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CSREES
Comprehensive Five-Year Review
September 7-11, 2003

School of Natural Resources
University of Nebraska-Lincoln



EXTENSION/OUTREACH



TEACHING



RESEARCH



SURVEY

Acknowledgements

We acknowledge here the many individuals in the School who gave thoughtful contributions toward the preparation of this self-study document, and particularly express appreciation to those who devoted considerable time and effort in their leadership and authorship of the various sections of the document.

In addition, we wish to express thanks to those support staff who contributed in various ways to the preparation of this document with editorial assistance, compilation of some of the statistics, design of the self-study covers and CD labels, burning the CDs, and compilation of the report itself.

The unit 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 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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CSREES COMPREHENSIVE REVIEW

Self Study

**School of Natural Resources
University of Nebraska-Lincoln**

September 7-11, 2003

11 August 2003

Dear Review Team Member:

Welcome to the School of Natural Resources at the University of Nebraska! We sincerely appreciate your willingness to participate in our CSREES five-year review and provide us with your expertise and counsel to assess where we've been and where we're going in the next five years. As you will soon discover, the School is at a very early stage in its evolution, thus the timing of this review is ideal both for assessing our current programs and for guiding us into the next decade and beyond. Your assistance and input could not come at a better time!

Although this document may appear to be a bit daunting at first glance because of its size, we have tried to be as concise and yet comprehensive as possible, to provide you with sufficient documentation to make informed judgements about the School. The longer chapters that address teaching, research, and extension & outreach are self-contained, including an individual executive summary and table of contents, as well as corresponding appendices. We also have provided a CD (inside front cover) for those of you who would prefer not to carry the hard copy. In addition, Chapter 8 summarizes what we consider to be the key questions posed throughout the report, to help guide you and draw attention to some of the issues that we view as important to our continued growth toward becoming a leader in natural resources research, education, and outreach.

Thank you again for your time and effort. We look forward to this review and to interacting with you over the coming days! Please let us know if you have any questions or need additional information, and if there is anything that I can do to help make your stay in Lincoln more comfortable.

Sincerely,

Kyle D. Hoagland
Interim Director

**CSREES Comprehensive Review - School of Natural Resources
University of Nebraska-Lincoln
September 7-11, 2003
Tentative Agenda**

**Sunday, Sept. 7
Embassy Suites Hotel**

- 6:00 PM Review Team Dinner
- 7:30 Review Team Meeting with Vice President and Vice Chancellor *John Owens*,
Dean *Elbert Dickey*, Dean *Richard Hoffman*, Dean *Darrell Nelson* and Dean
Steve Waller

**Monday, Sept. 8
East Campus Union**

- 7:15 AM Review Team departs Embassy Suites for East Campus Union
- 7:30 Breakfast meeting with Vice President and Vice Chancellor *John Owens*, Vice
Chancellor *Prem Paul*, Senior Vice Chancellor *Richard Edwards*, Dean *Elbert
Dickey*, Dean *Richard Hoffman*, Dean *Darrell Nelson*, Dean *Steve Waller*, and the
SNR Director; charge given to Review Team
- 9:00 Welcome and overview of SNR
- 10:00 Break
- 10:15 Overview and future direction of undergraduate program; Undergraduate
Curriculum Committee, Teaching Coordinator, and teaching faculty
- 11:45 AM Luncheon with relevant IANR and College of Arts & Sciences Department Heads
(Agronomy & Horticulture, Agricultural Economics, Biological Systems
Engineering, Entomology, Biological Sciences, Geosciences, et al.)
- 1:15 PM Overview and future direction of graduate program; SNR Graduate Committee,
Teaching Coordinator, and graduate faculty
- 2:45 Break
- 3:00 Overview and future direction of research programs; SNR Research Committee,
Research Coordinator, and research faculty
- 5:00 Walk to Hardin Hall for reception
- 5:30 PM Informal reception; SNR faculty and staff (Hardin Hall)
- 7:00 Review Team returns to Embassy Suites (dinner on their own)

Tuesday, Sept. 9

East Campus Union

- 7:30 AM Review Team departs for East Campus (incl. brief windshield tour of campus)
- 8:15 Overview and future direction of extension/outreach and survey programs; Extension/Outreach Coordinator, Extension/Outreach Committee, and extension and survey faculty
- 10:15 Break
- 10:30 Meetings with individual faculty or small groups (TBA)
- 11:45 AM Review Team luncheon with state and federal agency representatives; *Roger Patterson* (Department of Natural Resources), *Rex Amack* (Nebraska Game & Parks Commission), *Mike Linder* (Department of Environmental Quality), *Bob Joseph* (USGS), SNR Director, others
- 1:00 PM Meeting with SNR staff
- 2:00 Meeting with NRBC staff
- 2:30 Meeting with undergraduate students
- 3:30 Break
- 3:45 Open (meetings requested by Review Team)
- 5:45 Return to Embassy Suites (report development and dinner on their own)

Wednesday, Sept. 10 East Campus Union

- 7:00 AM Breakfast with SNR Administrators
- 8:30 Depart for East Campus
- 9:00 Overview and future direction of SNR Centers; *Shashi Verma* (Great Plains Regional Center for NIGEC), *Don Wilhite* (National Drought Mitigation Center), *Ken Hubbard* (High Plains Regional Climate Center), *Don Rundquist* (Center for Advanced Land Management Information Technologies), *Kyle Hoagland* (Water Center)
- 10:30 AM Break
- 10:45 Meeting with SNR graduate students

Wednesday, Sept. 10 (continued) East Campus Union

11:45 AM Luncheon with SNR Advisory Committee, Associate Director, and Coordinators

1:15 PM Open meeting with SNR faculty

2:30 Depart for Embassy Suites (finalize draft report and dinner on their own)

Thursday, Sept. 11
East Campus Union

7:00 AM Breakfast on their own (finalize comments for exit reports)

8:15 Depart for East Campus

8:30 Review Team exit report to UNL administration

10:00 Break

10:15 Exit report to SNR faculty and staff

11:45 Break

12:00 PM Lunch with SNR Director et al.

PM departures to airport as needed

CHAPTER 1 - INTRODUCTION AND OVERVIEW

1.1 Historical Perspective

The formation of a broader natural resources unit has been discussed periodically by numerous committees, subcommittees, external review teams, and task forces, beginning in 1965. Indeed, many of the units merged to form the School of Natural Resources were included in a subcommittee report to the Board of Regents in 1980. Their recommendations included,

“Study the feasibility and advisability of establishing a School of Natural Resources within the Institute of Agriculture and Natural Resources to include: Conservation and Survey, Meteorology and Climatology, Forestry, Fisheries and Wildlife, Arboretum, Range Management, Hydrology, Environmental Programs, and possibly the Geology Department from the College of Arts and Sciences.”

