staff had either full or courtesy appointments in several departments of UNL.

The first graduate degree in the agricultural meteorology program in the Department of Horticulture and Forestry was granted in 1974. Since then, an additional 33 students have earned either the M.S. and/or Ph.D. degree in the agricultural meteorology program from one of several departments of the IANR.

Current St[redacted]

Recogniz[redacted]turing of the programs in CAMaC and the changing roles of the cent[redacted] campuses, the University created the Department of Agricultural Meteorology in July 1989. Following a competitive process, Dr. Blaine L. Blad was appointed as the first Department Head. In addition to Dr. Blad, there are five doctoral level scientists in the faculty, each with a unique and a rather full program. Taken collectively, the faculty cover a broad array of topics in the field. There are a number of additional specialty areas, however, which are still needed to round out the new Department.

The background document provided to the review committee indicates that the Department has a set of long-term, open-ended, goals to be achieved. Since the Department is so new, these goals and objectives appear to be in their formative stages and new iterations should be developed and completed. More specific Action Plans have been prepared and submitted to the Administration of IANR for use in helping to set priorities over the next three to five years. These Action Plans include: Agricultural Climatology; Graduate Degree Programs; and Recruitment, Retention and Placement of Students. Each of these plans are fairly detailed and clearly presented. In addition, the Department has established priorities and goals in the areas of animal biometeorology, atmospheric chemistry and hydrometeorology, each of which is set out in detail.

There was obviously a high degree of faculty participation in the decision making processes leading to these plans. The faculty is to be commended for the planning which has been accomplished in the short time since the Department's inception.

In addition to the Department plans, each faculty member presented visual and oral descriptions of their individual plans for future activities. Because this is a department heavily dependent on grant funding, the emphasis is strongly research oriented. The teaching program has involved graduate level courses designed for students associated with the Department. For several years, there also has been a strong service/extension thrust. At present, however, extension activity is at a low level of only 0.35 FTE. The committee feels this is an area that definitely needs bolstering.

The Department has been very successful in acquiring, developing, and retaining [redacted] support staff. Support from other departments within IANR for the programs of the Department of Agricultural Meteorology is good. Added to these efforts are the inputs of the graduate students which, undoubtedly, have been very beneficial to the research programs.

The management style of the Department Head appears to be that of a facilitator. He is a strong advocate of his faculty and staff, and is sincerely interested in their professional development. It is evident that the research endeavors have been maintained in the transition from a research center to a department. The challenge now is the formulation of the goals of the teaching and extension programs.

Facilities Available to the Program

Currently, the Department of Agricultural Meteorology has office space in L. W. Chase Hall. The Department has a total of 17 faculty/staff offices which house six faculty, one bookkeeper, two secretaries, one computer analyst, one editorial assistant, nine graduate students, six technologists and one climate data specialist (plus three dedicated computers, two RBBS computers, three computer work stations, and a climate library). Overall, the current facilities are woefully inadequate, and this inadequacy is inhibiting the Department's growth.

New graduate students have recently moved into one large room in the Activities Building, which has been partitioned off. This is of concern to the faculty because these students will be separated from their advisors. Also these graduate students have complained about the lack of temperature control in the room and the excessive noise coming from the adjoining weightroom and basketball courts.

One technologist is housed in the Agricultural Engineering Annex and has plenty of work space and storage area for his activities. Storage areas currently being used in the old Animal Science Judging Pavilion are inadequate. Security at this location is of significant concern. Two outside doors are the only barriers before getting to the chicken wire caged storage areas. In addition, temperatures in both the Annex and the Pavilion are difficult to control, particularly in summer. Temperature extremes could result in damage to the instrumentation stored in these areas.

Obviously, adequate office space for faculty, staff, graduate students, equipment (computers, copiers, etc.), classroom space, laboratory areas (for teaching instruments course and for calibrating instruments) and equipment storage is sorely needed. Consideration should also be given to commit additional space to allow for future growth. One possibility is to move the Department to the basement of L. W. Chase Hall. This would substantially increase the area for the Department until such time that the new Natural Resources building is completed and the Department can be provided with permanent facilities. Currently, instrument calibration is being done in "borrowed" facilities in Phoenix, Arizona. This is an expensive and time consuming situation. Temporary residence in the basement of Chase Hall would allow inclusion of special rooms for calibration of research instrumentation.

Future Direction

The current major research areas, micrometeorology and applied climatology, should continue to be emphasized. The encompassing issue of the future of the atmospheric sciences is global climate change, and it can be well addressed by focusing ongoing research on this issue as a unifying theme. Climate impact and adjustment research are rapidly emerging areas that the climate staff should more fully address, particularly as they relate to agriculture and water resources on local, state, regional, national and international scales. There is currently a great need to understand climate variability, particularly on state and regional scales. Techniques

for studying [redacted] as well as the actual monitoring and analysis of subtle changes in [redacted] and atmospheric processes are additional major research areas that existing (and developing future) staff should address using their outstanding data bases and expertise.

Development of new research thrusts into totally new and complex areas, such as atmospheric chemistry, already being well addressed by other groups, is not encouraged. The Department should continue to build on its already sizable and diverse strengths. An approach strongly based on the concept of being the "best atmospheric research center in agricultural meteorology in the High Plains" is needed, both to attract and sustain high levels of external funding and high quality professional staff. The envisioned "High Plains Atmospheric Center" should attempt, through its High Plains Climate Center and faculty participation, to build quality multidisciplinary research programs.

TEACHING PROGRAM STATUS

Current Situation

Unfortunately, the faculty and department head have not devoted enough time and energy to develop a well-defined graduate curriculum. Further, while the faculty members have acknowledged the importance of the teaching program, they have individually shown a lack of commitment to teaching. Only four formal courses are offered within the Department, with only one of these being taught every year. The other three are taught on alternate years only. Most of the faculty are very active in extramural research (indeed, several appear to be over-extended), in grant proposal writing, field work, travel, etc. - activities that will have to be modified unless additional teaching faculty are brought into the Department.

At present, the Department is woefully lacking in teaching facilities - laboratory space and demonstration equipment, dedicated classrooms, and computer facilities.

The faculty-student ratio is not excessive at this time. The number of graduate students per FTE teaching faculty, how-ever, is not in balance.

Future Direction

The faculty have suggested several new courses that could be included into a graduate program (two of which have already been approved). Any decision on when (or whether) these courses will be taught will depend upon the availability of faculty and instruction funding support for the faculty.

The Department does not have an undergraduate education program, nor does the Review Committee recommend one at this time. Undergraduate programs in meteorology and climatology are available in the Department of Geography. An undergraduate minor in agricultural meteorology could probably be developed without a significant commitment of faculty resources.

EXTENSION PROGRAM STATUS

Current Status

The extension program continues to produce an array of important weather data and information of relevance to agriculture. Program strengths include access to data generated by the Automated Weather Data Network (AWDN), the recently completed Dial-Up Weather Information Bulletin Board, and close linkages to the High Plains Climate Center (HPCC). The efforts of this group related to acquisition and dissemination of agriculture weather information are recognized nationally and internationally. The Agricultural Climate Situation Committee continues to be an effective interdisciplinary program for disseminating decision-oriented agricultural weather information. Efforts to identify and prioritize future weather-related extension products through multidisciplinary advisory committees are commendable and essential to improving the output of the program's information.

Future Direction

The retirement of Dr. R. E. Neild (50% Extension), Dr. Hubbard's recent success in obtaining extramural financial support for research and the HPCC, and the recent loss of AGNET provide reasons for concern about current extension efforts. Dr. Neild's extension load has not been assumed by other faculty nor replaced by new faculty or staff. The responsibilities associated with the HPCC and the State Climatologist have necessarily broadened the focus of Dr. Hubbard's extension efforts, while at the same time concerns regarding the funding of a critical extension data source (AWDN) remain unsolved. A cost recovery program for weather-related extension products - a need identified in the 1983 review - has not yet been fully developed.

SUMMARY COMMENTS

Strengths

1. High quality research programs have resulted in success in obtaining grants. Excellent grantsmen.
2. Publication quality and quantity have generally been high.
3. External scientific interactions are outstanding.
4. The support structure for gathering climate data is excellent.
5. The support staff size and quality are an important component in the success of the Department.

Weaknesses

1. Interactions could be improved.

2. A definitive, integrated, long-term plan for the Department is lacking.

3. The Department is bordering on overcommitment. (Very serious!)

RECOMMENDATIONS AND SUGGESTIONS

Research Program

The Department needs to accomplish joint and detailed planning of its future research program, its teaching program and its extension program. This process will allow for an orderly implementation of the actions needed and recommended in the following sections.

1. The staff of the Department needs to be enlarged both to fulfill existing obligations and to seize sizable scientific opportunities. Enlargement might come through faculty additions or through other innovative means, including redirection of internal efforts, more meaningful research alliances in allied fields, and joint research and teaching with the Geography Department. These actions will require very careful planning and development of meaningful joint projects. Hence, leadership and administrative time is needed by the Department Head.

2. Additional space for offices, laboratories, computer facilities and storage must be provided if quality and reasonably cost-effective research and services are to be accomplished. We recommend a space needs analysis be performed to justify the amount of space and allied facilities needed now and with expected growth in applied climatology and other fields.

3. Future research should enlarge in two areas of expertise (micrometeorology and applied climatology), use global climate change as a unifying theme (specialize in monitoring change, describing change, and studying effects of change), and seek to establish a "Center of Atmospheric and Environmental Change for the High Plains". This should involve faculty from many of the departments of the University of Nebraska as well as scientists throughout the High Plains.

4. Future applied climate research and services should be embodied in a strong program of climate information services for Nebraska and the High Plains featuring strong user interactions, specialized data sets, and near-real time information systems. Interactions with Nebraska users of climate information should be strengthened.

5. Graduate student training should include requirements for: (a) a research proposal for the thesis, (b) specialized training and workshops involving research management and grantsmanship, and (c) teaching experience.

Instruction Program

1. The Department should begin curriculum planning by holding a faculty retreat to consider its teaching program. At that time it should develop the following:
   a. curricula for the M.S. and Ph.D. degrees including core courses in basic meteorology and climatology courses to be required for non-B.S. meteorology students, supporting courses, etc.;

   b. the courses to be offered each semester within the Department, prerequisites for each, etc.

   c. the faculty member responsible for each course;

   d. the number of graduate student advisees to be assigned to each faculty member;

   e. additional faculty to extend and strengthen graduate teaching programs.
2. The Department should hold a second retreat jointly with the Department of Geography. Topics for discussion at this retreat should include:
   a. expanded joint listing of courses both at graduate and undergraduate levels;

   b. joint seminars;

   c. team teaching and joint opportunities in research.

3. The proposed new course in biometeorological instrumentation should be taught. While it is a good idea to team teach courses, the use of team teaching to mitigate the work load on Dr. Hubbard because he is too overcommitted in his duties of being State Climatologist and Director of the HPCC is not justified. It is recommended that Dr. Hubbard be relieved of the duties of State Climatologist and be provided with sufficient teaching program support to allow him to take responsibility for a significant part of the graduate education program.

4. The course "Climate and Society" should be team-taught with a faculty member in Geography sharing a significant portion of the course with Dr. Wilhite. Dr. Wilhite should be provided with an increased percentage of his funding from the instruction budget and encouraged to reduce his research activity, if necessary, to allow an increased emphasis on quality graduate teaching.

While relevant to a curriculum in agricultural meteorology, the c "Crop Modeling" should be incorporated into the Plant Relationships course now offered in the Agronomy Depart

6. The course "Animal Biometeorology" should be placed on hold until a faculty member with interest and capability in this area is added to the staff.

7. Every effort should be made to offer the course "Agricultural Climatology" on a regular, yearly basis. If no new faculty are brought in, Dr. Blad should consider a significant reduction in his research activities so that he can devote the time and effort to strengthening the academic program, including teaching this course, if necessary.

8. Even if additional faculty are made available, the development of a high quality academic program, plus many administrative duties, planning for the future, interdepartment and centers coordination (activities now apparently with low priority), etc., will require an increased amount of Dr. Blad's time and energies. For this reason, he should seriously consider altering his role in specific future research projects.

9. It is recommended that either the agricultural climatology course be converted to an undergraduate/graduate-level course or a new course in plant canopy meteorology or applied agricultural climatology be taught at the upper division, undergraduate level.

10. It is recommended that several of the undergraduate courses in Geography (meteorology, climatology) be joint-listed with Agricultural Meteorology to allow undergraduate students in agricultural fields to minor in agricultural meteorology.

11. It is recommended that courses taught elsewhere in the University of particular relevance to students planning careers in agricultural meteorology (nonparametric statistics, logic and scientific methods, seminars in research grantsmanship, proposal writing, research project management, etc.), be identified and the students be encouraged to incorporate these into their programs of study.

If the above recommendations are seriously considered and implemented, the review committee believes that the Department of Agricultural Meteorology should be made an academic department with full M.S. and Ph.D. degree granting privileges. An undergraduate minor is also recommended. An undergraduate major is not recommended at this time.

Extension [redacted]

1. Develop departmental plan for extension effort in agricultural meteorology and climatology, establishing goals and key areas of focus as part of a broader Departmental plan.

2. Adjust faculty and/or staff focus to bolster extension efforts, with special emphasis on taking a systems approach to solving weather-related problems of interest to high plains agriculture.
3. Encourage linkages with Extension Service specialists in other departments and centers within IANR to address multidisciplinary problems related to weather.

4. Complete conversion of weather-related AGNET products for use with new dial-up weather system.

5. Develop a sound cost recovery and/or funding plan for the extension efforts in agricultural meteorology.

Other Suggestions

1. The potential reallocation of funds now administered in the Conservation and Survey Division to the Agricultural Meteorology Department appears reasonable, but before proceeding with this action, we suggest it await an in-depth departmental assessment and development of long-range plans for research, teaching and service.

2. Review of grant proposals by faculty peers to provide several benefits within the Department, e.g., suggestions for improvement, understanding of proposed actions.

Conclusion

The new Department of Agricultural Meteorology has great potential for serving the University, Nebraska, and the Nation through it's programs in research, education, and extension. It is poised for an enlarged role on campus, but is currently limited by facilities and personnel needs. Provided with the proper resources, this fine organization should continue, and exceed it's already high level of productivity.

University of Nebraska Lincoln
Institute of Agriculture and Natural Resources

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FAX: (402) 472-6338

DATE: June 18, 1990

MEMO TO: Dr. Ted Hartung

FROM: Blaine L. Blad

SUBJECT: **Response to CSRS Review of the Department of Agricultural Meteorology**

The faculty in the Department of Agricultural Meteorology have held a series of discussions to respond to issues, observations and recommendations made by the review team. We appreciate the dedicated efforts of the review team. They asked probing questions, made astute observations and truly worked very hard to provide a comprehensive review of present and proposed departmental programs. Although we do not agree with all their recommendations and suggestions, we believe their assessments of strengths and areas for improvement provide considerable food for thought. Their recommendations have been and will continue to be very useful in helping the department focus on important issues when developing and implementing future plans.

We are pleased with the conclusion of the review team: "The new Department of Agricultural Meteorology has great potential for serving the University, Nebraska and the nation through its programs in research, education and extension. Provided with the proper resources, this fine organization should continue and exceed its already high level of productivity."

Responses to General Comments

This section contains our response to comments made on pages 2-7, and the next main section will provide responses to the specific recommendations and suggestions made on pages 7-10. In some cases, there is obvious overlap.