After decades of discussion, debate, and recommendations, the **School of Natural Resources Sciences** (SNRS) was formed in 1997 by consolidation of the Department of Forestry, Fisheries and Wildlife, the Department of Agricultural Meteorology, a portion of the Conservation and Survey Division (including the Center for Advanced Land Management Information Technologies, or CALMIT), the UNL Water Center, and faculty from several other academic units, including the Department of Agronomy and Horticulture, the Department of Geosciences, and the School of Biological Sciences. The Nebraska Forest Service and the Nebraska Statewide Arboretum were identified as close affiliates of the new School. Thus, SNRS was formed by the merger of two long-standing units and faculty from several others, yet it did not include all of the units envisioned by the subcommittee report to the Regents in 1980 or by the SNRS Implementation Committee in 1996 (which essentially echoed the 1980 report).

SNRS represented a new model for academic units at UNL, because it was the first unit to be part of *both* the College of Arts and Sciences (CAS, located on City Campus) and the College of Agricultural Sciences and Natural Resources, which is part of the Institute of Agriculture and Natural Resources (IANR, located on East Campus). Thus, the Director of SNRS reported to four deans in two colleges, one in CAS and three in IANR (i.e. teaching, research and extension). In addition, SNRS was comprised of many faculty with *joint appointments* in SNRS and other academic units, as well as a large number of affiliated faculty with adjunct or courtesy appointments. A major goal of the School was to enhance the professional expertise of the faculty by facilitating programmatic interactions needed to address priority needs. In addition, SNRS was designed to foster partnerships and linkages with state and federal agencies. The broad vision of SNRS when it was formed was:

“The School will be a nationally prominent leader in academic, research, scholarly service and outreach programs in natural resource and environmental sciences. The School will have strong scientific programs to provide understanding of complex relationships and interactions within and among natural and managed ecosystems, will provide leadership in developing outstanding academic programs in natural resources and environmental sciences, and will develop integrated strategies to affect the social and economic processes. Thus, the School will serve the academic and scientific community, government agencies, resource managers, landowners, and the general public with timely and relevant information on the use and conservation of renewable and nonrenewable natural resources and on resource management opportunities and environmental challenges, particularly those in the Great Plains. Collaboration within and among disciplines will characterize the School’s programs.”

Since its inception in August 1997, the School underwent numerous important changes, including several changes in leadership, the Natural Resources Business Center [which provided business and administrative support to SNRS (and now SNR) and its affiliates] was centralized in a new location along with SNRS administrative offices, and the Water Center was transferred back out of the School in 2001.

The former head of the Department of Agricultural Meteorology, Dr. Blaine Blad, chaired the SNRS Implementation Committee and was the first Director of SNRS. The directorship was originally established for two years, but was extended to nearly three, including a national search for a new director. Dr. Ted Elliott, an ecosystem scientist, became Director in June 2000 and served until December 2001 when he went on medical leave. Ted passed away in June 2002 after battling cancer for over a year. Following an internal search, Dr. Kyle Hoagland became Acting and then Interim Director, from December 2001 to August 1, 2003.

The **School of Natural Resources (SNR)** was established on July 1, 2003 by the consolidation of the School of Natural Resource Sciences, the Conservation and Survey Division, and the Water Center. Programmatic opportunities and enhanced service to clientele groups were key elements in the decision to create a new unit. This merger was intended to leverage a history of collaboration at a time when administrative efficiencies and limited funding issues were critical, as they remain today. Integrating CSD with SNRS and the Water Center was a logical extension of a high level of formal and informal integration already in place through SNRS and fulfills most of the recommendation made in 1980. Following an internal search, Dr. Mark Kuzila, formerly Director of the Conservation and Survey Division, became Director of SNR on August 1, 2003 for a minimum of a three-year period. The faculty in SNR expressed their desire to IANR administration of having the option to conduct another national search for a new director, beginning in early 2005.

1.2 Previous Program Reviews

The most recent CSREES Comprehensive Reviews for the Department of Agricultural Meteorology (1995), Department of Forestry, Fisheries and Wildlife (1996), and Conservation and Survey Division (2001) are located in Appendix 1.1, 1.2, and 1.3, respectively. The unit responses to the review teams' principal recommendations are also included in these appendices. These reviews were generally positive and supportive, with recommendations on recurring issues such as space needs, new courses and degree programs, future faculty and support staff hires, research priority areas, infrastructure upgrades, and increased collaboration within the unit and with state and federal agencies.

1.3 Integration of SNRS, CSD, and Water Center

There were close working relationships among the personnel in the three units prior to their consolidation. These three units shared faculty through joint and courtesy appointments, joint research projects, and dual administrative duties (e.g., the Acting Director of the Water Center was also Associate Director of CSD). SNRS focused on the teaching, research and outreach missions of the university; CSD and the Water Center were units focusing primarily on research and scholarly service to clientele throughout Nebraska. Thus, the integration of these units is expected to result in a new unit that is stronger than each individually and one that will fully utilize their combined strengths to develop a more comprehensive natural resources program in all areas of academic and scholarly service. Thus, in the interest of elevating Natural Resources within IANR, the IANR Vice Chancellor decided that implementation of the recent integration of the three units would be in the best long-term interest for all involved. These units are considered to have high priority core programs within IANR, thus excellence in these areas is important to both the University and the State. A majority of faculties in the three units supported the integration in fall 2002.

The three units recently merged had missions that reflected a partial overlap in faculty scientific expertise and unit objectives, thus their integration is expected to be mutually complementary, enhancing teaching, research and outreach activities. Their individual missions were as follows:

SNRS: “To combine innovative interdisciplinary approaches with disciplinary excellence in the physical, biological and social sciences in order to: (1) foster an integrated, ecosystem approach to address complex natural resource and environmental issues; (2) provide a quality academic experience for students that prepares them to assume roles as natural resource scientists, managers and users during the 21st century; (3) provide relevant scientific information to stakeholders via innovative outreach and education programs, and; (4) nurture the development of a conservation ethic, which includes a responsible role for humans as components of ecosystems and stewards for natural resources.”

CSD: “To investigate and record information about Nebraska's geologic history, its rock and mineral resources, the quantity and quality of its water resources, land cover and other aspects of its geography, as well as the nature, distribution and uses of its soils.”

Water Center: “To develop and implement programs in water science associated with agriculture and natural resources.”

The SNR combined mission is clearly a hybrid of these mission statements, addressing teaching, research, outreach, and service missions that encompass all three units optimally. To illustrate the mutually complementary nature of this combined unit, SNRS outreach efforts are expected to be greatly enhanced by the merger with CSD and the Water Center because of their core missions, whereas CSD research-related activities should be expanded and improved by merging with SNRS. This was already apparent through joint appointments of CALMIT faculty (i.e. in CSD and SNRS), when the SNRS was first formed. Similarly, activity in all aspects of water sciences is expected to increase in all three units as a result of the merger. Additional synergistic interactions are also anticipated. For example, more team-taught courses in some areas, more interdisciplinary, large grant projects, and better coordination of natural resources information services are expected. Thus, all units involved should benefit relative to their previous strengths, rather than one or two being enhanced at the expense of another. For academic program enhancement and the potential expansion of natural resources course offerings, faculty with total or partial survey and scholarly service appointments in CSD have a greater opportunity to teach undergraduate and graduate courses under the broader mission of the new unit; likewise, extension faculty in SNRS have an excellent opportunity to work more closely with CSD faculty and Water Center personnel on delivering natural resources outreach programs.

We are also aware that an effective integration of these three units must occur at the individual level as well for the consolidation to be successful. Thus, we have planned an annual research colloquium and social events throughout the year to increase the opportunities for personnel interaction and discussion. In addition, faculty *and* staff meetings are now often combined on a monthly basis, to enhance interactions with staff, and to keep them informed and included in the decision-making process.

1.4 Our Long-term Vision for the School of Natural Resources

The recently integrated unit, SNR, addresses the IANR Strategic Plan (2000-2008) program theme, “Improve Natural Resource Management and Enhance Environmental Quality” by: (a) placing high priority on water and mineral resources programs; (b) augmenting the understanding, management, and stewardship of Nebraska’s soil and range land resources; (c) supporting programs on geographic information systems (GIS) and natural resource data base activities; (d) supporting programs on global climate and environmental change; and (e) enhancing Nebraska’s woodlands, wildlife, fisheries, and other aquatic resources through research, education, and service programs.

Key contributions by SNR to crucial ecological, agricultural, and human dimensions issues facing the State, the nation, and the world are reflected in our seven program areas:

Biological Systems - conservation biology of plants and animals; agroforestry and shelterbelt ecology; riparian ecology; prevention of non-point pollution of rivers; wildlife ecology; and fisheries science;

Climate and Bio-atmospheric Systems - impacts of global environmental change; carbon sequestration; climate and drought monitoring; severe weather; micrometeorology; environmental biophysics;

Earth Resources - soil science; microbiological systems; geological studies; cycling of natural and human-made chemicals; and soil restoration;

Ecosystems - encompassing all of the above and including the specialization areas of agro-ecosystems, grassland ecology and management, woodland habitats, landscape ecology, carbon sequestration, climate change, riparian systems, aquatic systems, and urban habitats;

Geospatial Information - remote sensing/GIS; geospatial analysis of cultural and natural resources; global positioning systems; and natural systems simulation;

Human Dimensions - natural resource management, planning, law, and economics; drought mitigation; human-wildlife conflicts; and rural sustainability; this is a newly emerging area within the current School, and one that we anticipate will grow significantly in SNR;

Water Resources - water quality/chemistry; ground/surface water systems and their modelling; water chemistry and analysis; wetlands and lake ecology; and soil moisture;

Thus, we view our new mission as broader than in any of the individual, pre-merged units, and one that offers a plethora of new opportunities in research, teaching, extension/outreach, and survey. Natural resources programs have been elevated within IANR to unprecedented levels in the history of this land-grant institution. With the pending new Natural Resources building, we envision even greater things. Our new vision and mission for the School of Natural Resources are:

SNR Vision - The School of Natural Resources will be an international leader in natural resources education, research, and outreach. The School will also be the primary provider of natural resources information and service to the citizens and stakeholders of Nebraska.

SNR Mission - The School of Natural Resources will combine interdisciplinary approaches and disciplinary excellence to:

- foster an integrated, systems approach to address complex natural resource, environmental and human issues;
- provide a quality academic experience for students;
- conduct fundamental research of the mechanisms associated with natural resource systems;
- provide innovative outreach to citizens and stakeholders;
- investigate, record, and disseminate information about Nebraska's earth, water, atmospheric and biological resources; and
- promote a comprehensive conservation ethic for the effective and appropriate management and sustainable utilization of natural resources.

1.5 Format and Content of Review Document

This report is arranged by functional groupings (teaching, research, extension/outreach, and survey) rather than sub-discipline, reflecting our philosophy of integration instead of mini-departments. Based on prior reviews in departments ultimately merged to form SNR, as well as more recent reviews of other units in IANR, we have provided documentation to facilitate this review, nevertheless we would be happy to provide other information deemed necessary by the Review Team. In addition, we have included open time periods in the review schedule to facilitate meetings with individuals and/or groups not part of the set schedule, at the Review Team's discretion.

CHAPTER 2 - ADMINISTRATION AND STRUCTURE

2.1 Introduction

The School of Natural Resources (SNR) was formed on July 1, 2003 by merging the School of Natural Resource Sciences (SNRS), the Conservation and Survey Division (CSD), and the Water Center, three parts of the University of Nebraska's Institute of Agriculture and Natural Resources (IANR) and the College of Arts & Sciences (CAS), into a single administrative unit. This formation of SNR will enhance both academic programs and service to clientele groups. It capitalized on a history of collaboration among these units and is a logical extension of much existing informal integration.

2.1.1 Institutional Setting

The University of Nebraska is a system consisting of four components - the University of Nebraska-Lincoln (UNL), the University of Nebraska at Omaha (UNO), the University of Nebraska at Kearney (UNK), and the University of Nebraska Medical Center (UNMC), located in Omaha. A chart representing the organization of the University of Nebraska is presented in Fig. 2-1. The University of Nebraska system is governed by a board of regents that is elected from eight districts in the state. The chief executive officer of the system is the president. Each of the four components in the system is headed by a chancellor.

2.1.2 University of Nebraska-Lincoln

UNL is the flagship campus of the University of Nebraska system, serving both as the land-grant and comprehensive public university of the state. A member of the American Association of Universities (AAU), UNL is the primary research and doctoral degree granting university in the system for all fields statewide basis through the College of Architecture, the College of Arts and Sciences, the College of Business Administration, the College of Engineering and Technology, the College of Fine and Performing Arts, the College of Human Resources and Family Sciences, the College of Journalism and Mass Communications, the College of Law, the Teachers College, the system-wide Graduate College, and the Institute of Agriculture and Natural Resources. UNL enrollment during the fall 2002 semester was 22,988 students, of which 4,380 were enrolled in the Graduate College of Law.