Academic Environment:

The review team states that the number of office support staff is low, but that the secretaries and faculty did not express any dissatisfaction with the work load and productivity. This is a correct observation, but we are concerned that a heavy demand has been put on the secretarial staff and that it is only because of their outstanding skills, dedication and willingness to work extra hours that they are able to cope successfully with the amount of work they must do. Certainly, with further additions to the faculty, additional secretarial help will be needed.

We are pleased that cooperating departments have expressed strong support for agricultural meteorology and a desire to increase interdisciplinary programs. We have maintained, we believe, a high level of interactions with other departments and we see our efforts continuing and even increasing in the future. We trust that such efforts will truly be interdisciplinary and that we will not be viewed as having primarily a service role to provide climatic data and information, scientific know-how and meteorological instrumentation to assist other departments. We are certainly willing

to provide these services, but we are primarily interested in working on good scientific problems of mutual benefit to all scientists involved.

Research Programs:

The review team noted that the department has scientists with unique and full programs covering a broad array of topics in agricultural meteorology. Nevertheless, they suggest that some areas are still needed to round out the new department. We suggested some of these areas in our self-study document, including animal biometeorology, atmospheric chemistry, hydrometeorology, mesoscale/boundary-layer modeling and remote sensing modeling. We plan to seek internal and external funding to support these and perhaps other programs as time, facilities and resources permit.

The review team commended the department for the planning that was accomplished in the short period that the department has existed, but correctly observed that the goals and objectives of the department are in their formative stage and additional iterations are required. (Later on in the document the review team expressed concern about a long-term plan for the department. More will be given on that later in this response.)

The review team concluded that departmental emphasis has been and is strongly oriented toward research and that the department is heavily dependent on grant funding. They remarked on the high quality of the research programs and the excellent grantsmanship demonstrated by the faculty. They were complimentary of the high quality of the research support staff, and we certainly agree with that assessment. They also felt that scientific interactions with scientists within and external to UNL have been outstanding.

We are grateful for this assessment of the review team and feel that the strength of the department will continue to be in the area of research. We believe that scientists within the department will have ample opportunity to make strong scientific contributions and that they will be successful in acquiring funds to support active and productive research programs.

We concur with the review team that the current major areas of emphasis, micrometeorology and applied climatology, should continue to be emphasized. The issue of global change could serve as a theme for the department, but we believe that the departmental focus should be broader than global change. There is a need to understand climate variability and to analyze subtle changes in climatic and atmospheric processes, particularly on a state and regional scale. The department should continue to address these issues. The proposed position in agricultural climatology will greatly enhance our capability to do so; it will also allow us to evaluate the possible impacts of climate change on managed and natural ecosystems.

The review team suggested that the department should not develop research thrusts into what they termed "totally new and complex areas, such as atmospheric chemistry." We do not agree with their suggestion; we believe they did not understand the benefits of this proposed position nor how it would compliment our current and potential areas of research. Unfortunately, a discussion on the atmospheric chemistry program for the department did not occur during the review.

With established programs in micrometeorology and remote sensing, UNL has an excellent opportunity to contribute to global change initiatives. The recent creation of the Center for Laser-Analytical Studies of Trace Gas Dynamics will help to increase scientific knowledge of certain trace gases implicated as having the potential for causing climate change. Enhancement of our capability to accurately rescale our results to regional and global levels and evaluation of the consequences of increasing trace gas concentrations will require scientists with expertise and experience in atmospheric

chemistry. To our knowledge, this research area is not being addressed at land grant universities in any of the states in our region. We believe that the proposed atmospheric chemistry program would complement our current programs and bring an area of needed expertise to the department.

Teaching:

The review team did not feel that we have devoted sufficient time and energy to develop a well-defined graduate curriculum. Considerable time and effort was spent a few years ago in an attempt to develop a graduate degree program within CAMaC, which was not approved by UNL administration. We continue to feel the need to develop a graduate degree program, but have not devoted much time to that effort because of limited resources. We have had a relatively small FTE of only about 0.5 allocated for teaching. As a center, we did not have a strong teaching mission, but with our change in status to a department we are renewing our efforts to develop a graduate degree program and expanding our teaching efforts. We have already held a series of half-day sessions discussing future directions for teaching. We are in the process of developing two new courses to add to the four we already teach. We will further define and refine our curriculum as we make application for granting graduate degrees in agricultural meteorology.

The review team suggested that faculty in the department have shown a lack of commitment to teaching--largely because of the high level of activity in research and grantsmanship. We disagree. Each member of the department who has had a teaching assignment has shown a strong commitment to teaching and has devoted considerable time and effort to the courses he or she teaches. The generally high ratings given to instructors by students are an indication of the dedicated efforts that the faculty members have made to teaching. Nevertheless, we recognize, as pointed out by the review team, that additional time, effort and resources need to be devoted to our teaching efforts. It will be necessary for most, if not all, faculty in the department to teach a course or courses, and we are committed to doing so.

The review team stated that the department is "woefully lacking in teaching facilities." We agree. More will be given on this later in the document in Space Needs and Assessment.

Several new courses for inclusion in a graduate program, depending on the availability of teaching support, were suggested by the team. We are developing two new courses, which we plan to offer in 1991. We have identified others that we believe should be offered in the future. Specifics on these courses will be given in Responses to Specific Recommendations. Additional support will be required to address further development of teaching in the department.

We agree with the review team that the department should be given full M.S. and Ph.D. degree granting privileges and that we should not attempt to offer an undergraduate major at this time. They suggested that an undergraduate minor could be developed, and we will explore this possibility in conjunction with other departments, especially Geography.

The review team made a statement to the effect that the faculty-student ratio is not excessive, but that the number of graduate students per FTE teaching faculty is not in balance. We do not understand what is meant by students/FTE teaching faculty and why it is not in balance. All faculty in the department advise between one and five students and we feel that this is an appropriate number.

Extension:

The review team was highly complimentary of the weather data collection and dissemination of climate information accomplished by the department and the High Plains Climate Center. They also pointed out that the Agricultural Climate Situation Committee is an effective program for disseminating decision-oriented agricultural weather information. They recognized and commended the efforts of advisory committees to help determine priorities for future weather-related extension products.

Although complimentary of the department's efforts in extension, the review team expressed concern that the department, especially with Dr. Neild's retirement, is not devoting enough effort to extension. We concur with that view and are attempting to rectify this problem. We have redirected .35 FTE of Dr. Weiss' time to extension and have proposed that the new position in agricultural climatology have 0.40 FTE devoted to extension. We have also made a request of the Dean and Director of Extension to provide funds to hire a part-time technician to support the efforts of the Agricultural Climate Situation Committee and other extension programs. All of these efforts should permit Dr. Hubbard to devote more of his time to the High Plains Climate Center and other desirable research and teaching activities.

The team also noted that some financial resources are needed for funding the acquisition of data through the Automated Weather Data Network (AWDN) and that a cost-recovery program for weather-related extension products has not been fully developed. Although full support for the AWDN is not currently available, most stations are supported by state or private funds. The amount of funds to fully support operation of the network is not great but is still needed. Means of securing this support are being explored. Some charges are made for weather-related products and, perhaps, more should be done in this area, but in many cases we feel that this information should be available to the public free of charge.

General Observations

The review team noted a serious lack of adequate space for offices, equipment, classrooms, laboratories, and so forth. We, of course, are acutely aware of this problem. Based on the recommendation of the review team that a possible solution might come from housing the department in the basement of L. W. Chase Hall, we have worked with the Biological Systems Engineering Department to examine this possibility. A plan has been sent to IANR administration for renovating the basement. An analysis of the available space there to house departmental personnel, equipment, graduate students, and so forth, reveals that it is insufficient to meet current needs without the addition of several offices on the first floor and that there is certainly not enough space for needed laboratories nor room for future growth. We are willing to further explore the renovation of the basement, but wish to emphasize once again that, at best, this would be a temporary, short-term solution and that new facilities, such as those proposed for the Natural Resources Building, provide the only real long-term solution.

Although complimentary of the plans and goals set forth in the self-study document given to them, the review team felt that the department lacked a definitive integrated long-term plan. The department was only a few months old at the time of the review, and although we had held some planning sessions before the review, many of the ramifications of the change in status from a center to a department became evident only during the review. We have begun to develop a long-term plan through a series of half-day sessions devoted to goals and objectives for research, teaching and extension/service. A document summarizing those discussions and the goals and plans enumerated there will be forthcoming.

The review team suggested that internal interactions could be improved but offered no explanation of what they meant nor any suggestions for making the improvements. We have tried to maintain open communications between all faculty, between the faculty and the departmental head, and between the faculty and support staff. We will work to make certain that open and effective communication is fostered so that internal interactions are enhanced. 7

The review team felt that the department is bordering on overcommitment. Certainly there is no lack of things to do for anyone within the department, and plenty of demands are made on our time. We have ample opportunity for involvement in more activities than we can handle. Because we are a small department there is, we suspect, a greater than average demand placed on all of us to serve on various departmental, institute and UNL committees. We see potential areas for growth, but often we don't address them because of our high level of involvement. The addition of a new faculty member in agricultural climatology will help, but it certainly will not solve the problem of overcommitment, especially as we expand our course offerings and increase our commitment to teaching. 7

Specific Recommendations and Suggestions

Research Program:

The review team suggested the need for joint and detailed planning for future research, teaching and extension programs. We have had three planning sessions thus far to address many of the recommendations made by the team, as well as other items they did not address. Other sessions are planned for the future.

1. We concur with the recommendation that the department needs to be enlarged both through additions of new faculty and staff and some internal redirection. We have already accomplished some redirection of current faculty and will add a new faculty member in our agricultural climatology program. We have identified other areas of research where we believe that the department could be strengthened by acquiring faculty with expertise to either enhance and complement current research programs or to develop new areas of expertise. 7(1)

   We have begun the process to establish possible research and teaching alliances with faculty in the Department of Geography. We are only in the early stages of the process and plan to have more discussion sessions with Geography.

   As suggested by the review team, careful planning is required, and the department head should devote administrative time to the planning process. To this end, the department head has restricted his research involvement so that he can devote more time to the planning of this and other departmental efforts.

2. The team made an extremely strong recommendation ("must be provided") for additional offices, laboratories, computer facilities, storage, and so forth, for the department. As discussed earlier in this document, we have begun to address this issue. We have performed an analysis of the current and projected space requirements of the department. We have begun discussions with the Physical Plant personnel to determine the feasibility of renovating the basement of L. W. Chase Hall as a temporary solution to current needs. We have made specific recommendations for our projected space needs in the proposed Natural Resources Building. We believe the IANR administration appreciates the critical space needs of our department and we hope for a timely 7(2)

resolution to the problem. It would be informative to compare the current space allocated to our department on a per FTE basis to that of other IANR units. To that end we are requesting the IANR administration to provide such information.

3. The review team suggested an enlarged research program in micrometeorology and applied climatology using global climate change as a unifying theme. We plan to expand our research efforts in micrometeorology and applied climatology through enlargement of some of our current programs and through the addition of complementary programs. The review team suggested the establishment of a "Center of Atmospheric and Environmental Change for the High Plains." We have held some preliminary discussion with faculty from CALMIT about the establishment of an Earth and Atmospheric Systems (EAS) program. This proposed program is in line with, but is broader in concept than, the center proposed by the team. The EAS program could involve faculty from many departments within UNL, some faculty from UNO, possibly scientists from other universities, and appropriate persons from state and federal agencies. This program would address global change as an issue but would include climate variability and the monitoring of surface conditions as well. The EAS program is in line with recommendations made in the IANR Strategic Action Plans.

4. The review team has recommended that "future applied climate research and services should be embodied in a strong program of climate information services for Nebraska and the High Plains," and that these programs should feature "strong user interactions, specialized data sets, and near-real time information systems." Basically, we agree with the review team. However, currently, and in the near future, there are more opportunities for user interaction than we can handle. For this reason we feel that user advisory committees have been and will continue to be worthwhile because they provide perspectives and guidance on setting priorities for applied climate research and services that have a high payoff.

   The Advisory Committee for the High Plains Climate Center helps to fill this function on a regional scale. NC-94 interactions are expected to supplement this committee during the next five years because one of NC-94's objectives in the new NC-94 regional research project is to develop a closer association and interaction with the regional climate centers. This group is setting joint goals with the climate centers to develop critical but specialized data sets for use in future research and service programs. On the state level we plan to survey users of the various climate services (*i.e.*, dial-up, advisories and face-to-face) in a continuous effort to strengthen these services. We plan to continue our program of near-real time data collection and dissemination as the base for near-real time climate service. IANR advisory groups have provided and will continue to provide guidance on the type of near-real time products needed and the format of those products.

5. The review team made specific recommendations for improved training of our graduate students. We believe that their recommendations are pertinent and we have begun discussing means to adopt and implement their recommendations.

   a. In the past a majority of our graduate students have prepared materials for their proposed thesis or dissertation research and presented this information to their advisory committee. We are developing procedures for formalizing the process to ensure that each student prepares a thesis or dissertation research proposal.

b. We will encourage graduate students, especially Ph.D. students, to participate in workshops on research management and grantsmanship. We encourage ARD to sponsor periodic workshops on these subjects that could be attended by graduate students. We are discussing the value and feasibility of having all Ph.D. candidates develop a research proposal that would be appropriate for submission to a granting agency as a requirement for graduation.

c. We will provide Ph.D. and appropriate M.S. students with an opportunity to gain teaching experience as part of their graduate training. For example, graduate students might present class lectures, teach recitation sessions, serve as laboratory assistants, consult with individual students or videotape actual or simulated classroom lectures for later review and critique. We expect our students to make presentations in departmental seminars and to present papers at professional meetings. We will look for opportunities to involve them in as many teaching and extension activities as possible.

Instruction Program:

1. The review team recommended a departmental faculty retreat to consider its teaching program. This retreat should address several specific recommendations enumerated by the review team. We have held retreat sessions to address some of the issues raised by the team and to this point we have done the following:

   a. The faculty are unanimous in their desire to offer a graduate degree in agricultural meteorology. Considerable time has been devoted to discussing core requirements for M.S. and Ph.D. degrees in the department. Several courses currently being taught by faculty within and outside the department have been identified as strong candidates for the core courses. Additional courses that we plan to teach have also been considered. However, we have not yet formalized the list of core courses. This will be done in the next few months as we compile materials for the graduate degree program application.

   b,c. Courses to be offered each semester and the faculty member(s) responsible for each course have been identified. In addition to AgMet 408/808, AgMet 450/850, AgMet 908 and AgMet 958, which we currently offer, we will teach AgMet 907, "Agricultural Climatology," during the fall of 1990. This latter course will be taught by Dr. de Jager, a visiting scholar from South Africa. The faculty member to be assigned to teach this course in 1992 has not yet been determined. Two courses, one on biometeorological instrumentation and measurements and another on crop modeling, are being developed and will be offered in 1991.

   d. All faculty in the department are currently advising graduate students. Graduate students are not assigned to an advisor and a prospective graduate student is not admitted to the department unless a faculty member agrees beforehand to advise the student. We believe that each faculty member should advise at least one but generally not more than 3-5 students. However, the decision as to the number of students a faculty member advises is left up to the individual. The system works well as presently administered and we do not wish to change it.

e. We have identified several additional areas and courses that we believe would strengthen our graduate teaching programs. As resources become available we plan to gradually expand the number of courses offered.

2. The review team recommended a joint retreat with faculty in the Department of Geography for the purpose of exploring the possibility for joint course listings, sponsoring joint seminars and developing joint teaching and research linkages. Discussions have already been held between the Head of Agricultural Meteorology and the Chair of Geography to ascertain the interest in holding such a joint retreat. There is interest in both departments in developing better research and teaching relationships that are mutually beneficial to both groups. A joint retreat will be held as soon as schedules of the faculty in both departments can be coordinated.

3. We will teach the proposed course on biometeorological instrumentation as recommended by the review team. We are altering the position description of Dr. Hubbard to include a teaching component so that he can take the primary responsibility for this course. It is likely, because of the diversity of expertise on various types of instrumentation that should be offered in this course, that the course should include invited lectures. It is not intended to use the team approach to help mitigate Dr. Hubbard's workload. His role as State Climatologist is being evaluated and a decision on which faculty member should be the Nebraska State Climatologist will be made after we hire the new faculty member in Agricultural Climatology.

4. The suggestion by the review team for the course "Climate and Society" to be team taught with a faculty member in Geography will be investigated as one of several actions the two departments can take to improve interdepartmental coordination.

At this time, Dr. Wilhite does not want to have the amount of his time assigned to graduate teaching increased as suggested by the review team, because of his significant state, national and international commitments and the lack of other departmental faculty to assume this role. It is essential that Dr. Wilhite maintain a strong research program on the impacts and policy implications of climate variability and change, complemented by a solid service or outreach program. Such a commitment requires considerable scheduling flexibility that is inconsistent with a significant teaching load.

5. The review team suggested that our proposed course, "Crop Modeling," should be taught as part of the "Plant-Water Relations" class. If the major emphasis of the course was to explore, in detail, the physiological mechanisms of plant growth and their relationship with the environment, then it would be appropriate to teach this subject matter as part of the "Plant-Water Relations" class. This is not what we propose for the crop modeling course. The major goal of this course is to examine models that predict crop yields using different climate scenarios and at various geographic locations. The course would also investigate relationships between climate and plant pests and the influence of pests on crop yields. These goals are in agreement with one of the major functions of agricultural meteorology stated in the Encyclopedia Britannica: "Agricultural meteorologists use weather and climatic data in enterprise and risk analysis as well as short- and long-range forecasting of crop yields and animal performance." Although physical and biological mechanisms involved in plant growth cannot be ignored, the impact of weather on yields will be stressed.

Addressing the interaction of weather and climate on crop yields will entail the application of principles taught in other Ag Met courses on processes such as the transfer of heat, water vapor, CO_2, and so forth.

6. We do not plan to teach a course on animal biometeorology until a faculty member with interest and capability in this area is added to the staff. Dr. LeRoy Hahn from the Meat Animal Research Center has a courtesy appointment with the department and has considerable expertise in animal biometeorology. He has expressed an interest in teaching at least a few classes on animal biometeorology. We will explore the possibility of having him teach a portion of one or more of the courses offered by the department or presenting a series of seminars to the department. We currently have one graduate student who is doing thesis research in animal biometeorology, with Dr. Hahn serving as her co-advisor.

7. The course, "Agricultural Climatology," will be offered in the fall of 1990. It will be taught by a visiting scholar, Dr. Jimmy de Jager. He will work with departmental faculty to develop materials for the course. We believe that this course could easily develop a sufficient audience to justify offering it every year. For now, the course will be offered in alternate years until such time as demand for the course would justify teaching it on a yearly basis.

The review team suggested that Dr. Blad should consider reducing his research activities to devote more time and effort to strengthening the academic program, including the teaching of this course if necessary. It is hoped that the new person hired for the agricultural climatology program or an existing faculty member with expertise in agricultural climatology will teach the course beginning in 1992. If that does not occur, then Dr. Blad is willing to consider teaching the course. The issue of reducing his research activities to devote more time for academic programs is discussed in the section that follows.

8. Dr. Blad has already taken steps to reduce the amount of time he will devote to research, especially large field experiments, so that he can devote more time to the development of a high-quality academic program and other departmental administrative matters. Nevertheless, he still has commitments to previous and current research projects that will require some time and attention. One of the attractive features of the position description for the Head of Agricultural Meteorology was the opportunity to do some research, and Dr. Blad is reluctant to completely give up this opportunity at this time.

9. It was recommended that we either convert the agricultural climatology course to an undergraduate/graduate level course or develop a new course in plant canopy meteorology or applied climatology to be taught at the upper division undergraduate level. Since the content of this course is still being developed, it is premature to decide whether it should be a "graduate only" course or whether it should also include an upper division undergraduate component. We have used the course as previously taught by Dr. Neild to meet the requirement for "graduate student only" courses for M.S. degrees. We frankly don't understand the need for the requirement of graduate courses only and believe that the relevance of this policy should be examined. We are supportive of the idea of developing an undergraduate course, especially with the renewed emphasis on natural resources that has recently emerged within IANR. Such a course should probably incorporate sections on applied climatology and plant canopy meteorology. Once our proposed graduate level courses are in place, consideration will be given to

developing this undergraduate course. The role, if any, that faculty from Geography might have in jointly teaching this course should be explored in future discussions with them.

10. In principle, there is no problem with joint-listing of courses in Geography and Agricultural Meteorology. The administrative heads of the two units have already discussed this, and it would be a topic for discussion at the joint retreat. We are uncertain about what is involved in offering a minor in agricultural meteorology to undergraduate students in IANR, as suggested by the review team, but we will explore this possibility, depending on the outcome of future discussions with the Geography Department. 9(10)

11. Our students are already taking some of the courses identified and recommended by the review team, but we are uncertain about whether or not courses covering several of the topics they identified are available. We agree that some or all of the topics would be useful parts of a graduate program for our students. We will explore the availability of such courses and incorporate them into graduate programs as deemed appropriate by the advisory committee.

Since we are seriously considering the recommendations made by the review team and implementing those that will strengthen our academic programs, we believe that we should be made an academic department with full M.S. and Ph.D. degree granting privileges. We intend to actively pursue that objective. We will examine what is required to implement the recommendations for granting an undergraduate minor in agricultural meteorology but we do not intend, at this time, to offer an undergraduate major.

Extension Program:

1. Although only a small amount of FTE in the department has been devoted to extension, we believe that our extension programs have been of high quality. We agree with the suggestion made by the review team that there should be an extension plan in agricultural meteorology that is part of the overall departmental plan. To begin devising such a plan, we have held one retreat session to discuss the department's role in extension. We are also examining agricultural meteorology extension programs at other universities to gain ideas about programs that we may wish to incorporate into our extension efforts. For example, Drs. Hubbard, Weiss and Blad have recently visited and examined the agricultural meteorology extension program at Iowa State University. 10(1)

2. We have already adjusted the position description for Dr. Weiss to add an extension component. The position description for the new faculty person to be hired to bolster the agricultural climatology program will have 0.40 FTE devoted to extension. A major focus of the extension program in the department is to use a systems approach to solving weather-related problems of interest and concern to Nebraska and the region. To that end the Agricultural Climate Situation Committee uses input from scientists in several disciplines on the main UNL campus and at research and extension centers to evaluate weather effects on agriculture and to issue advisories to assist in making decisions about various types of agricultural operations. Various crop models are being examined and evaluated for their potential to assist in making management decisions. The models use weather as essential input and should prove valuable in providing information that would be useful in helping to make management decisions. 10(2)

3. The review team recommended that linkages should be established with extension specialists in other disciplines to address multidisciplinary approaches to solving problems related to weather. We have developed a number of these linkages in the past and anticipate even more in the future. The Agricultural Climate Situation Committee is a good example of the involvements of scientists from many disciplines working together on weather-related problems. We also use multidisciplinary advisory committees to help define the types of climate information that we should collect and provide to various user groups. 10(3)

To help expand the role of agricultural meteorologists in extension and to receive input from various leaders in extension in the development of the position description for the new agricultural climatology position, discussions have been held with several relevant department heads and with the program coordinators of the Extension Priority Initiatives Committees on: a) Conserving and Managing Natural Resources, b) Enhancing Water Quality, c) Revising Rural Communities and d) Increasing Agricultural Profitability.

At a departmental retreat the faculty discussed having departmental representation on several extension committees. We feel that faculty from the department should have greater involvement on these committees than we have had in the past. Such involvement would enhance multidisciplinary cooperation and interaction. We have begun a program to invite scientists from various departments to present seminars to our department. At the same time we are discussing possible cooperative efforts with them and other members of their department. We will continue to explore appropriate linkages with extension specialists in various departments.

4. Most of the important computer programs that were on the discontinued AGNET systems have already been converted to the new dial-up WEATHER system. A few of the programs have not been converted and may not be unless there is a demand for the programs and a need expressed by the multidisciplinary Extension Advisory Committees that have been organized to provide input into the Agricultural Meteorology extension and research programs.

5. Because of the limited amount of time devoted to this topic during the review, we were not able to show the review team all of the information pertaining to our cost recovery system in extension. In the past several years we have developed several charges for use in cost recovery. We have: a $2.00 minimum fee for furnishing data, a $.25 per page charge for photocopying, and an hourly charge when a request takes more than one-half hour. In addition, we charge for furnishing archived data from the automated weather network. The charge is $20.00 per station-year for hourly data and $10.00 per station-year for daily data. Invoice and request forms have been developed for use in cost recovery. A more comprehensive cost recovery system is envisioned for the future, but this will be delayed until the National Climate Service System is organized under the National Weather Service, National Environmental Satellite Data Information Service, and Office of Atmospheric Research and a study ensuring uniform cost recovery among the regional climate centers has been completed.

Other Suggestions

1. The transfer of funds that had been administered in the Conservation and Survey Division to the Department of Agricultural Meteorology has been completed. This was accomplished after discussions between personnel within the two units. It was felt that this was in the best interest of both units. 10(1)

2. We are uncertain of the reason(s) for the review team's recommendation that grant proposals should be reviewed by faculty peers. We have encouraged informal reviews of research proposals by appropriate faculty within and without the department in the past and will continue to do so. We feel it is not advisable to have a formal requirement that all proposals must be peer reviewed before submission. The department head plans to review all proposals to the degree that it is feasible. The review team suggested that one of the benefits of the peer review would be an increased understanding of the proposed actions. We believe that discussions of proposed and/or funded projects in seminars or other meetings are more effective in helping all faculty, staff and students in the department understand proposed and funded projects. We will continue to hold such discussions. 10(2)

BLB:skk

cc: Dr. Darrell W. Nelson
Dr. Leo E. Lucas
Dr. Donald M. Edwards
Dr. Irvin T. Omtvedt
Agricultural Meteorology Faculty

bc: Dr. Jeanne Kay

ATTACHMENT D

Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR TENURE
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank_____ Date of Initial Specific Term Appointment_____

Composite Rating: 1990_____ 1991_____ 1992_____ 1993_____

Action by Departmental Promotion and Tenure Committee

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Unit Administrator

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Lead Dean(s) and/or Director(s)

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by IANR Deans Committee

Recommended_/ / / / Not Recommended_/ / / /(Initial One) Date_____
Comments:

Action by Vice Chancellor

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

REV 10/93

Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR PROMOTION
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank_____ Tenured_____ If so, Date of Tenure_____

Composite Rating: 1990_____ 1991_____ 1992_____ 1993_____

Proposed Promotion to Rank of _____

Action by Departmental Promotion and Tenure Committee

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Unit Administrator

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Lead Dean(s) and/or Director(s)

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by IANR Deans Committee

Recommended___/___/___ Not Recommended___/___/___(Initial One) Date_____
Comments:

Action by Vice Chancellor

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

REV 10/93

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

COLLEGE OF AGRICULTURAL SCIENCES AND NATURAL RESOURCES

Instructor

1. A Master's degree*
2. Previous teaching experience desirable
3. Recommendations indicating potential teaching ability

Assistant Professor

1. A Doctoral degree in appropriate field or equivalent* with relevant experience desired
2. Previous teaching experience, including favorable evaluations of teaching and a sincere interest in teaching
3. Recommendations indicating a capacity for scholarly development

Associate Professor

1. A Doctoral degree in appropriate field*
2. Teaching reputation established by experience (time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years)
3. Evidence of scholarly achievement and professional stature
   a. Successful development of teaching programs
   b. Publications or similar proof of current knowledge in this field and participation in professional activities
   c. Membership in graduate faculty preferred
4. Advising students and participating in committee assignments as needed for general college operations
5. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Professor

1. A Doctoral degree in appropriate field*
2. Teaching reputation established
   a. Recommendations high
   b. Leadership established in classroom
   c. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual (normally a minimum of seven years as an Associate Professor)
   d. Teaching not usually limited to either graduate or undergraduate
3. Scholarly achievements
   a. Recognized nationally in field
   b. Publications in own field of high quality
   c. Recognized to be current in his/her knowledge
4. Effectively participates and assumes leadership in student advising and in committee assignments

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

SCHOLARLY SERVICE APPOINTMENT

Instructor

1. A master's degree or equivalent professional degree in a suitable field.
2. An educational and/or employment background suggesting capability to perform scholarly service duties.
3. Recommendations indicating potential for scholarly service assignment.

Assistant Professor

1. A doctoral degree* or other equivalent terminal degree in an appropriate field with relevant experience
2. Meets position requirements at a level of a well-qualified individual
3. Demonstrated capability in a scholarly service appointment

Associate Professor

1. A doctoral degree* or other equivalent terminal degree
2. Time-in-rank as an assistant professor is ordinarily at least five years, but typically is six years
3. Evidence of professional growth and developing stature
4. Demonstrated ability to conceptualize, collect, and disseminate date and information and/or to provide training to appropriate clientele
5. Experience in effective service program leadership and demonstrated scholarly creativity
6. Meets position requirements in an excellent manner and at a level expected of a well-qualified individual
7. Evidence of positive interpersonal relationships with colleagues and clientele

Professor

1. A doctoral degree* or other equivalent terminal degree
2. Normally a minimum of seven years experience in the associate professor rank
3. Demonstrated depth, scholarship, creativity, and versatility in accomplishing service activities
4. Recognition by colleagues and clientele for intellectual depth, scholarship, versatility, and effectiveness in service activities which make substantial contributions to colleagues, the department, institute, university, state and/or the national and international community
5. Demonstrated continued professional growth and potential
6. Meets position requirements in an excellent manner and at a level expected of a well-qualified individual
7. Because this is the terminal academic rank, judgments on promotion are based upon sustained records of effective performance and involve more rigorous evaluation than those of other academic ranks.

*Circumstances may, in rare instances, cause this requirement to be modified.