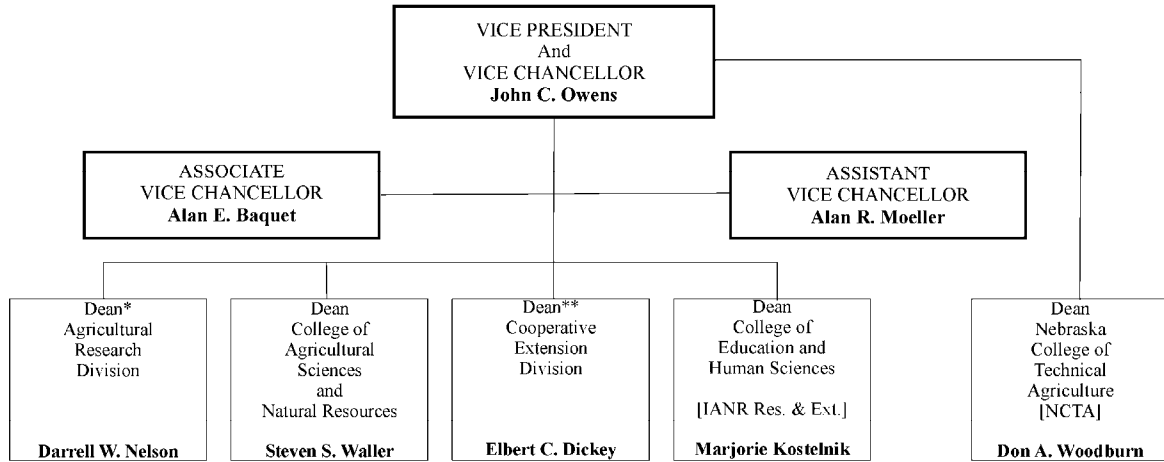
2.1.3 Institute of Agriculture and Natural Resources

The Institute of Agriculture and Natural Resources (IANR) is a semi-autonomous component of UNL headed by a vice chancellor, who also serves as a vice president of the University of Nebraska system, as do the chancellors of UNL, UNO, UNK, and UNMC (see Fig. 2-1 - UN Structure). The administrative structure of IANR is represented by Fig. 2-2. Three IANR divisions of major importance to SNR are College of Agriculture Sciences and Natural Resources (CASNR), the Agricultural Research Division (ARD), and the Cooperative Extension Division (CED). SNR is one of 15 academic units within IANR, each of which is administered by a leader who reports to the deans of CASNR, ARD, and CED for the respective teaching, research, and extension programs of the unit. A substantial portion of IANR's research and outreach activities are based at four research and extension centers (Fig. 2-3).

2.1.4 College of Arts & Sciences

The College of Arts & Sciences (CAS) is headed by a Dean (Richard Hoffmann), who reports primarily to the Senior Vice Chancellor for Academic Affairs (Richard Edwards), and three Associate Deans. The CAS is comprised of 17 departments, schools, institutes, and centers, with approximately 370 faculty.

ORGANIZATIONAL CHART
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA



* Director of Agricultural Experiment Station
**Director of Cooperative Extension

IANR ADMINISTRATIVE UNITS

AGRICULTURAL & NATURAL RESOURCES
ACADEMIC DEPARTMENTS
AGRICULTURAL ECONOMICS
Richard T. Clark
AGRICULTURAL LEADERSHIP
EDUCATION AND COMMUNICATION
Susan M. Fritz
AGRONOMY AND HORTICULTURE
Kenneth G. Cassman
ANIMAL SCIENCE
Donald H. Beermann
BIOCHEMISTRY
Donald Weeks
BIOLOGICAL SYSTEMS ENGINEERING
Glenn J. Hoffman, Interim
STATISTICS (formerly Biometry)
Walter W. Stroup
ENTOMOLOGY
Z. B. Mayo
FOOD SCIENCE AND TECHNOLOGY
Stephen L. Taylor
PLANT PATHOLOGY
Anne K. Vidaver
SCHOOL OF NATURAL RESOURCES
Kyle Hoagland/Mark Kuzila
VETERINARY AND BIOMEDICAL SCIENCES
John A. Schmitz

EDUCATION AND HUMAN RESOURCES
ACADEMIC DEPARTMENTS
FAMILY AND CONSUMER SCIENCES
Julie M. Johnson
NUTRITIONAL SCIENCE AND DIETETICS
Marilynn Schnepf
TEXTILES, CLOTHING AND DESIGN
Carol Thayer, Acting

DISTRICT CENTERS
NORTHEAST RESEARCH AND EXTENSION CENTER - Norfolk
John F. Witkowski
PANHANDLE RESEARCH AND EXTENSION CENTER - Scottsbluff
Charles A. Hibberd
SOUTH CENTRAL AGRICULTURE LABORATORY - Clay Center
Fred Roeth, Coordinator
SOUTHEAST RESEARCH AND EXTENSION CENTER - LINCOLN
Susan N. Williams, Interim
WEST CENTRAL RESEARCH AND EXTENSION CENTER - North Platte
Gary W. Hergert

IANR PROGRAM UNITS
COMMUNICATIONS AND INFORMATION TECHNOLOGY
Dan C. Cotton
4-H YOUTH DEVELOPMENT
Beth Birnstihl
NEBRASKA FOREST SERVICE
Gary L. Hergenrader
NEBRASKA STATEWIDE ARBORETUM
James H. Locklear

INTERDISCIPLINARY CENTERS
AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER - Ithaca
Daniel J. Duncan
CENTER FOR ADVANCED LAND MANAGEMENT INFORMATION TECHNOLOGIES (CALMIT)
Donald C. Rundquist
CENTER FOR APPLIED RURAL INNOVATION
John C. Allen
CENTER FOR BIOLOGICAL CHEMISTRY
Donald Weeks
CENTER FOR BIOTECHNOLOGY
Michael Fromm
CENTER FOR GRASSLAND STUDIES
Martin A. Massengale
FOOD PROCESSING CENTER
Stephen L. Taylor
GREAT PLAINS REGIONAL CENTER FOR GLOBAL ENVIRONMENTAL CHANGE
Shashi B. Verma
GREAT PLAINS VETERINARY EDUCATIONAL CENTER - Clay Center
Gary P. Rupp
INDUSTRIAL AGRICULTURAL PRODUCTS CENTER
Milford A. Hanna
NEBRASKA LEAD PROGRAM
Allen G. Blezek
WATER CENTER
Michael Jess, Acting Director
NEBRASKA RURAL INITIATIVE
Sandra K. Scofield

1-Jul-03

Figure 2-2. IANR Org. Chart

2.2 SNR Internal Administration

Fig. 2-4 represents the administrative structure of SNR. The unit is administered by the SNR Director who reports to three IANR deans, the dean of the College of Agricultural Sciences and Natural Resources (CASNR), the dean and Director of the Agricultural Research Division (ARD), and the dean and director of the Cooperative Extension Division (CED). The majority of SNR activities are within IANR, however a small part is affiliated with of the College of Arts and Sciences (CAS) so the Director also reports to the dean of that college. The SNR Director also has direct access to the IANR Vice Chancellor.