REV 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

AGRICULTURAL RESEARCH DIVISION

Instructor

1. A Master's degree*
2. An interest in experiment station research
3. Recommendations indicating research capability

Assistant Professor

1. A Doctoral degree in appropriate field* with relevant experience desired
2. Demonstrated understanding of and interest in the research program of the experiment station
3. Recommendations indicating demonstrated research capability

Associate Professor

1. A Doctoral degree in appropriate field*
2. Evidence of professional growth and developing stature
3. Effective participation in supporting activity; such as, committee assignments and program planning
4. Demonstrated ability to communicate results of research both in scientific and lay channels
5. Experience in effective research project leadership and demonstrated personal creativity (time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years)
6. Membership in graduate faculty
7. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Professor

1. A Doctoral degree in appropriate field*
2. Demonstrated intellectual depth and versatility in a number of research activities
3. Recognition by colleagues in the Institute and in his/her profession, and by his/her clientele, as a scholar
4. Demonstrated ability to direct the research efforts of others and to contribute to the programs of his/her department and colleagues
5. Demonstrated continued professional growth and potential
6. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual
7. Because this is the terminal academic rank, recommendations are based upon sustained records of effective performance (normally a minimum of seven years as Associate Professor) and involve more subjective evaluation than earlier promotions
8. Meets eligibility requirements for fellow rank in graduate faculty

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

COOPERATIVE EXTENSION - SPECIALIST

Instructor

1. A Master's degree*
2. Interest in Extension work
3. Recommendations to indicate potential as an Extension Specialist

Assistant Professor

1. All qualifications of lower rank, plus
2. A Doctoral degree* with relevant experience desired
3. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Associate Professor

1. A Doctoral degree in appropriate field*
2. Time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years; in the development and execution of Extension plans of work which demonstrate creativity, credibility and a high degree of acceptance by clientele
3. Evidence of professional growth and developing stature
4. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual.

Professor

1. A Doctoral degree in appropriate field*
2. Recognition by colleagues and clientele for intellectual depth, versatility and effectiveness in Extension activities which contribute substantially to programs of the department, Institute, University and to people of the state
3. Demonstrated continued professional growth potential
4. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual (normally a minimum of seven years as Associate Professor)

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 11/05/92

ATTACHMENT B
Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR APPOINTMENT RENEWAL
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Appointment Action: Specific Term_____ Special_____

Faculty Member_____ Present Rank_____

Date of Initial Appointment____/____/_____ Date Tenure Eligible____/____/_____

ACTION BY DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Initial One: Recommended_____ Not Recommended_____ Date____/____/_____

Comments/Progress:

ACTION BY UNIT ADMINISTRATOR

Initial One: Recommended_____ Not Recommended_____ Date____/____/_____

Comments/Progress:

REV 10/94

Evaluation Year_____

PROGRESS TOWARD TENURE
"FOR DEPARTMENTAL USE ONLY"
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank____/____/____

DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Progress Toward Tenure: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

UNIT ADMINISTRATOR APPRAISAL

Progress Toward Tenure: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

I have reviewed this document:

_____ (Faculty Member Comments on Back)

Faculty Member Signature

NOTE: All specific term and special team appointments can be terminated as outlined in the Faculty Handbook, Section 4.4.2, Chapter IV – BL-37.e

REV 10/94

Evaluation Year_____

PROGRESS TOWARD PROMOTION
"FOR DEPARTMENTAL USE ONLY"
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank____/____/____

DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Progress Toward Promotion: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

UNIT ADMINISTRATOR APPRAISAL

Progress Toward Promotion: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

I have reviewed this document:

_____ (Faculty Member Comments on Back)

Faculty Member Signature

REV 10/94

STAFF APPRAISAL OF SUPERVISOR

Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln

Name of Person You are Appraising_____

Position_____ **Period of Appraisal** _____

INSTRUCTIONS: Please appraise your supervisor by circling the appropriate numerical indicator for each descriptive statement. Numerical indicators represent a continuum (or range or scale) with 1 being *unacceptable* and 5 being *superior*. "N" indicates the statement is not applicable or that you have inadequate information to answer.

	(CIRCLE NUMERICAL INDICATOR)					
Encourages teamwork within and among work groups (i.e., an office, laboratory, or similar work group).	1	2	3	4	5	N
Fosters and implements clear communication.	1	2	3	4	5	N
Fosters an atmosphere of mutual trust and respect.	1	2	3	4	5	N
Delegates responsibility and authority.	1	2	3	4	5	N
Is fair and equitable in the annual staff evaluation process.	1	2	3	4	5	N
Assists staff in personal/professional development.	1	2	3	4	5	N
Recognizes individual efforts and achievements by others.	1	2	3	4	5	N
Lets staff know his/her schedule of availability.	1	2	3	4	5	N
Demonstrates an open attitude toward new ideas and methods.	1	2	3	4	5	N
Plans effectively; considers time constraints of those who work with him/her.	1	2	3	4	5	N
Actively solicits and values staff's input in areas relating to their duties.	1	2	3	4	5	N
Adjusts his/her decisions when appropriate.	1	2	3	4	5	N

OVER

ATTACHMENT D

Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR TENURE
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank_____ Date of Initial Specific Term Appointment_____

Composite Rating: 1990_____ 1991_____ 1992_____ 1993_____

Action by Departmental Promotion and Tenure Committee

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Unit Administrator

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Lead Dean(s) and/or Director(s)

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by IANR Deans Committee

Recommended___/___/___ Not Recommended___/___/___(Initial One) Date_____
Comments:

Action by Vice Chancellor

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

REV 10/93

Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR PROMOTION
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank_____ Tenured_____ If so, Date of Tenure_____

Composite Rating: 1990_____ 1991_____ 1992_____ 1993_____

Proposed Promotion to Rank of _____

Action by Departmental Promotion and Tenure Committee

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Unit Administrator

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Lead Dean(s) and/or Director(s)

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by IANR Deans Committee

Recommended___/___/___ Not Recommended___/___/___(Initial One) Date_____
Comments:

Action by Vice Chancellor

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

REV 10/93

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

COLLEGE OF AGRICULTURAL SCIENCES AND NATURAL RESOURCES

Instructor

1. A Master's degree*
2. Previous teaching experience desirable
3. Recommendations indicating potential teaching ability

Assistant Professor

1. A Doctoral degree in appropriate field or equivalent* with relevant experience desired
2. Previous teaching experience, including favorable evaluations of teaching and a sincere interest in teaching
3. Recommendations indicating a capacity for scholarly development

Associate Professor

1. A Doctoral degree in appropriate field*
2. Teaching reputation established by experience (time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years)
3. Evidence of scholarly achievement and professional stature
   a. Successful development of teaching programs
   b. Publications or similar proof of current knowledge in this field and participation in professional activities
   c. Membership in graduate faculty preferred
4. Advising students and participating in committee assignments as needed for general college operations
5. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Professor

1. A Doctoral degree in appropriate field*
2. Teaching reputation established
   a. Recommendations high
   b. Leadership established in classroom
   c. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual (normally a minimum of seven years as an Associate Professor)
   d. Teaching not usually limited to either graduate or undergraduate
3. Scholarly achievements
   a. Recognized nationally in field
   b. Publications in own field of high quality
   c. Recognized to be current in his/her knowledge
4. Effectively participates and assumes leadership in student advising and in committee assignments

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

SCHOLARLY SERVICE APPOINTMENT

Instructor

1. A master's degree or equivalent professional degree in a suitable field.
2. An educational and/or employment background suggesting capability to perform scholarly service duties.
3. Recommendations indicating potential for scholarly service assignment.

Assistant Professor

1. A doctoral degree* or other equivalent terminal degree in an appropriate field with relevant experience
2. Meets position requirements at a level of a well-qualified individual
3. Demonstrated capability in a scholarly service appointment

Associate Professor

1. A doctoral degree* or other equivalent terminal degree
2. Time-in-rank as an assistant professor is ordinarily at least five years, but typically is six years
3. Evidence of professional growth and developing stature
4. Demonstrated ability to conceptualize, collect, and disseminate date and information and/or to provide training to appropriate clientele
5. Experience in effective service program leadership and demonstrated scholarly creativity
6. Meets position requirements in an excellent manner and at a level expected of a well-qualified individual
7. Evidence of positive interpersonal relationships with colleagues and clientele

Professor

1. A doctoral degree* or other equivalent terminal degree
2. Normally a minimum of seven years experience in the associate professor rank
3. Demonstrated depth, scholarship, creativity, and versatility in accomplishing service activities
4. Recognition by colleagues and clientele for intellectual depth, scholarship, versatility, and effectiveness in service activities which make substantial contributions to colleagues, the department, institute, university, state and/or the national and international community
5. Demonstrated continued professional growth and potential
6. Meets position requirements in an excellent manner and at a level expected of a well-qualified individual
7. Because this is the terminal academic rank, judgments on promotion are based upon sustained records of effective performance and involve more rigorous evaluation than those of other academic ranks.

*Circumstances may, in rare instances, cause this requirement to be modified.

REV 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

AGRICULTURAL RESEARCH DIVISION

Instructor

1. A Master's degree*
2. An interest in experiment station research
3. Recommendations indicating research capability

Assistant Professor

1. A Doctoral degree in appropriate field* with relevant experience desired
2. Demonstrated understanding of and interest in the research program of the experiment station
3. Recommendations indicating demonstrated research capability

Associate Professor

1. A Doctoral degree in appropriate field*
2. Evidence of professional growth and developing stature
3. Effective participation in supporting activity; such as, committee assignments and program planning
4. Demonstrated ability to communicate results of research both in scientific and lay channels
5. Experience in effective research project leadership and demonstrated personal creativity (time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years)
6. Membership in graduate faculty
7. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Professor

1. A Doctoral degree in appropriate field*
2. Demonstrated intellectual depth and versatility in a number of research activities
3. Recognition by colleagues in the Institute and in his/her profession, and by his/her clientele, as a scholar
4. Demonstrated ability to direct the research efforts of others and to contribute to the programs of his/her department and colleagues
5. Demonstrated continued professional growth and potential
6. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual
7. Because this is the terminal academic rank, recommendations are based upon sustained records of effective performance (normally a minimum of seven years as Associate Professor) and involve more subjective evaluation than earlier promotions
8. Meets eligibility requirements for fellow rank in graduate faculty

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

COOPERATIVE EXTENSION - SPECIALIST

Instructor

1. A Master's degree*
2. Interest in Extension work
3. Recommendations to indicate potential as an Extension Specialist

Assistant Professor

1. All qualifications of lower rank, plus
2. A Doctoral degree* with relevant experience desired
3. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Associate Professor

1. A Doctoral degree in appropriate field*
2. Time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years; in the development and execution of Extension plans of work which demonstrate creativity, credibility and a high degree of acceptance by clientele
3. Evidence of professional growth and developing stature
4. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual.

Professor

1. A Doctoral degree in appropriate field*
2. Recognition by colleagues and clientele for intellectual depth, versatility and effectiveness in Extension activities which contribute substantially to programs of the department, Institute, University and to people of the state
3. Demonstrated continued professional growth potential
4. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual (normally a minimum of seven years as Associate Professor)

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 11/05/92

ATTACHMENT B
Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR APPOINTMENT RENEWAL
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Appointment Action: Specific Term_____ Special_____

Faculty Member_____ Present Rank_____

Date of Initial Appointment____/____/____ Date Tenure Eligible____/____/____

ACTION BY DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Initial One: Recommended_____ Not Recommended_____ Date____/____/____

Comments/Progress:

ACTION BY UNIT ADMINISTRATOR

Initial One: Recommended_____ Not Recommended_____ Date____/____/____

Comments/Progress:

REV 10/94

Evaluation Year_____

PROGRESS TOWARD TENURE
"FOR DEPARTMENTAL USE ONLY"
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank_____/_____/_____

DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Progress Toward Tenure: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

UNIT ADMINISTRATOR APPRAISAL

Progress Toward Tenure: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

I have reviewed this document:

_____ (Faculty Member Comments on Back)

Faculty Member Signature

NOTE: All specific term and special team appointments can be terminated as outlined in the Faculty Handbook, Section 4.4.2, Chapter IV -- BL-37.e

REV 10/94

Evaluation Year_____

PROGRESS TOWARD PROMOTION
"FOR DEPARTMENTAL USE ONLY"
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank_____/_____/_____

DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Progress Toward Promotion: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

UNIT ADMINISTRATOR APPRAISAL

Progress Toward Promotion: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

I have reviewed this document:

_____ (Faculty Member Comments on Back)

Faculty Member Signature

REV 10/94

1994 FACULTY APPRAISAL OF ADMINISTRATOR PERFORMANCE

Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

Administrator's Name: _____ **Unit:** _____

WRITTEN COMMENTS SHOULD BE PROVIDED ON THE REVERSE SIDE OF THIS FORM ONLY.

DIRECTIONS: Provide an evaluation for each major element by circling the appropriate numerical descriptor.

1	U	Unsatisfactory
2	NI	Needs Improvement
3	S	Satisfactory
4	E	Excellent
5	O	Outstanding
NO		Not Observed

	(Circle numerical descriptor)					
PLANNING Anticipates/recognizes unit needs; sets priorities	1	2	3	4	5	NO
ADMINISTRATIVE LEADERSHIP Provides leadership; prompt with decision-making; supports team efforts	1	2	3	4	5	NO
PERSONNEL MANAGEMENT Successful at recruiting; motivational for staff; recognizes achievements; encourages diversity	1	2	3	4	5	NO
FINANCIAL MANAGEMENT Effective budget development; management of resources	1	2	3	4	5	NO
COMMUNICATIONS Fosters open communication; shares pertinent information; responsive; communicates expectations	1	2	3	4	5	NO
RELATIONSHIPS Positive, professional image; encourages professionalism; develops off campus contacts	1	2	3	4	5	NO
PERSONAL Personal conduct and improvement; peer recognition; calm demeanor under stress; admits mistakes	1	2	3	4	5	NO
NON-ADMINISTRATIVE DUTIES Teaching/Research/Extension/Service	1	2	3	4	5	NO
OVERALL	1	2	3	4	5	NO

OVER – WRITTEN COMMENTS ON BACK OF FORM, PLEASE

STAFF APPRAISAL OF SUPERVISOR

Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln

Name of Person You are Appraising_____

Position_____ **Period of Appraisal** _____

INSTRUCTIONS: Please appraise your supervisor by circling the appropriate numerical indicator for each descriptive statement. Numerical indicators represent a continuum (or range or scale) with 1 being *unacceptable* and 5 being *superior*. "N" indicates the statement is not applicable or that you have inadequate information to answer.

(CIRCLE NUMERICAL INDICATOR)

Encourages teamwork within and among work groups (i.e., an office, laboratory, or similar work group).	1	2	3	4	5	N
Fosters and implements clear communication.	1	2	3	4	5	N
Fosters an atmosphere of mutual trust and respect.	1	2	3	4	5	N
Delegates responsibility and authority.	1	2	3	4	5	N
Is fair and equitable in the annual staff evaluation process.	1	2	3	4	5	N
Assists staff in personal/professional development.	1	2	3	4	5	N
Recognizes individual efforts and achievements by others.	1	2	3	4	5	N
Lets staff know his/her schedule of availability.	1	2	3	4	5	N
Demonstrates an open attitude toward new ideas and methods.	1	2	3	4	5	N
Plans effectively; considers time constraints of those who work with him/her.	1	2	3	4	5	N
Actively solicits and values staff's input in areas relating to their duties.	1	2	3	4	5	N
Adjusts his/her decisions when appropriate.	1	2	3	4	5	N

OVER

ATTACHMENT D

Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR TENURE
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank_____ Date of Initial Specific Term Appointment_____

Composite Rating: 1990_____ 1991_____ 1992_____ 1993_____

Action by Departmental Promotion and Tenure Committee

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Unit Administrator

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Lead Dean(s) and/or Director(s)

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by IANR Deans Committee

Recommended_____ Not Recommended_____(Initial One) Date_____
Comments:

Action by Vice Chancellor

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

REV 10/93

Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR PROMOTION
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank_____ Tenured_____ If so, Date of Tenure_____

Composite Rating: 1990_____ 1991_____ 1992_____ 1993_____

Proposed Promotion to Rank of _____

Action by Departmental Promotion and Tenure Committee

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Unit Administrator

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by Lead Dean(s) and/or Director(s)

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

Action by IANR Deans Committee

Recommended___/___/___/___ Not Recommended___/___/___/___(Initial One) Date_____
Comments:

Action by Vice Chancellor

Recommended _____ Not Recommended _____(Initial One) Date _____
Comments:

REV 10/93

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

COLLEGE OF AGRICULTURAL SCIENCES AND NATURAL RESOURCES

Instructor

1. A Master's degree*
2. Previous teaching experience desirable
3. Recommendations indicating potential teaching ability

Assistant Professor

1. A Doctoral degree in appropriate field or equivalent* with relevant experience desired
2. Previous teaching experience, including favorable evaluations of teaching and a sincere interest in teaching
3. Recommendations indicating a capacity for scholarly development

Associate Professor

1. A Doctoral degree in appropriate field*
2. Teaching reputation established by experience (time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years)
3. Evidence of scholarly achievement and professional stature
   a. Successful development of teaching programs
   b. Publications or similar proof of current knowledge in this field and participation in professional activities
   c. Membership in graduate faculty preferred
4. Advising students and participating in committee assignments as needed for general college operations
5. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Professor

1. A Doctoral degree in appropriate field*
2. Teaching reputation established
   a. Recommendations high
   b. Leadership established in classroom
   c. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual (normally a minimum of seven years as an Associate Professor)
   d. Teaching not usually limited to either graduate or undergraduate
3. Scholarly achievements
   a. Recognized nationally in field
   b. Publications in own field of high quality
   c. Recognized to be current in his/her knowledge
4. Effectively participates and assumes leadership in student advising and in committee assignments

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

SCHOLARLY SERVICE APPOINTMENT

Instructor

1. A master's degree or equivalent professional degree in a suitable field.
2. An educational and/or employment background suggesting capability to perform scholarly service duties.
3. Recommendations indicating potential for scholarly service assignment.

Assistant Professor

1. A doctoral degree* or other equivalent terminal degree in an appropriate field with relevant experience
2. Meets position requirements at a level of a well-qualified individual
3. Demonstrated capability in a scholarly service appointment

Associate Professor

1. A doctoral degree* or other equivalent terminal degree
2. Time-in-rank as an assistant professor is ordinarily at least five years, but typically is six years
3. Evidence of professional growth and developing stature
4. Demonstrated ability to conceptualize, collect, and disseminate date and information and/or to provide training to appropriate clientele
5. Experience in effective service program leadership and demonstrated scholarly creativity
6. Meets position requirements in an excellent manner and at a level expected of a well-qualified individual
7. Evidence of positive interpersonal relationships with colleagues and clientele

Professor

1. A doctoral degree* or other equivalent terminal degree
2. Normally a minimum of seven years experience in the associate professor rank
3. Demonstrated depth, scholarship, creativity, and versatility in accomplishing service activities
4. Recognition by colleagues and clientele for intellectual depth, scholarship, versatility, and effectiveness in service activities which make substantial contributions to colleagues, the department, institute, university, state and/or the national and international community
5. Demonstrated continued professional growth and potential
6. Meets position requirements in an excellent manner and at a level expected of a well-qualified individual
7. Because this is the terminal academic rank, judgments on promotion are based upon sustained records of effective performance and involve more rigorous evaluation than those of other academic ranks.

*Circumstances may, in rare instances, cause this requirement to be modified.

REV 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

AGRICULTURAL RESEARCH DIVISION

Instructor

1. A Master's degree*
2. An interest in experiment station research
3. Recommendations indicating research capability

Assistant Professor

1. A Doctoral degree in appropriate field* with relevant experience desired
2. Demonstrated understanding of and interest in the research program of the experiment station
3. Recommendations indicating demonstrated research capability

Associate Professor

1. A Doctoral degree in appropriate field*
2. Evidence of professional growth and developing stature
3. Effective participation in supporting activity; such as, committee assignments and program planning
4. Demonstrated ability to communicate results of research both in scientific and lay channels
5. Experience in effective research project leadership and demonstrated personal creativity (time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years)
6. Membership in graduate faculty
7. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Professor

1. A Doctoral degree in appropriate field*
2. Demonstrated intellectual depth and versatility in a number of research activities
3. Recognition by colleagues in the Institute and in his/her profession, and by his/her clientele, as a scholar
4. Demonstrated ability to direct the research efforts of others and to contribute to the programs of his/her department and colleagues
5. Demonstrated continued professional growth and potential
6. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual
7. Because this is the terminal academic rank, recommendations are based upon sustained records of effective performance (normally a minimum of seven years as Associate Professor) and involve more subjective evaluation than earlier promotions
8. Meets eligibility requirements for fellow rank in graduate faculty

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 9/92

CRITERIA FOR APPOINTMENT AND PROMOTION IN RANK
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

COOPERATIVE EXTENSION - SPECIALIST

Instructor

1. A Master's degree*
2. Interest in Extension work
3. Recommendations to indicate potential as an Extension Specialist

Assistant Professor

1. All qualifications of lower rank, plus
2. A Doctoral degree* with relevant experience desired
3. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual

Associate Professor

1. A Doctoral degree in appropriate field*
2. Time-in-rank as an assistant professor is ordinarily at least five years, and typically is six years; in the development and execution of Extension plans of work which demonstrate creativity, credibility and a high degree of acceptance by clientele
3. Evidence of professional growth and developing stature
4. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual.

Professor

1. A Doctoral degree in appropriate field*
2. Recognition by colleagues and clientele for intellectual depth, versatility and effectiveness in Extension activities which contribute substantially to programs of the department, Institute, University and to people of the state
3. Demonstrated continued professional growth potential
4. Meets position requirements in a highly desirable manner and at a level expected of a well-qualified individual (normally a minimum of seven years as Associate Professor)

*Circumstances may, in rare instances, cause this requirement to be modified.

Rev 11/05/92

ATTACHMENT B
Evaluation Year_____

SUMMARY OF RECOMMENDATION FOR APPOINTMENT RENEWAL
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Appointment Action: Specific Term_____ Special_____

Faculty Member_____ Present Rank_____

Date of Initial Appointment____/____/____ Date Tenure Eligible____/____/____

ACTION BY DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Initial One: Recommended_____ Not Recommended_____ Date____/____/____

Comments/Progress:

ACTION BY UNIT ADMINISTRATOR

Initial One: Recommended_____ Not Recommended_____ Date____/____/____

Comments/Progress:

REV 10/94

Evaluation Year_____

PROGRESS TOWARD TENURE
"FOR DEPARTMENTAL USE ONLY"
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank____/____/____

DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Progress Toward Tenure: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

UNIT ADMINISTRATOR APPRAISAL

Progress Toward Tenure: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

I have reviewed this document:

_____ (Faculty Member Comments on Back)

Faculty Member Signature

NOTE: All specific term and special team appointments can be terminated as outlined in the Faculty Handbook, Section 4.4.2, Chapter IV – BL-37.e

REV 10/94

Faculty Member Comments:

Evaluation Year_____

PROGRESS TOWARD PROMOTION
"FOR DEPARTMENTAL USE ONLY"
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA

Faculty Member_____ Present Rank_____

Date of Rank____/____/____

DEPARTMENTAL PROMOTION & TENURE COMMITTEE

Progress Toward Promotion: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

UNIT ADMINISTRATOR APPRAISAL

Progress Toward Promotion: Excellent____ Satisfactory____ Unsatisfactory____

Comments:

I have reviewed this document:

_____ (Faculty Member Comments on Back)

Faculty Member Signature

REV 10/94

Faculty Member Comments:

1994 FACULTY APPRAISAL OF ADMINISTRATOR PERFORMANCE

Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

Administrator's Name: _____ **Unit:** _____

WRITTEN COMMENTS SHOULD BE PROVIDED ON THE REVERSE SIDE OF THIS FORM ONLY.

DIRECTIONS: Provide an evaluation for each major element by circling the appropriate numerical descriptor.

1	U	Unsatisfactory
2	NI	Needs Improvement
3	S	Satisfactory
4	E	Excellent
5	O	Outstanding
NO	Not Observed	

	(Circle numerical descriptor)					
PLANNING Anticipates/recognizes unit needs; sets priorities	1	2	3	4	5	NO
ADMINISTRATIVE LEADERSHIP Provides leadership; prompt with decision-making; supports team efforts	1	2	3	4	5	NO
PERSONNEL MANAGEMENT Successful at recruiting; motivational for staff; recognizes achievements; encourages diversity	1	2	3	4	5	NO
FINANCIAL MANAGEMENT Effective budget development; management of resources	1	2	3	4	5	NO
COMMUNICATIONS Fosters open communication; shares pertinent information; responsive; communicates expectations	1	2	3	4	5	NO
RELATIONSHIPS Positive, professional image; encourages professionalism; develops off campus contacts	1	2	3	4	5	NO
PERSONAL Personal conduct and improvement; peer recognition; calm demeanor under stress; admits mistakes	1	2	3	4	5	NO
NON-ADMINISTRATIVE DUTIES Teaching/Research/Extension/Service	1	2	3	4	5	NO
OVERALL	1	2	3	4	5	NO

OVER -- WRITTEN COMMENTS ON BACK OF FORM, PLEASE

What are the strengths of the administrator?

What are the concerns about the administrator?

Recommendations:

Optional: Signature of Evaluator

STAFF APPRAISAL OF SUPERVISOR

Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln

Name of Person You are Appraising_____

Position_____ **Period of Appraisal** _____

INSTRUCTIONS: Please appraise your supervisor by circling the appropriate numerical indicator for each descriptive statement. Numerical indicators represent a continuum (or range or scale) with 1 being *unacceptable* and 5 being *superior*. "N" indicates the statement is not applicable or that you have inadequate information to answer.

(CIRCLE NUMERICAL INDICATOR)

Encourages teamwork within and among work groups (i.e., an office, laboratory, or similar work group).	1	2	3	4	5	N
Fosters and implements clear communication.	1	2	3	4	5	N
Fosters an atmosphere of mutual trust and respect.	1	2	3	4	5	N
Delegates responsibility and authority.	1	2	3	4	5	N
Is fair and equitable in the annual staff evaluation process.	1	2	3	4	5	N
Assists staff in personal/professional development.	1	2	3	4	5	N
Recognizes individual efforts and achievements by others.	1	2	3	4	5	N
Lets staff know his/her schedule of availability.	1	2	3	4	5	N
Demonstrates an open attitude toward new ideas and methods.	1	2	3	4	5	N
Plans effectively; considers time constraints of those who work with him/her.	1	2	3	4	5	N
Actively solicits and values staff's input in areas relating to their duties.	1	2	3	4	5	N
Adjusts his/her decisions when appropriate.	1	2	3	4	5	N

OVER

	(CIRCLE NUMERICAL INDICATOR)					
Demonstrates leadership in determining priorities.	1	2	3	4	5	N
Can appropriately advise employee(s) on day-to-day questions.	1	2	3	4	5	N
Respects both the confidentiality of individuals and department issues.	1	2	3	4	5	N
Accurately reflects all sides of the situation at hand to others when a problem occurs.	1	2	3	4	5	N
Maintains composure in stressful situations.	1	2	3	4	5	N
Works to create an inclusive environment for all people in the University community.	1	2	3	4	5	N
OVERALL APPRAISAL	1	2	3	4	5	N

Please supplement your appraisal with narrative comments to clarify or to provide new comments.

_____

Employee Signature Optional

Graduate Majors

Actuarial Science
M.S.
Dr. Colin Ramsay
312 Burnett Hall
Lincoln, NE 68588-0307
(402) 472-2698

The actuarial science program was established in 1958 to provide education for students seeking employment with life insurance companies. The program has become internationally recognized as one of the leading actuarial science programs in North America and has produced several hundred graduates who are actuaries in the U. S. and in over a dozen countries.

A Master of Science degree is available for students who have a mathematical preparation, including calculus, linear algebra, and mathematical statistics. However, the program has had many successful students with backgrounds in non-mathematical fields. The M.S. degree requires a minimum of 48 hours without a thesis. At least nine hours must be in either statistics, finance or economics. Students are strongly urged to take as many classes as possible in finance and economics.

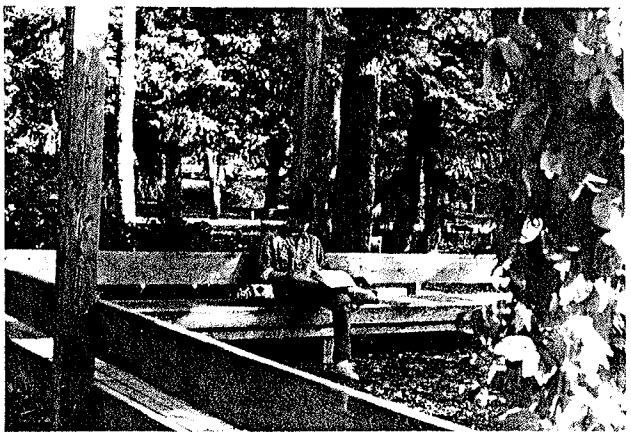
Students earning a degree in another discipline can choose actuarial science as a minor. Requirements depend on the degree plan of the major area, but at least 12 hours of actuarial science is a typical.

Agricultural Economics
M.S., Ph.D.
Dr. Maurice Baker
314D Filley Hall
Lincoln, NE 68583-0922
(402) 472-1796

The M.S. and Ph.D. programs in agricultural economics provide the foundation for professional problem solving in agricultural economics and agribusiness, including the broader areas of resource development, environmental planning and public policy.

Major areas of course work in agricultural economics include marketing, agricultural finance, agribusiness, natural resources development, quantitative methods, international trade, policy, and production economics and management. Study in other fields is encouraged to supplement and complement those in the department.

Careers in agricultural economics reflect the broad base of the educational program. Graduates in production and marketing may seek self-employment as farmers and ranchers, or as managers of domestic and international agribusiness marketing firms. Other careers include employment by consulting firms, educational institutions, financial agencies, private and government research, and service activities here and abroad.



Agricultural Education
M.S.
Dr. Leverne Barrett
300 Agricultural Hall
Lincoln, NE 68583-0709
(402) 472-2807

The M.S. degree in agricultural education may be earned in any of the four areas of emphasis offered in the Department of Agricultural Leadership, Education and Communication: teaching and instruction, extension education, leadership and human resource development, and international agricultural education. Courses in teaching methodology, audio-visual instructional materials, leadership, and educational research highlight most graduate programs.

Candidates for the degree of Master of Science with a major in agricultural education must possess a bachelors degree in an appropriate field from an accredited institution. In addition, students may pursue doctoral or educational specialist degrees through Teachers College, and be advised by agricultural leadership, education and communication staff members who hold joint appointments.

Agricultural Meteorology
(M.S., Ph.D. Agronomy; Agricultural and Biological Systems Engineering)
Dr. Albert Weiss
245 L. W. Chase Hall
Lincoln, NE 68583-0728
(402) 472-6761

The Department of Agricultural Meteorology is recognized as a national and international leader in preparing students for careers that stress interactions between the atmosphere and natural and managed ecosystems.

The department has programs in micrometeorology and atmosphere/biosphere interactions, and the remote sensing of energy, mass and radiation exchanges and vegetative conditions at the earth's surface. It also has programs in climate impact assessment, climatic change, and drought management and preparedness and the development and utilization of crop growth and yield models. Interdisciplinary research is encouraged, particularly for students with strong backgrounds in physical or biological sciences.