The SNR Director is assisted by two associate directors, they are the Associate Director for Teaching and Research and the Associate Director for Extension, Outreach, Survey and Information Services. *The Associate Directors are responsible for assisting and advising the Director. They do not supervise the faculty.* The manager and staff of the Natural Resources Business Center assist the SNR Administration and faculty with personnel and financial issues in support of SNR.

Five faculty members serve as coordinators for the Teaching, Research, Extension, Survey and Information Services programs. The coordinators are responsible for assisting the SNR Director in implementing specific tasks and programs, and for working with the Associate Directors and Director to ensure that all missions of SNR are coordinated.

2.2.1 SNR Faculty and Staff

A complete list of the SNR faculty and staff are provided in Appendix 2.1 and 2.2, respectively. The table lists faculty and staff by area of interest and identifies their FTE distribution. SNR is a large interdisciplinary unit which presently counts a total of 74 faculty and 89 staff. SNR is one of the largest academic units in IANR.

2.2.2. External Advisory Committee

Discussions are currently underway to form an External Advisory Committee for Natural Resources. The School intends to make this one of its top priorities over the next six months, with the aim of creating a committee with advisory, advocacy, and resource acquisition roles, similar to advocacy groups already in place for agriculture. Our aim is to provide a stronger voice for natural resources issues at the state and local levels.

2.2.3 Policies Regarding the Operation of the Unit

SNR policies, procedures, and committee structure are described in the “Bylaws and Operating Procedures of the School of Natural Resources”, a draft of which is included in Appendix 2.3. A special committee made up of faculty and staff is currently developing these documents as a result of the recent merger. Some of the more important policies and procedures involving faculty members are described in the following paragraphs.

Figure 2-4 SNR Administrative Structure

2.2.4 Performance Appraisal

The performance of individual faculty members is evaluated annually by the SNR Director based on the faculty member's completion of an Annual Report of Faculty Accomplishments (ARFA). The IANR guidelines for preparing ARFAs and a copy of the IANR performance evaluation form are included in Appendix 2.4. ARFAs are submitted to the director in mid-November. The director reviews the ARFAs and completes faculty evaluations by mid-December. Based on information obtained from the ARFAs, the SNR Administration develops an annual report of accomplishments and impacts for the past year and goals for the future. The annual report is reviewed by the SNR faculty. An annual unit planning and evaluation session is held sometime between January and March. At the unit planning and evaluation session, IANR administration and the director discuss the unit's accomplishments and impacts for the past year and its goals for the future, and the CASNR, ARD, and CED deans review the performance of individual faculty members with the director. Subsequent to the unit planning and evaluation session, an individual session is scheduled for each faculty member. At that session, the faculty member and the director review the faculty member's performance and future plans. These sessions are usually scheduled for February and March and typically last one hour.

Faculty members are given the opportunity to individually evaluate the director in December after the director distributes an Annual Report of Administrator Accomplishments. A summary of the faculty evaluations of the head is compiled by IANR and used as input for the deans' evaluations of the head and as the basis for an evaluation session conducted by the unit's promotion and tenure committee. Annual performance evaluations of managerial/professional and office/service staff members are conducted by their respective supervisors and reviewed by the SNR Administration.

2.2.5 Faculty Salary Determination

Annual faculty salary adjustments are set primarily according to merit, based on the annual performance evaluations and subject to guidelines established by UNL and IANR. Although most of the funds available for determining salary adjustments are assigned to the unit for allocation by the director, significant amounts are retained for allocation by the deans and by the vice chancellor. Funds from the deans' pool are allocated to individual faculty members on the basis of exceptional merit or to address salary compression, salary inequities, market considerations, and retention issues. Special consideration is given to the issue of gender inequities according to Board of Regents guidelines. Funds from the vice chancellor's pool are allocated to individual faculty members according to their performance as it related to the quality of the administrative unit, its accomplishments, and its impacts.

2.2.6 Promotion and Tenure

According to UNL guidelines for promotion and tenure, the time-in-rank as an assistant professor necessary for promotion to associate professor ordinarily is at least five years and typically is six years. Promotion to professor normally requires a minimum of seven years as an associate professor. The timetable for tenure generally is specified in an individual's original letter of offer. Although an individual usually is considered for tenure after five years, timing of the tenure decision depends on the initial appointment date and prior experience at other academic institutions. Both early promotion and tenure may be considered in exceptional circumstance.

IANR guidelines specify that the unit promotion and tenure committee and the unit leader should provide annual written feedback to each faculty member regarding the faculty member's progress toward tenure and the faculty member's progress toward promotion through the sixth year. The guidelines also specify that written feedback regarding progress toward promotion should be provided at least once every three years for faculty members who are tenured but not fully promoted. It has been the unit's practice to

provide such feedback every year. The promotion and tenure committee and the director are also responsible for recommending annual reappointment for those faculty members who do not hold tenure or who hold special appointment.

2.3 Public Relations

SNR combines marketing and publicity assets and goals of the former School of Natural Resource Sciences, Conservation and Survey Division, and Water Center. This effort includes 2.0 FTE communicators working closely with UNL's Communications and Information Technologies (CIT) and other established UNL communications functions and offices. SNR publicity, marketing, and outreach functions cover print, internet, electronic and broadcast mediums, scholarly and general audience publishing, and conferences, conventions, tours, forums workshops, and seminars. The SNR website is located at <http://snr.unl.edu> .

SNR communicators currently include one from the Water Center and one from the Conservation and Survey Division. Their now combined efforts are guided in-part by an Outreach Committee, which is also studying marketing, publicity, and student recruitment strategies. Current marketing and publicity efforts are focused on the following areas:

- Establishing an identity for the new SNR.
- Increasing visibility of the SNR's value and contributions to the University and the State.
- Increasing the number and quality of undergraduate and graduate students in the natural resources disciplines.
- Publicizing how faculty and staff accomplishments contribute to continued development of the State and protection of its natural resources.
- Promoting wise stewardship of state funds.
- Increasing external stakeholder support and awareness for the SNR.
- Improving support resources and infrastructure for engaging marketing and outreach efforts.
- Increasing the knowledge of and support for the new SNR by University administration, the public, the business community and others.
- Increase awareness among alumni of natural resources disciplines and attract and highlight donors and donations.