The department has excellent field facilities for making micrometeorological measurements of trace gas fluxes like carbon dioxide, solar and thermal radiant energy fluxes and a network of automated weather stations. An archive of climatological data is maintained by the department, which also has access to national and international data sources for use in climate studies.

***832. Administration of Agricultural Agencies and Organizations** (Vocational and Adult Eduation *832) (3 cr III) Lect/act. Prereq: Permission of instructor.
Administrative-management theory and practice, research and techniques applied to agricultural agencies organizations. Exposure to philosophies and experiences of outstanding administrators. Applicable to domestic and international students.

833. Planning and Implementation of Cooperative Extension Programs for Domestic and Foreign Audiences (3 cr I) Lect 3. Prereq: Permission of instructor.
The unique features of the cooperative extension service as an educational institution and its involvement of local people in the program development and identification of problems and design of long-range plans, annual plans, community development, and plans for single events; applicable to domestic and foreign extension programs.

***845. Research in Occupational Education** (Consumer Science and Education; Vocational and Adult Education 845) (3 cr) Lect. Research methods used in the study of problems in occupational education.

***890. Workshop Seminars in Education** (Vocational and Adult Education 890) (1-12 cr I, II, III) Prereq: Permission of instructor. Work, singly or in groups, on practical educational problems, done under the supervision of staff with assistance of selected educational consultants.

***893. Technical Agricultural Workshops** (1-12 cr I, II, III) Prereq: Permission.
Group study of technology in agricultural occupations. Workshops, special meetings, and assignments.

896. Independent Study in Agricultural Education (1-9 cr) Prereq: 12 hrs agricultural education or closely related areas and permission.
Individual or group projects in research, literature review, or extension of course work under supervision and evaluation of a departmental faculty member.

***899. Masters Thesis** (6-10 cr)

901. Supervision and Administration in Vocational Education (Consumer Science and Education, Curriculum and Instruction, Vocational and Adult Education 901) (3 cr)
Philosophy, objectives, and procedures in supervision and administration of vocational education programs. Supervision relationships with teachers, agents, school administrators, boards, federal and state officials. Evaluation of local programs of vocational education.

903. Teacher Education in Agriculture (1-3 cr) Lect.
Philosophy, objectives, and procedures in the preparation of teachers of vocational agriculture both pre-service and in-service. Campus courses, student teaching, selection and guidance of trainees, evaluating performances, and in-service courses, conferences, and teacher helps.

904. Seminar in Vocational Education (1-6 cr) (Vocational and Adult Education 904)

905. In-service Preparation for Occupational and Adult Educators (Curriculum and Instruction; Vocational and Adult Education 905) (3 cr) Lect/lab.
Identifying and solving problems in program planning, methodology, department operation, and school and community relationships. Primarily to aid beginning occupational and adult teachers in planning and establishing effective programs. Workshop on campus, followed by four small-group meetings during the year and two days of individual instruction in the local department, in addition to student assignments.

908. Organization of the Agricultural Mechanics Program (2-3 cr) Lect/lab.
Philosophy, objectives, procedures, and techniques used in organizing the program of agricultural mechanics instruction for secondary and post-high school students and adults. Determining units of instruction, evaluating student effort, procedures in shop instruction, selection of equipment, and integration into the vocational agriculture program.

913. Program Development in Occupational Education (Curriculum and Instruction; Vocational and Adult Education 913) (3 cr) Lect.
Philosophy and objectives of occupational education. Techniques of program development, choosing instructional areas, determining sequences, planning time distributions, integrated course of study and meeting individual needs, youth activities.

996. Research Other Than Thesis (2-6 cr I, II, III) Prereq: Permission.
Research in selected problems in agricultural education.

999. Dcotoral Dissertation (cr arr)

Agricultural Meteorology

Department Head: Professor Blaine L. Blad, Ph.D.

Faculty members in the Department of Agricultural Meteorology teach courses to help students gain an understanding of relationships and interactions between the atmosphere and the biosphere. These courses examine the relationships between physical factors and the biological environment. Courses are also offered that examine the role of climate and the impact of climatic events on agriculture, in particular, and society, in general. The department has a very active research program. Graduate students are currently admitted in the department through agronomy, biological systems engineering or the horticulture departments.

Faculty

****Anderson, Mark R.** -1987; Associate Professor; BS 1977, MS 1980, Northern Illinois; PhD, Colorado, 1985

****Blad, Blaine L.** -1970; Professor and Head; BS, Brigham Young, 1964; MS 1968, PhD 1970, Minnesota

****Dewey, Kenneth F.** -1974; Professor; BA, Elmhurst, 1969; MS, Northern Illinois, 1970; PhD, Toronto, 1973

Easterling, William E. -1991; Associate Professor; BA 1976, MA 1980, PhD 1984, North Carolina

****Hubbard, Kenneth G.** -1981; Professor; BS, Chadron State, 1971; MS, South Dakota Mines and Technology, 1973; PhD, Utah State, 1981

Merchant, James W. -1989; Associate Professor; BS, Towson State, 1969; MA 1973, PhD 1984, Kansas (Courtesy Appointment)

****Rowe, Clinton M.** -1987; Assistant Professor; BA 1978, MS 1982, PhD 1988, Delaware

****Rundquist, Donald C.** -1983; Professor; BS, Wisconsin (Whitewater), 1967; MA, UNO, 1971; PhD, UNL, 1977 (Courtesy Appointment)

****Verma, Shashi B.** -1972; Professor; BS, Ranchi (India), 1965; MS, Colorado, 1967; PhD, Colorado State, 1971

****Walter-Shea, Elizabeth A.** -1989; Assistant Professor; BS, Central Arkansas, 1978; MS, Texas A&M, 1981; PhD, UNL, 1987

****Weiss, Albert** -1975; Professor; BS, City College (New York), 1962; MS, Rutgers, 1969; PhD, Cornell, 1975

****Wilhite, Donald A.** -1977; Professor; BS, Central Missouri State, 1967; MA, Arizona State, 1969; PhD, UNL, 1975

Courses

808. Microclimate: The Biological Environment (Agronomy; Forestry, Fisheries and Wildlife; Geography; Horticulture; Mechanized Systems Management 808; Biological Sciences 857) (3 cr I) Prereq: Math 100 and 101, 5 hrs physics or by permission.
For description, see Mechanized Systems Management 808.

850. Climate and Society (Agronomy, Geography 850) (3 cr) Lect 3. Prereq: Geog 252 or 350 or equivalent; or by permission. *Offered spring semester of odd-numbered calendar years.*
Identify the impact of climate and extreme climatic events on society and societal responses to those events. The course is global in scope and interdisciplinary.

907. Agricultural Climatology (Agronomy; Forestry, Fisheries and Wildlife; Horticulture 907; Geography 952) (2 cr II) Prereq: 9 hrs plant sciences, 3 hrs statistics. *Offered spring semester of odd-numbered calendar years.*

908.Micrometeorology of the Biological Environment—Advanced Topics (Agronomy; Forestry, Fisheries and Wildlife; Geography; Horticulture; Mechanized Systems Management 908) (3 cr II) *Offered spring semester of even-numbered calendar years.*

958. Turbulent Transfer in the Atmospheric Surface Layer (Agricultural Engineering 958) (3 cr) *Offered spring semester of odd-numbered calendar years.*

Agriculture

***810. Research Strategies in Agriculture** (1 cr I)
A seminar addressing practical topics related to the planning, organization, administration, financing, and reporting of research in agriculture.

815. Comparative Public Administration: Development Administration and Politics in the Third World (Political Science 815) (3 cr)
For description, see Political Science 815.

988. Becoming a Professional Scientist (Entomology; Textiles, Clothing and Design 988) (2 cr I)
For description, see Entomology 988.

Agronomy

Department Head: P. Stephen Baenziger, Ph.D.
Graduate Committee: Associate Professor Johnson, chair; Professors Martin; Associate Professors Anderson, Skopp

Graduate programs in agronomy may be developed in plant breeding and genetics, soil science, crop physiology and production, range and forage management, and weed science. Applicants must meet the admission requirements for graduate study and must submit to the Department of Agronomy a completed application form including the transcripts of course work, and three letters of recommendation supporting the application from persons qualified to evaluate the applicant's potential for graduate college. Foreign applicants must, in addition, provide evidence of adequate financial resources for self-support during the term of graduate study and must submit a TOEFL examination score of at least 500, or present equivalent test scores or evidence of English language proficiency. Applicants are encouraged to send a letter to the chairperson of the Agronomy Graduate Committee describing their background, experience, and personal and academic goals in pursuing graduate study. A Graduate Record Examination is not required. Previous academic training must indicate that the student has the scholastic potential to pursue graduate study. Although a background in the area of emphasis is desirable, promising students with degrees in other fields can usually complete basic prerequisites within one semester. A student admitted with deficiencies, as determined by the Graduate Committee, will be enrolled in a provisional status until the deficiencies are removed.

Each student pursuing the Ph.D. degree in agronomy must complete a doctoral program approved by a supervisory committee. In addition to work required in the major field and a) supporting courses or b) minor as explained in the general requirements of the Graduate College, see "Requirements for Graduate Degrees" on page 18, the student, with the approval of the supervisory committee, must fulfill one of the following requirements: a) demonstrate a reading knowledge of one foreign language, b) study in one collateral field (9 hours minimum), or c) master a special research technique. The supervisory committee will determine the language requirement, the number of hours which must be completed in the collateral field, or the research technique.

Faculty

****Adams, Don C.** -1990; Associate Professor; BS 1976, MS 1978, Utah State; PhD, New Mexico State, 1980

****Anderson, Bruce E.** -1979; Associate Professor; BS, Minnesota, 1974; MS 1977, PhD 1980, Missouri

****Andrews, David J.** -1984; Professor; BS, North Wales, 1955; AGSC, Cambridge, 1956; TRAG, Imperial College of Trinidad, 1957

****Baenziger, P. Stephen** -1986; Professor and Head; BA, Harvard, 1972; MS 1974, PhD 1975, Purdue

****Baltensperger, David D.** -1989; Associate Professor; BS, NE Wesleyan, 1976; MS, UNL, 1978; PhD, New Mexico State, 1981

Binford, Gregory D. -1993; Assistant Professor; BS 1986, MS 1988, Clemson; PhD, Iowa State, 1991

****Blad, Blaine L.** -1970; Professor; BS, Brigham Young, 1964; MS 1968, PhD 1970, Minnesota

****Brandle, James R.** -1975; Associate Professor; BS, Tennessee, 1966; MS 1970, PhD 1974, Missouri

****Clegg, Max D.** -1967; Associate Professor; BS, NU, 1957; MS, Colorado, 1961; PhD, California, 1967

University of Nebraska Lincoln
Institute of Agriculture and Natural Resources

Department of Agricultural Meteorology
L. W. Chase Hall
P.O. Box 830728
Lincoln, NE 68583-0728
(402) 472-3679
Telex: UNL Comm LCN 484340
FAX: (402) 472-6614
IANR

MEMORANDUM

DATE: January 11, 1996

TO: IANR Administrative Council

FROM: Blaine L. Blad

SUBJECT: Response to Departmental Comprehensive Review Report

As a department we were pleased with the results of our departmental review. We put significant thought and effort into preparing for the review and we are satisfied that our efforts were rewarded. We are grateful for the dedicated efforts of the review team, for their recommendations and for the positive interactions that occurred during the review between the team and the departmental faculty and staff.

The overall complimentary nature of the report reflects, I believe, the excellence of the fine faculty and staff in the department. It has been a pleasure for me to work with such dedicated and competent people. I also appreciate the input and support that the IANR administration provided during this review.

The response to this report reflects the collective input from faculty, staff and students. We will continue to hold discussions, using information in this report as a guide in developing future departmental thrusts, plans and requests.

What follows is our response to the specific recommendations made on pages 16-18 of the report.

Research Program

1. We appreciate the comment by the team that the faculty and support staff are overextended and that we should secure another faculty position to work with our current research program. It is true that we all have more to do than we can reasonably hope to accomplish but we enjoy our work and feel positive about our programs. We could certainly make good use of another faculty position to support our current research program. Such a position would also support teaching and/or extension activities.

2. The review team suggested the following priority for the proposed three new positions: (a) Carbon Cycle Modeling, (b) Regional Scale Atmospheric Modeling and (c) Bio-Environmental Meteorology. We agree with this priority and will begin actively seeking support for the Carbon Cycle Modeling program in 1996. Drs. Blad, Easterling and Verma will work together to develop this program. We ask the IANR administration to give serious consideration to funding this program from the reallocation pool. We will also explore opportunities for securing external funds to help in supporting this program. We will also define and develop the Regional Scale Atmospheric Modeling program and explore sources of funding for such a program. At this time we do not plan to actively pursue development of the Bio-Environmental Meteorology program for at least another couple of years.

3. We are keenly aware of the problems associated with the lack of adequate space. We are pleased that we will be able to renovate the basement of Chase Hall. That will provide some relief, but the only long term solution we see is the proposed Natural Resources Building or the assignment of a large amount of space in an existing building. The disadvantage of having graduate students located in a building distant from our offices has a negative impact on interactions between the students and the faculty/staff. Anything that can be done to help bring a solution to our space problem will be appreciated.

4. We are already seeing reduced funding for some of our programs beginning in 1996. We will continue our strong efforts to secure funding from other than current resources. We are optimistic that we will continue to be successful in securing a substantial amount of external funding, but we are concerned that we may encounter short term lapses in funding for some of our support personnel. We ask the IANR administration to consider development of a contingency fund to help cover such short-term lapses - not only for our department, but for all IANR departments.

Academic Program

1. We have been aware for some time that many of our graduate students would like to gain some teaching experience. From time to time we have had some students assist us in recitation sessions or classes devoted to instrument demonstrations but we realize that our efforts to this point have been inadequate. Our students make at least one presentation per year in our seminars. We think the suggestion to videotape these presentations and then critique them is a good one and we will try this approach. We are also encouraging interested students to take a course or two on teaching techniques. We will enlist student help in making presentations to various groups through our outreach activities. In addition, we will try to incorporate students into

some of our courses, especially those with laboratory sections. We also will incorporate the suggestion to have students review papers submitted for publication and to provide students feedback on their reviews.

2. In 1996 we will submit the necessary paperwork to secure permission to offer a Master of Science degree in the department. We view this as a first step in the eventual offering of a Ph.D. degree in the department.

3. We have not identified the overlaps that occur between courses offered within the department or overlaps that may occur with courses offered by other departments. It is, of course, necessary in many courses to build on material presented in an earlier course, but we want to minimize duplicating information. We plan to bring our graduate students together to discuss this and other issues related to teaching in the department. If we find that duplication or overlapping of materials is a problem, we will rectify the situation.

4. Drs. Meyer and Blad are preparing materials for a proposed course "Introduction to Bio-Environmental Climatology". We believe that this would be a very good course for students in CASNR and other UNL units. Because Dr. Meyer is supported by external funds and salary release money, we are faced with the challenge of allocating his time and resources to support this activity. We feel that the opportunity for him to help team-teach this course, however, will not only be beneficial to the department but is in his best interest as well for his own professional development and the opportunity for future employment. We would appreciate any suggestions and assistance from the IANR administration on helping us to implement the course. Dr. Blad will, likewise, need to redirect some of his efforts to help develop and teach the course.

5. The department is strongly in favor of developing the course "Global Environmental Change". This course would be taught by Dr. Easterling and would be both highly relevant and timely in dealing with a very important scientific issue. Once Dr. Easterling has achieved tenure, he will be encouraged to devote the time and energy necessary to develop and teach this course.

Additional Comments

1. We plan to offer an undergraduate minor in Agricultural Meteorology within the next couple of years. We believe such a program would introduce more undergraduates to opportunities in Agricultural Meteorology and should stimulate greater interest in graduate studies. It will also provide other students with an opportunity to gain an

indepth understanding of how weather influences many biological processes and how it affects agriculture, natural resources, and other elements of society.

2. We will encourage our students to take courses offered at UNL that will help them become more effective managers of research and other academic activities to help prepare them for future careers in all aspects of science.

Outreach Program

1. We will have a retreat in 1996 devoted primarily to extension and scholarly service and what the department can do to improve and coordinate its outreach program. Prior to that retreat the department will select a faculty member to be our outreach coordinator and to work closely with the department head in developing a focused and well-coordinated outreach program.

2. We will survey departmental faculty to ascertain their interest in participating in outreach programs and the amount of time they would like to spend on outreach activities. Based on this survey and the perceived needs of the department, FTEs will be adjusted as feasible to help achieve the desired outcome.

3. We have had some interactions with 4-H programs in the past as a means to help us in our K-12 programs. We should, however, explore the expansion of our efforts in 4-H programs and determine how we can best use this important program in helping to educate students, teachers and the public on important bio-atmospheric issues.

4. Specialists in the department have been and will continue to be encouraged to take a very active role in the development and implementation of the Education-Action Plans that deal with Agriculture and Natural Resources Policy, Natural Resources and Environmental Management and Integrated Crop Management. We will encourage all departmental specialists to take an active role on the team(s) working on these issues.

Technical Support Personnel

1. The departmental statements, i.e., Vision and Mission, were shared with all staff and students before the review as part of the original draft of the self-study document. An invitation was extended at that time for input on any and all material contained in that document. In many cases suggestions were made by students and staff and incorporated into the self-study document. In light of this, this recommendation is a little puzzling. Nevertheless, we will be mindful of improving departmental communications in the future.

2. We have already incorporated this suggestion and have circulated appropriate faculty meeting minutes to all staff. We will, likewise, hold a minimum of two joint faculty/staff/student meetings each year to discuss departmental plans and to keep one another abreast of what is going on in various programs within the department.

3. We have always encouraged all staff to take advantage of opportunities to obtain training to update and upgrade their technical skills. We have used and will continue to use departmental and/or program funds to support these activities. We strongly encourage our technical staff to avail themselves of these opportunities.

Office Support Personnel

1. We have already purchased one new computer with appropriate software for the office staff. Our head secretary has been devoting four hours per day to learning how to use this new system. Our plans are to purchase two additional computers with the latest software this next spring or fall, at the latest, and to have all department secretaries and our bookkeeper trained in the use of the new computers and software.

2. Internal communications have been and will continue to be improved using some of the procedures described earlier in this document. It may be desirable for the office support staff to meet with the department head on a frequent basis (perhaps weekly or monthly) to discuss departmental activities, to plan for addressing departmental needs, to address any concerns of the office staff and to provide some feedback between faculty and staff.

3. We are moving toward the use of e-mail as the primary method of departmental communication. All faculty and staff have the necessary equipment and either have or soon will have the expertise to use e-mail.

4. Discussions have already taken place with Dr. Hoffman to determine if we can secure a small room to locate mail boxes, microwave, refrigerator and other items to reduce the congestion in the offices of support staff and to improve the security of confidential materials. Because of limited available space, however, we will continue to suffer from cramped quarters for the office staff. It is unlikely that much progress will be made on this matter until new facilities to house the department are obtained.

Interdisciplinary

1. The department has a history of cooperating with faculty within and outside the university on interdisciplinary projects. We do not feel that the evaluation process

has been a hinderance to our interdisciplinary efforts. We feel that support and encouragement of interdisciplinary activities by the current IANR administration has been very positive. This was not a problem identified by our faculty with the review team, but it emerged as a topic from the meeting with the department heads. If the evaluation process can be modified to encourage and reward interdisciplinary activities more strongly than it does now, so much the better.

2. It is the intention of the department to participate fully and proactively in the Natural Resources program.

3. The department has been and will continue to be a major player in working toward a new Natural Resources building. We see this as the most viable means for solving our space problems while at the same time bringing together many scientists to work on interdisciplinary problems more effectively than we have in the past. We anticipate strong support from IANR in helping to make this dream a reality.

In conclusion, we believe that the recommendations are generally appropriate and address most of the issues we directed to the review team. We will do our best to implement these recommendations.

BLB/db

REPORT

OF

COMPREHENSIVE REVIEW

DEPARTMENT OF AGRICULTURAL METEOROLOGY

UNIVERSITY OF NEBRASKA, LINCOLN

LINCOLN, NEBRASKA

SEPTEMBER 26-29, 1995

FOREWORD

This Comprehensive Review was requested as part of the on-going review of programs at the University of Nebraska's Institute of Agriculture and Natural Resources (IANR). This is the second Review of this Department since it was formed in 1989, and reviewed that same year. Prior to becoming a Department, this unit existed as the Center for Agricultural Meteorology and Climatology. Much progress was documented in the interim between Reviews, including the addition of several scientists and the creation of new Centers within the Department.

The Review Team consisted of four members from outside the University and three from the Campus. Members of the Team are as follows:

Dr. Boyd W. Post, Chair, USDA-CSREES; Dr. Lloyd W. Gay, School of Renewable Natural Resources, University of Arizona; Dr. Katharine B. Perry, Department of Horticultural Science, North Carolina State University; Dr. Clarence Sakamoto, Senior Agrometeorologist, Columbia, MO; Dr. David T. Lewis, Agronomy Department, University of Nebraska; Dr. Anne K. Vidaver, Head, Plant Pathology Department, University of Nebraska; and Elena Tsvetsinskaya, Graduate Student, Agricultural Meteorology, University of Nebraska.

These scientists/administrators bring a breadth of knowledge and experience, which is essential to the review process for this Department.

Arrangements for the Review were made by Dr. Blaine L. Blad, Department Head and Professor. An excellent document containing background information was prepared by a faculty committee and delivered to the Review Team well in advance of departure for the Review. The document contained a number of very significant questions pertaining to the various aspects of activities within the Department. The Team has attempted to respond to as many of these questions as we could discuss in the relatively short time available. However, we have attempted to provide a comprehensive report as was requested.

The team was shown the offices and classrooms now in use by the Department. We were also shown the area in the basement of Chase Hall which is to be subdivided into several laboratories in the near future.

Opportunities for informal interactions of the Review Team with the faculty and administrators was very helpful to the Review process and greatly appreciated by the Team.

GENERAL COMMENTS

Resource Situation

Nebraska is a leading agricultural state in both production and agribusiness. Of the almost 48 million acres of land used for agriculture in Nebraska, about 18 million acres are in cropland and 30 million are in rangeland. Nebraska is second only to California in irrigated farm land with 8.5 million acres. In 1990, Nebraska ranked fourth in the nation in farm income behind California, Texas, and Iowa, eighth in cash receipts from crops, and second only to Texas in receipts from livestock and animal products. Approximately two-thirds of Nebraska's farm income is from livestock and one-third from crops.

Agriculture will continue to dominate the state's economy. About one of every two Nebraskans are dependent upon agriculture for their employment. About 96% of the land in Nebraska is privately owned, and most of it is used in some way for production agriculture. The main crops in Nebraska are corn, alfalfa, soybeans, sorghum, wheat, rye, oats, barley, sugar beets, and dry edible beans. Nebraska is attempting to diversify with alternative commodities like fruits, aquaculture, honey, nuts, milkweed, potatoes, vegetables, amaranth, crambe, and sunflower. Nebraska has a major opportunity to add value to its commodities rather than selling raw products. About one-third of the crop production is exported.

Clearly agricultural production is very closely linked to the weather and climate of the state. Services provided by the Department are of great importance to many aspects of agriculture in Nebraska.

University

The University of Nebraska is one of the outstanding Land-Grant institutions in the nation. There are strong programs in the agricultural sciences and in the supporting sciences such as chemistry . This creates an outstanding opportunity for collaboration in many types of interdisciplinary, or multidisciplinary research, teaching, or outreach. Leaders of other Departments and Programs were very complementary of the personnel and cooperative arrangements they have with the Department.

Administration

Rarely is the faculty so appreciative of the administrators of programs as are the faculty in the IANR. We found a very positive attitude about administration from graduate students on through Department Heads. The reasons for this were evident to the Review Team from the interest shown by the administrators throughout the review process. Clearly, a very high value is placed on the review process by the administrators and all those personnel with whom we were involved. This is one of the best examples of the participatory process and the benefits of building trust that could be found in comparable institutions.

STATUS OF PROGRAMS

History

Agriculture on the high plains has always been very aware of weather and climate because of the great effects this part of the environment has on plants and animals, and which in turn determines the well-being of families and the economy of the region. The first professional in agricultural meteorology at UNL was Dr. Norman Rosenberg, who joined the faculty of the Department of Horticulture and Forestry in the 1960's.

Under Dr. Rosenberg's leadership the agricultural meteorology program grew and thrived. In 1979 the Center for Agricultural Meteorology and Climatology (CAMaC) was formed with a small, but very capable, group of scientists, with Rosenberg as leader. CAMaC was established as a separate entity within IANR to fill the needs for expanded research and service for the State of Nebraska and adjacent high plains regions. It is significant that this Center was strongly interdisciplinary from the outset, with each professional staff person having either full or courtesy appointments in several departments of UNL.

CAMaC became the Department of Agricultural Meteorology in 1989, with Dr. Blaine L. Blad serving as the Department Head and has continued to grow very well in size and service. Within the Department there are now five Centers, which are focal points for unique activities related to the expertise of faculty members. This Department serves clientele from the state level to the international level in ways no other group, anywhere, is serving. At the same time the strong interdisciplinary character continues to benefit the Campus and the State.

Current Situation

The Department has been growing quite vigorously over the past several years and has made impressive advances. It is now a larger group, growing from six faculty to ten. Concurrently, support positions have increased by six new members. External funds, which the Department is very adept at attracting, have been used to add these persons. Support from appropriated funds for Departmental programs is average compared to other units in IANR.

There are five centers within the Department. They are the Center for Laser-Analytical Studies of Trace Gas Dynamics, the Great Plains Center for Global Environmental Change, the National Drought Mitigation Center, the High Plains Climate Center, and the International Drought Information Center. The first three mentioned are new since 1989.

Space is still a major concern of the Department. Some renovations have been completed in Chase Hall and there are plans to create research laboratories in the basement of that building. These additions will help the situation, but not completely solve the problem. It would be highly desirable to have sufficient space to house graduate students in the same building with their major professors, with whom they are working on research projects. Currently, these students are officed a block away, in the Biological Systems Engineering Laboratory.

The curriculum has undergone significant change with three courses being given major revision and five new courses added. However, teaching FTE has increased only 0.19. Calculations indicate that the teaching effort is equivalent to about 1.4 FTE, whereas the official FTE is 0.74. The difference is considerable. Classrooms, computers, etc. do not appear to be a constraint for the teaching effort.

Graduate student numbers have not fluctuated much in the past several years. The major change in graduate student is that there is a greater proportion of foreign students, and these are supported largely on grant funds.

In meetings with the technical support staff and the office support staff, it was clear that these are very capable, dedicated persons who work well with the faculty members and graduate students. They, too, are working in cramped quarters and trying conditions. However, morale was excellent. They expressed a desire for improving communications within the Department so as to better understand the goals and objectives of the unit, which would help them feel more "involved".

Facilities and Equipment

Research facilities and equipment appear to be near state-of-the art, and certainly adequate. State-of-the-art equipment is on hand for research underway, and new instruments are adopted as they are developed and tested. Many times the staff works with equipment manufacturers to test new equipment before it is released to the general scientific community. It does not appear, however, that office support staff equipment is so up-to-date. Computing equipment here appears to be of a vintage that is not within existing standards. Electronic mail does not seem to be available to every work station. Copying capabilities also appear to be substandard.

The main research laboratory for the Department is located at the Agricultural Research and Development Center at Mead, NE. The laboratory includes about 20 ha of land for field experiments, and houses state-of-the-art equipment for micrometeorological flux measurements of mass and energy. Portable facilities and equipment are available to conduct research at remote locations, such as Kansas, Russia, Northeastern Nebraska, Minnesota and Canada. Computing capability for research projects is also maintained at state-of-the-art with computers networked on the UNL campus. Equipment is updated as needed. Computer capability is adequate to handle data collection, computation and analysis. Climatic data can be collected through an automated weather station network, and computer facilities are available to make data available to the scientists, private industry, public officials, and the general public. Facilities to archive most of these data and information are, however, not adequate.

The Department is trying to develop, but as yet does not have adequate facilities to calibrate some of the sensors used in research and outreach. Some calibration instruments have been developed by the departmental staff, but others are available only through other institutions. The proposed research laboratories will contain some calibration capabilities. In addition,

equipment purchased for the instrumentation course may have potential to calibrate some of the sensors.

Space is a major concern of the Department. Classrooms are adequate, but teaching laboratories are not. Computer capability exists, but space to house the equipment is not adequate. A very fine group of support staff has inadequate space to work. The office staff has little privacy in the workplace, and are scattered in physical locations. The accounting person has people visiting her "office" to use the microwave oven, posing a potential threat to confidentiality of records. Graduate students have little space of their own. Ideally, graduate students should be housed in the same building in which their major professors are housed.

Some of the overcrowding awaits solution through renovation of the basement of Chase Hall. Yet, it was stated that this will mainly make it possible to centralize some activities. Long-term plans call for a facility to house "Natural Resources" activities on east campus. It is thought that Agricultural Meteorology would be housed in this facility. This appears to be a long-term solution to the space shortages that currently exist. A short-term solution might be through use of space in the Biochemistry building, if decentralization of operations can be tolerated. Otherwise, considering the shortage of space campuswide, a clear solution to this problem is not evident.

RESEARCH PROGRAM

The Department has established an exceptionally strong, productive, research program in important areas within the broad field of agricultural meteorology. Their Department is the national leader of the following activities: organization of meteorological networks, and the development and maintenance of weather data bases; the assessment and mitigation of drought; and turbulent transfer of energy and mass between the earth's surface and the atmosphere. The research activities and graduate program of this Department are especially esteemed by colleagues in the national professional societies of agronomy, soil science and meteorology.

The seven senior (tenured) faculty members comprise 4.32 research FTE (Self-Study [SS], p. 10; also given as 4.61 FTE on p. 36), and the three junior (untenured) faculty represent 1.5 research FTE. Research activities of the senior faculty are covered by authorized FTE. However, the junior faculty are in nontenure-track positions. Unless additional FTE authorizations become available, the junior faculty positions can be viewed realistically only as temporary, post-doctoral appointments.

Total budgeted research support in 1994 was $158,271 $/FTE (SS, p. 36). These totals are similar to amounts budgeted for other units in ARD. However, total grant funds in the Department were 276,460 $/FTE which is substantially larger than the average of 108,884 $/FTE reported for other units in ARD. External research grants received by the Department over the period 1990-1995 total $7,867,363 (SS, p. 75). The success of the Department in securing long-term grants and contracts from external funding sources clearly demonstrates recognition of the excellence of their research program. We applaud these achievements, yet we also recognize that this very success translates into heavy reliance on grant funds to maintain the present level of research activity.