APPENDIX 2.1

**School of Natural Resources Faculty and Their General Areas of Interest
(FY03 Adjusted Budget)**

| Faculty, Rank/Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Admin | Soft Funded |
|--|-------------------------------|------------|-------------|------------------------|-------------|-------|---------------|
| FORESTRY | | | | | | | |
| Dennis Adams, Rural Forester | .25 SNRS .75 NFS | | | .25 | | | .25 E |
| Scott DeWald, Assoc. Forester | .25 SNRS .75 NFS | | | .25 | | | |
| Mark Harrell, Forester | .25 SNRS .75 NFS | | .25 | | | | |
| Gary Hergenrader, State Forester & Professor | .30 SNRS .70 NFS | .10 | .10 | .10 | | | |
| Scott Josiah, Asst. Professor | 1.00 SNRS | | .25 | .75 | | | |
| Steve Karloff, Assoc. Forester | .25 SNRS .75 NFS | | | .25 | | | |
| H. Doak Nickerson, Assoc. Forester | .25 SNRS .75 NFS | | | .25 | | | |
| Steve Rasmussen, Dist/Ext. For; Professor | .25 SNRS .75 NFS | | | .25 | | | |
| T.B.A. (Formerly Jon Wilson), Forester | .25 SNRS .75 NFS | | | .25 | | | |
| SUBTOTALS | SNRS 3.05 NFS 5.95 | .10 | 0.60 | 2.35 | | | 0.25 E |
| GEOLOGY | | | | | | | |
| Marvin Carlson, Professor | 1.00 CSD | | | | 1.00 | | |
| Robert Diffendal, Professor | 1.00 CSD | | | | 1.00 | | |
| Duane Eversoll, Professor | 1.00 CSD | | | | 1.00 | | |
| Robert M. Joeckel, Asst. Professor | 1.00 CSD | | | | 1.00 | | |
| Joseph Mason, Asst. Professor | .75 CSD .25 GEOS | | | | 0.75 | | |
| Roger Pabian, Professor | 1.00 CSD | | | | 1.00 | | |
| James Swinehart, Professor | .85 CSD .15 GEOS | | | | 0.85 | | |
| Perry Wigley, Professor | 0.60 CSD | | | | 0.60 | | |
| SUBTOTALS | 7.20CSD 0.40GEOS | | | | 7.20 | | |

| Faculty, Rank/Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Admin | Soft Funded |
|---|---|-------------|-------------|------------------------|-------------|-------------|-----------------------------------|
| GRASSLAND AND AGRO-ECOLOGY | | | | | | | |
| Tala Awada, Asst. Professor (AY appt) | 1.00 SNRS | .20 | .80 | | | | |
| Jim Brandle, Professor | 1.00 SNRS | .30 | .70 | | | | .29 R |
| Geoffrey Henebry, Rsrch. Assoc. Professor | .60 SNRS .40 CSD | .20 | | | .80 | | .20 T .80 S |
| Johannes Knops, Asst. Professor (AY appt) | .20 SNRS-CAS .80 SBS | .20 | | | | | |
| Dave Wedin, Assoc. Professor | 1.00 SNRS | .40 | .60 | | | | |
| Xinhua Zhou, Rsrch. Asst. Professor (AY appt) | 1.00 SNRS | | 1.00 | | | | 1.00 R |
| SUBTOTALS | 0.40CSD .20 SNRS-CAS 4.60 SNRS 0.80SBS | 1.30 | 3.10 | | 0.80 | | .20 T 1.29 R .80 S |
| METEOROLOGY/CLIMATOLOGY | | | | | | | |
| Kenneth Dewey, Professor (AY appt) | .60 SNRS-CAS .40 GEOS | | .15 | .45 | | | |
| Michael Hayes, Rsrch. Assoc. Professor | 1.00 SNRS | | 1.00 | | | | 1.00 R |
| Qi (Steve) Hu, Assoc. Professor | 1.00 SNRS | .10 | .55 | .35 | | | |
| Ken Hubbard, Professor; Director, HPRCC | 1.00 SNRS | .10 | .70 | .20 | | | .03 R |
| Xiaomao Lin, Rsrch. Asst. Professor (AY appt) | 1.00 SNRS | | .80 | .20 | | | .80 R .20 E |
| Andrew Suyker, PD Rsrch. Assoc. | 1.00 SNRS | | 1.00 | | | | 1.00 R |
| Tsegaye Tadesse, PD Rsrch. Assoc. | 1.00 SNRS | | 1.00 | | | | 1.00 R |
| Shashi Verma, Professor; Director, GPRC | 1.00 SNRS | .15 | .85 | | | | |
| Elizabeth Walter-Shea, Professor & Teaching Coordinator | 1.00 SNRS | .35 | .65 | | | | |
| Albert Weiss, Professor | 1.00 SNRS | .15 | .85 | | | | |
| Don Wilhite, Professor; Director, IDIC & NDMC; Associate Director ¹ , SNRS | 1.00 SNRS | .10 | .65 | | | .25 | .03 R |
| SUBTOTALS | SNRS-CAS .60 SNRS 10.00 GEOS 0.40 | 0.95 | 8.20 | 1.20 | | 0.25 | 3.86 R 0.20 E |
| REMOTE SENSING/GIS | | | | | | | |
| Anatoly Gitelson, Professor | .50 SNRS .25 CSD | | .50 | | .25 | | |

| Faculty, Rank/Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Admin | Soft Funded |
|---|--|-------------|-------------|---------------------|-------------|-------------|---------------|
| | .25 GEOS | | | | | | |
| James Merchant, Professor | .40 SNRS .60 CSD | | .40 | | .60 | | |
| Sunil Narumalani, Assoc. Professor (AY appt) | .60 SNRS-CAS .40 CSD | .30 | .30 | | .40 | | |
| Rick Perk, Asst. Geoscientist | 1.00 CSD | | | | 1.00 | | 1.00 S |
| Al Peters, Assoc. Geoscientist | .80 CSD | | | | .80 | | .80 S |
| Don Rundquist, Professor; Director, CALMIT | .60 SNRS .40 CSD | .35 | .25 | | .40 | | |
| SUBTOTALS | CSD 3.45 SNRS 1.50 SNRS-CAS .60 GEOS 0.25 | 0.65 | 1.45 | | 3.45 | | 1.80 S |
| SOIL SCIENCE | | | | | | | |
| Francis Belohlavy, Instructor | 1.00 CSD | | | | 1.00 | | 1.00 S |
| Steve Comfort, Assoc. Professor | 1.00 SNRS | .10 | .75 | .15 | | | |
| Stephen Hartung, Instructor | 1.00 CSD | | | | 1.00 | | 1.00 S |
| Mark Kuzila, Professor and <i>Director</i> ² | 1.00 CSD | | | | | 1.00 | |
| Hannan LaGarry, Geoscientist | 1.00 CSD | | | | 1.00 | | 1.00 S |
| Patrick Shea, Professor | 1.00 SNRS | .10 | .80 | .10 | | | |
| Joe Skopp, Assoc. Professor | 1.00 SNRS | .50 | .50 | | | | |
| Phillip Young, Instructor | 1.00 CSD | | | | 1.00 | | 1.00 S |
| Bill Zanner, Asst. Professor | .90 SNRS .10 CSD | .30 | .60 | | .10 | | |
| SUBTOTALS | CSD 5.10 SNRS 3.90 | 1.00 | 2.65 | 0.25 | 4.10 | 1.00 | 4.00 S |
| WATER | | | | | | | |
| Jerry Ayers, Assoc. Professor | .25 SNRS-CAS .15 SNRS | .25 | .15 | | .60 | | |