The Department has an excellent publication record. During the 1990-1995 period, formal publications totaled 82 refereed journal articles, 24 book chapters, and 9 Books/Monographs/ Edited Proceedings. During this period, graduate students completed 5 M.S. theses and 10 Ph.D. dissertations.

There are no clearly defined client groups for the interdisciplinary activities of the Department. Users of their results are diffused within the scientific and agricultural communities, ranging from scientists in basic research to growers seeking application information and to individuals with a general interest in weather phenomena.

The weather measurement, analysis and drought-related portions of the Department's program offer potential economic benefits to the agricultural community. Their basic research into transfer processes between earth and atmosphere are contributing to our understanding of the carbon balance and global climatic change. The potentially enormous economic benefits of these contributions can be acknowledged, but they are not easily quantified.

The primary limitation of the present research program appears to be the finite capacity of the very able faculty. Senior faculty are heavily committed to externally funded research. Further expansion will nudge them closer towards over-commitment, and increase the present reliance on external funds. There is a well-recognized, long-term, shortage of space for support staff and graduate students that remains difficult to solve without specific investment by the Department and/or University.

Graduate students play a very important role in the research program. Only funded students are accepted for study, and the philosophy is that the students gain an important portion of their research experience by direct participation. However, orientation of graduate research areas into well-defined, grant-funded projects can work against the desirable experience that students should obtain by grappling with definition of research problems, but it undeniably makes for research efficiency and for "cutting edge" projects. Students in this Department are heavily involved in ongoing research.

The Department research program is clearly interdisciplinary, with major components from biology, meteorology, and soil science. The last two disciplines are themselves widely recognized to be interdisciplinary. The Department has participated vigorously in cooperative research with a variety of well-known organizations. The wide-ranging relationships within the University of Nebraska, and with other institutions are well documented (SS, p. 13 and p. 76).

The Department's research has a threefold focus: (1) interactions between the earth's surface and the atmosphere: (2) incorporation of weather information into decision making; and (3) consequences of climatic variability. The research is interdisciplinary, with the strongest common link being through atmospheric processes. We note that the program does not address issues related to forecasting of weather events that impact agriculture; this topic is often an important component of "agricultural meteorology" programs elsewhere.

International research conducted by the Department falls within two groups. The first (i.e., turbulent transfer) is process oriented, and work carried out at international locations has, for the most part, provided important extensions to a wider range of environments, and to the testing of experimental techniques in cooperation with other organizations. Operations in foreign environments have strengthened the scientific base of the Department's process-based programs. The second group of international studies (i.e., drought mitigation) applies expertise developed by the Department to solution of weather-related problems within a specific foreign country. Both types of involvement are valuable, and both have directly enhanced the scientific base of the Department, and indirectly contributed to the Department's outstanding reputation for research.

ACADEMIC PROGRAM

The Department has assigned an equivalent of 0.74 FTE for teaching to its staff, although some of them teach even though they are not assigned FTE in this area. New courses since 1989 include: (1) Climate Impacts on Society, (2) Bio-Atmospheric Instrumentation, and (3) Crop Growth and Yield Modeling. Three other courses have been revised and updated.

In 1995 there are 16 graduate students, of which 11 are international. There has been a trend towards more international students during the past five years, indicating a high global profile of its excellent program, particularly as it is associated with its research program and the consequent support for graduate students. The Team believes that the ratio of international to domestic students is not a critical issue. The objectives and mission of the Department should be the prime motivation factor.

Two new courses have been proposed: Global Climate Change and Bio-Environmental Climatology. These two are needed and provide critical linkages to the Department's academic program. The first is in an uncharted area, but is timely and relevant. The second is designed as a survey course to provide background in agricultural production systems and its natural environment. It is targeted for undergraduate (sophomore/junior) level and is designed as a foundation to more advanced level classes.

Attempts have been made to incorporate teaching opportunities for the graduate students, but indications are that they are limited. More opportunities are desirable. A few students have detected overlaps in subject matter. Although this may be necessary and desirable in instances, it is an area for potential review within the faculty. The students should also be encouraged to enroll in supplemental courses that prepare them, for example, to manage research, to improve writing, and to deal with conflict management. In general, the students seemed highly pleased with advisor interactions and the opportunity to study in the Department with the state-of-the-art equipment.

There is excellent working-level interaction with other Departments and units in the University (e.g. Agronomy, Forestry, Fishers and Wildlife, Geography, Horticulture, Biological Sciences, Water Science) at the academic level. There are a number of courses offered on campus to complement the Department's academic program. This has led to the capability of tailoring the individual program to the needs of each student. A proposal has been made to offer a minor in Agricultural Meteorology. The Team did not totally understand the ramification of this offering, and is neutral in its response.

OUTREACH PROGRAM (COOPERATIVE EXTENSION SERVICE AND SCHOLARLY SERVICE)

Currently there are 2.65 FTE in the Outreach Program. In CES there is 1.10 FTE, of which 0.50 is funded by soft money. In SS there is 1.55 FTE, of which 1.0 is funded by soft money. These FTE are distributed across eight faculty members representing three of the Centers in the Department and one individual faculty position program.

Each faculty member has developed goals, identified clientele group(s)/audience(s), chosen multiple delivery methods and planned and/or carried out activities. These accomplishments are to be commended. The activities carried out thus far, appear to be worthwhile and well received by the target audiences. It will be important in the future to quantify impacts and secure benefit-cost data of some program activities. Estimates determined from surveys, questionnaires and inputs from economists would be helpful in this quantification. This may be achieved for the CES activities by specialists proactively participating in the Education Action Plans.

There is not an apparent departmental plan for outreach efforts. The individual faculty have not created a unified plan and assigned/volunteered for distributing the responsibilities of implementing the plan. This has caused an appearance of random, unrelated activities being performed.

The CES component of the Great Plains Regional Center for Global Environmental Change (GPRC) is a unique program. The expertise provided by the specialist is not available in any other state extension program to this Team's knowledge. Educational materials that are developed and educational programs produced should be considered for national distribution. This could also be a potential funding source as the cost of producing these materials can be recouped under Extension regulations.

The plans for educational materials development and demonstrations on the use of the weather and climate information in the Department is an excellent one. This is an area where a void exists in educating/extending the knowledge and technology developments in the field of agricultural meteorology.

The outreach faculty are encouraged to consider shifting some of the reactive efforts, e.g. the Ag Climate Update, to more proactive programming. For example, rather than trying to assess the impacts of a frost/freeze after the event, develop methods to allow timely and systematic assessments of weather events and have materials ready to reference to support decision making at the production level. Applied research could be carried out and subsequent training provided to assist growers who have crops damaged by weather about how they should alter their cultural practices for the remainder of the season given the damage. This is already being done using the CERES- Maize model. Expanding these efforts is suggested.

Similar to the research component, there are concerns about the amount of FTE in the outreach program supported by soft money. Efforts should be made to secure permanent funding for these positions. However, the future is much brighter for external funding of educational efforts when compared to the research component. The faculty in the Department have made a laudable beginning in this area. They are strongly encouraged to continue to explore the many possibilities in this area.

FUTURE DIRECTION OF UNIT

Some questions are answered above. The Unit's future direction is consistent with the IANR Strategic Plan and its action plans. Its commitment to quality and excellence have been fulfilled and, given continued success in seeking funds, likely will continue.

The quest for a suitable name change is recognized. We believe such change is appropriate and timely. It may not be feasible to use the preferred name of Bio-Atmospheric Sciences, hence, alternatives need to be considered.

New program areas are supported in principle. These programs are in the area of ecosystem carbon balance modeling and regional scale modeling. Both of these areas would complement current strengths. A program in bio-environmental meteorology is not recommended at this time.

Additional sources of funding may be available. These include the Natural Resource Conservation Service, NATO Advanced Studies program for meetings, BARD program (if appropriate), private foundations interested in national and international issues, NSF Directorates for Science Education for teaching, and SBIR programs for instrumentation development in cooperation with industry.

With growth of the Department and scope of activities, some internal communication seems to have been neglected. Some consultation with support staff, both technical and clerical, would be helpful in apprising them of changes in personnel and programs. Action plans and revisions should be shared among all personnel. Staff representation on the next Review Team should be considered. Support staff communication should be enhanced by e-mail connectivity and distribution of faculty minuted. Upgrading of computer hardware and software is expected to increase the efficiency of the dedicated staff.

The Review Team recommends to the Administration that it explore "bridging" funds for temporary support of programs expected to be funded. The University's Foundation should be approached for such potential assistance.

SUMMARY COMMENTS

Research Program

Strengths:

1. High degree of research activity.
2. High quality research programs.
3. Ability to secure significant levels of external funding.
4. Excellent level of research productivity, expressed in publications and other products.
5. Excellent technical and support staff.
6. High quality graduate students.
7. High quality graduate programs.
8. Have earned a well known reputation for the Department, indeed outstanding.
9. Number of centers directed by departmental faculty members.
10. Ability to extend the research results.
11. Faculty are very dynamic and operate at the cutting edge of their field.
12. Morale is very positive, faculty have positive outlook.

Concerns:

1. Number of faculty is small relative to research commitments.
2. Lack of adequate space for laboratories.
3. Lack of adequate space to co-locate faculty, technicians and support staff.
4. Uncertainty of future grant funding.
5. There appeared to be consensus among Department Heads that the University evaluation process is a barrier or discouragement to interdisciplinary research due to the emphasis on individual achievements.

Academic Program

Strengths:

1. Cadre of strong teaching personnel equipped with resources that enable it to address cutting edge issues in bio-atmospheric sciences.

2. Wide diversity of courses outside the Department which are beneficial to graduate students' needs.

3. Policy of tailoring graduate programs to meet individual student needs.

4. Strong ability to attract funding to support graduate students.

5. International reputation of faculty attracts students from all over the world.

Concerns:

1. Small number of courses limits the opportunity of graduate students to gain teaching experience.

2. Title of graduate degree does not reflect the actual area of training received.

3. Apparent need for increased coordination of subject matter in courses taught by Department.

4. Potential overloading of staff if new courses are offered.

Outreach (Extension and Scholarly Service)

Strengths:

1. Unique Global Change Education Component.

2. Exhibit a strong commitment to make products available to Nebraskans, the region and the world.

3. Willingness to explore state-of-the-art delivery methods, e.g. Internet, World Wide Web. Emphasis on choosing audiences that maximize educational efforts, i.e., teaching teachers, resource managers, rather than individuals.

Concerns:

1. Lack of coordination of outreach program.

2. Lack of evaluation of impact.

3. Question impact of Ag Climate Update relative to limited distribution number and potential duplication.

RECOMMENDATIONS

Research Program

1. The increase in faculty and support staff since 1989 has been more than matched by increased extramural research obligations. We feel that the faculty and support staff are overextended; they should be enlarged in order to meet present commitments and to insure prompt response to new opportunities. We propose that all creative means be explored in an effort to secure another faculty position to work with the current research program.

2. The Department of Agricultural Meteorology has proposed that the existing research program be augmented by two new faculty positions that will build upon existing strengths. The Department identified three subject areas for the possible expansion. We conclude that the priority among the three proposed areas be as follows:

   (a) Carbon cycle modeling (Action Plan No. 3, July 7, 1995);

   (b) Regional scale atmospheric modeling (verbal, Dr. Easterling, Sep. 28, 1995);

   (c) Bio-Environmental Meteorology (Action Plan No. 2, July 7, 1995).

   We recommend that FTE for the two new positions be sought through reallocation from IANR.

3. The limited space available for faculty, staff and students must be addressed if the Department is to continue to function satisfactorily. An ideal solution of the space shortage would permit co-location of faculty, staff and students. We urge that every effort be made to solve this problem.

4. The general outlook for external funding has deteriorated substantially in 1995, and the prospects for maintaining large programs primarily on grant support now appear less likely. Given the value and productivity of the Department's research, we feel that redirection of internal funds to support of the Department should be explored with IANR.

Academic Program

1. The students be given the opportunity to teach if they express an interest. This may be arranged through selective subject matter in separate courses. The opportunity could also be provided through seminars. In this regard, a video of the individual's presentation could be taped for critique by the individual and an advisor. Selected graduate students could also be given the opportunity, if appropriate, to review papers submitted for publication.

Participation in outreach programs would also provide these students with experience in effective communication.

2. The Department should proceed with plans to offer its own Master of Science degree. If problems for this plan are encountered, an option for consideration might be in the School of Biological Sciences with specialization in Atmospheric Science.

3. Improve the coordination among the teaching staff as to the contents of the individual course to minimize overlaps.

4. The Review Team supports the proposed plan by the Department to initiate a survey course on "Introduction to Bio-Environmental Climatology" for undergraduates, provided the proposed effort can be matched with a reallocation of FTE.

5. The Team also supports the plan for the proposed course in "Global Environmental Change." This course is timely and relevant. It can attract a potential market from a diversity of disciplines ranging from the political and social science students to the biological and physical science students. Because of the envisioned time lag for receiving approval of such a course, it is suggested that this course be presented as a Seminar or Topic series.

Additional Comments:

1. The Team is not clear as to the ramification(s) of providing an undergraduate minor in Agricultural Meteorology and, therefore, offered no guidance on this question.

2. Encourage students to take a course that prepares them to manage research.

3. Ratio of international to domestic students is not critical. Objectives and missions should be the prime motivation.

Outreach Program (Extension and Scholarly Service)

1. Coordinate the Department Outreach Program. Consider appointing a faculty member to be the Coordinator.

2. Realign outreach responsibilities to achieve meaningful percentage FTEs, i.e. split outreach FTEs among fewer faculty.

3. Consider 4-H programming as a delivery mechanism for K-12 audience.

4. Specialists should take an active role in all facets (planning, implementing, evaluating and accountability/impact assessment) of Education Action Plans.

Technical Support Personnel

1. Share Departmental statements (i.e., Vision and Mission) with technical support personnel.

2. Improve internal communications within the Department, i.e., share appropriate portions of faculty meeting minutes.

3. Provide training in computer applications for computer specialists in advanced technology.

Office Support Personnel

1. Upgrade computers and provide appropriate software to improve effectiveness.

2. Improve internal communications as mentioned earlier.

3. Make e-mail the official means of Departmental communication. Professional expertise may be desirable in initial phases.

4. When new space becomes available, correct the location problems affecting office staff, i.e., microwave in accounting office, etc.

Interdisciplinary

1. Encourage/initiate action to modify evaluation process, so as to at least equate interdisciplinary and individual achievements, or encourage interdisciplinary activities.

2. Plan to participate fully in the effort to establish the Natural Resources Program being discussed and considered.

3. Support and work for a new Natural Resources Building, which would be essential to the creation of a strong, viable Natural Resources Program.

CONCLUSION

The future for this growing Department appears to be exceptionally full of opportunity as new knowledge in this field continues to be developed. Applications of the new knowledge and resulting technologies will create new demands for both the faculty and graduates educated by them. The uncertainties of continued global climate change will provide opportunities and present challenges for the talents of meteorologist/climatologists for many years to come. This Department is poised to participate fully in meeting these challenges and utilizing the opportunities. Assuming the resources needed become available to them, their level of achievement will continue to excel.