| Faculty, Rank/Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Admin | Soft Funded |
|--|--|-------------|-------------|---------------------|-------------|-------------|-------------------------|
| | .60 CSD | | | | | | |
| Mark Burbach, Asst. Geoscientist | 1.00 CSD | | | | 1.00 | | |
| Xun-Hong Chen, Assoc. Professor | .33 SNRS .67 CSD | .08 | .08 | .17 | .67 | | |
| James Goeke, Professor | 1.00 CSD | | | | 1.00 | | |
| David Gosselin, Professor | .75 SNRS .25 CSD | .10 | .65 | | .25 | | |
| F. Edwin Harvey, Assoc. Professor | .75 SNRS .25 CSD | .20 | .55 | | .25 | | |
| Kyle Hoagland, Professor & <i>Interim Director</i> ¹ , SNRS | .50 SNRS .50 WC | .12 | .28 | | | .60 | |
| John Holz, Rsrch. Asst. Professor | 1.00 SNRS | .15 | .50 | .35 | | | .10 E .50 R |
| Michael Jess, Senior Lecturer; <i>Acting Dir.</i> , WC ³ ; <i>Associate Dir.</i> ² , CSD | .30 SNRS .70 CSD | | | .30 | .20 | .50 | |
| Susan Lackey, Geoscientist | 1.00 CSD | | | | 1.00 | | |
| James Parham, PD. Rsrch. Assoc. | 1.00 SNRS | | 1.00 | | | | 1.00 R |
| Edward Peters, Professor | 1.00 SNRS | .75 | .25 | | | | |
| Steve Sibray, Assoc. Geoscientist | 1.00 CSD | | | | 1.00 | | |
| Daniel D. Snow, Rsrch. Asst. Professor, Water Science Lab, Water Center | 1.00 WC | | 1.00 | | | | 1.00 R |
| Mary Spalding, Professor | 1.00 SNRS | | 1.00 | | | | |
| Scott Summerside, Assoc. Geoscientist | 1.00 CSD | | | | 1.00 | | |
| Jozsef Szilagyi, Assoc. Professor | 1.00 CSD | | | | 1.00 | | |
| SUBTOTALS | 8.47 CSD .25 SNRS-CAS 6.78 SNRS 1.50 WC | 1.65 | 5.46 | .82 | 7.97 | 1.10 | 2.50 R .10 E |
| WILDLIFE | | | | | | | |
| Patricia Freeman, Professor | 1.00 CSD | .25 | .75 | | | | |
| Scott Hygnstrom, Professor | 1.00 SNRS | .30 | | .70 | | | .35 E |
| Ron Johnson, Professor & Extension/Outreach Coordinator | 1.00 SNRS | | .31 | .69 | | | |
| Larkin A. Powell, Asst. Professor | 1.00 SNRS | .60 | .40 | | | | |
| Brigitte Tenhumberg, Rsrch. Asst. Prof. | 0.50 SNRS | | .50 | | | | 0.50 R |
| Andrew J. Tyre, Asst. Professor | 1.00 SNRS | .40 | .60 | | | | |
| SUBTOTALS | SNRS 5.50 CSD 1.00 | 1.55 | 2.56 | 1.39 | | | .50 R .35 E |
| OTHER | | | | | | | |
| Robert Kuzelka, Assoc. Professor; | | .35 | .30 | .35 | | | |

| Faculty, Rank/Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Admin | Soft Funded |
|---|--|-------------|--------------|---------------------|--------------|-------------|---|
| Director, Environmental Studies Prog. | 1.00 SNRS | | | | | | |
| Karl Reinhard, Assoc. Professor (AY appt) | 1.00 SNRS-CAS | .25 | .60 | .15 | | | |
| SUBTOTALS | 1.00 SNRS-CAS 1.00 SNRS | 0.60 | 0.90 | 0.50 | | | |
| TOTALS | 24.62 CSD 36.23 SNRS 2.05 SNRS-CAS 1.50 WC <u>65.10</u> 1.05 GEOS 5.95 NFS <u>0.80 SBS</u> 7.80 <u>72.90</u> | 7.80 | 24.92 | 6.51 | 23.52 | 2.35 | .20 T 8.15 R .90 E <u>6.60 S</u> 15.85 |
| Subtotal FTE | | | | | | | |
| TOTAL FTE | | | | | | | |

¹ SNRS Administrative FTE: 0.60 for the Director and 0.25 for the Associate Director.

Director and Associate Director currently held by Hoagland and Willhite, respectively, on a temporary basis.

² CSD Administrative FTE: 1.00 for the Director and .50 for the Associate Director.

³ WC Administrative FTE: 0.50 for the Director and no admin FTE for Associate or Assistant Director.

***Codes for Acronyms Used:**

- SNRS = School of Natural Resource Sciences
- CALMIT = Center for Advanced Land Management Information Technologies, CSD
- CLAS = Center for Laser Analytical Studies of Trace Gas Dynamics
- CSD = Conservation and Survey Division
- ESP = Environmental Studies Program
- GEOS = Geosciences
- GPRC = Great Plains Regional Center of the National Institute for Global Environmental Change
- HPRCC = High Plains Regional Climate Center
- IDIC = International Drought Information Center
- NDMC = National Drought Mitigation Center
- NFS = Nebraska Forest Service
- SBS = School of Biological Sciences
- WC = Water Center

APPENDIX 2.2

**School of Natural Resources Managerial/Professional and Office/Service Staff
by Faculty Areas of Interest
(Based on FY03 Adjusted Budget)**

| Name, Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Soft Funding |
|--|-------------------------------|-----------------|-----------------|--------------------------------|---------------|---------------------|
| FORESTRY | | | | | | |
| Heidi Brott, Forestry Technician | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Christine Meyer, Natural Resources Information & Education Assistant | .30 SNRS .20 NFS | | | 0.30 | | |
| SUBTOTALS | SNRS 1.30 NFS 0.20 | | 1.00 | 0.30 | | 1.00 R |
| GEOLOGY | | | | | | |
| Leigh Anne LaGarry, Field Research Coord. | 0.50 CSD | | | | 0.50 | .50 S |
| SUBTOTALS | CSD 0.50 | | | | 0.50 | 0.50 S |
| GRASSLAND AND AGRO-ECOLOGY | | | | | | |
| Bruce Bolander, Manager | .20 SNRS 0.80 NFS | | 0.20 | | | .20 R |
| Mike Cieslik, Ag Research Technician | 1.00 SNRS | | 1.00 | | | 1.00 R |
| SUBTOTALS | SNRS 1.20 NFS 0.80 | | 1.20 | | | 1.20 R |
| METEOROLOGY/CLIMATOLOGY | | | | | | |
| George Burba, Research Technologist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Ed Cunningham, Electronic Technician | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Allen Dutcher, State Climatologist | 1.00 SNRS | | 1.00 | | | |
| Song Feng, Research Specialist | 1.00 SNRS | | 1.00 | | | .50 R |
| Ann Fiedler, Staff Secretary | 0.50 SNRS | | 0.50 | | | .50 R |
| Brian Fuchs, Climate Data Specialist | 1.00 SNRS | | 0.09 | 0.91 | | .09 R .91 E |
| Shellie Hanneman, Clerical Assistant | 1.00 SNRS | | | 1.00 | | 1.00 E |
| Cindy Hays, Research Specialist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Kim Klemsz, Web Programming Assistant | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Sebastien Korner, Systems Manager | 1.00 SNRS | | | 1.00 | | 1.00 E |
| Mark Mesarch, Research/Outreach Specialist | 1.00 SNRS | | 1.00 | | | .15 R |
| Lorna Pleasant, Project Assistant | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Glen Roebke, Electronic Technician | 1.00 SNRS | | | 1.00 | | 1.00 E |
| Todd Schimelfenig, Research Technologist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Jan Schinstock, Administrative Coordinator | 0.50 SNRS | | 0.50 | | | .50 R |
| Bill Sorensen, Software Dev. Specialist | 1.00 SNRS | | 0.15 | 0.85 | | .85 E |
| Mark Svoboda, Climatologist | 1.00 SNRS | | 1.00 | | | 1.00 R |

| Name, Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Soft Funding |
|---|-------------------------------|----------|--------------|---------------------|--------------|--------------------------|
| Deb Wood, Publications Specialist | 1.00 SNRS | | 1.00 | | | .35 R |
| SUBTOTALS | SNRS 17.00 | | 12.24 | 4.76 | | 9.09 R 4.76 E |
| REMOTE SENSING/GIS | | | | | | |
| Jeff Arnold, Operations Manager | 1.00 CSD | | | | 1.00 | 0.50 S |
| Michael Anthofer, Computer Technician | 0.50 CSD | | | | 0.50 | 0.50 S |
| Chad Boshart, Research Specialist | 1.00 CSD | | | | 1.00 | 1.00 S |
| Chris Chalmers, Research Specialist | 1.00 CSD | | | | 1.00 | 1.00 S |
| Patti Dappen, Research Specialist | 1.00 CSD | | | | 1.00 | 1.00 S |
| Bernice Goemann, Clerical Assistant | 1.00 CSD | | | | 1.00 | .64 S |
| Amanda Holland, Research Specialist | 1.00 CSD | | | | 1.00 | 1.00 S |
| Galina Keydan, Research Analyst | 1.00 CSD | | | | 1.00 | 1.00 S |
| Bryan Leavitt, Research Specialist | 1.00 CSD | | | | 1.00 | 1.00 S |
| Brian Putz, Research Specialist | 1.00 CSD | | | | 1.00 | 1.00 S |
| Donna Stadig, Clerical Assistant | .50 CSD | | | | 0.50 | 0.50 S |
| Milda Vaitkus, Research Coordinator | 1.00 CSD | | | | 1.00 | 1.00 S |
| SUBTOTALS | CSD 11.00 | | | | 11.00 | 10.14 S |
| SOIL SCIENCE | | | | | | |
| Tom Machacek, Research Technologist | 1.00 SNRS | | 0.75 | 0.25 | | |
| Tom Schickel, Hydrogeologic Specialist | 1.00 CSD | | | | 1.00 | |
| Wally Troyer, Research Technologist | 0.50 SNRS | | 0.50 | | | |
| Denise Wally, Research Technologist | 1.00 SNRS | | 1.00 | | | .50 R |
| SUBTOTALS | CSD 1.00 SNRS 2.50 | | 2.25 | 0.25 | 1.00 | 0.50 R |
| WATER | | | | | | |
| Tadd Barrow, Water Resources Specialist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Dave Cassada, Separations Chemist | 1.00 WC | | 1.00 | | | 1.00 R |
| Hilary Hansen, Research Technician | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Ben Harris, Water Resources Specialist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Mike Kaminski, Research Technologist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Roger Ladd, Research Technician | 1.00 WC | | 1.00 | | | 1.00 R |
| Jerry Leach, Research Technician | 1.00 CSD | | | | 1.00 | |
| Glen Martin, Stable Isotope Chemist | 1.00 WC | | 1.00 | | | 1.00 R |
| Steve Monson, Research Technologist | 1.00 WC | | 1.00 | | | 1.00 R |
| Jason Olnes, Research Technician | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Cory Reade, Research Technologist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Ryan Ruskamp, Research Technician | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Melba Stemm, Clerical Assistant | .50 CSD | | | | .50 | |

| Name, Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Soft Funding |
|--|---|----------|--------------|---------------------|-------------|--------------------------|
| Cynthia Taylor, Research Analyst | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Larry Vrtiska, Research Technologist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Kelli Warren, Research Technologist | 1.00 WC | | 1.00 | | | 1.00 R |
| SUBTOTALS | CSD 1.50 SNRS 9.00 WC 5.00 | | 14.00 | | 1.50 | 14.00 R |
| WILDLIFE | | | | | | |
| Renaë Held, Coordinator Tern & Plover Conservation Partnership | 1.00 SNRS | | | 1.00 | | 1.00 E |
| Jeanine Lackey, Extension Specialist | 1.00 SNRS | | | 1.00 | | 1.00 E |
| Christine Meyer, Natural Resources Information & Education Assistant | .30 SNRS .20 NFS | | | 0.30 | | |
| Chris Thody, Coordinator Wildlife Conservation Outreach | 1.00 SNRS | | | 1.00 | | 1.00 E |
| Susan Traylor, Research Technologist | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Dallas Virchow, Coordinator Wildlife Damage Management | 1.00 SNRS | | | 1.00 | | 1.00 E |
| SUBTOTALS | SNRS 5.30 NFS .20 | | 1.00 | 4.30 | | 4.00 E 1.00 R |
| OTHER | | | | | | |
| Elaine Connelly, Staff Secretary | 1.00 SNRS | | 0.80 | 0.20 | | |
| Dee Ebbeka, Cartographer | 0.75 CSD | | | | 0.75 | |
| Charlie Flowerday, Editor | 1.00 CSD | | | | 1.00 | |
| Jolene Foster, Clerical Assistant | 1.00 CSD | | | | 1.00 | .75 S |
| Jim Hines, Information Technology Manager | 1.00 SNRS | | 0.90 | 0.10 | | .30 R |
| Les Howard, GIS & Cartography Manager | 1.00 CSD | | | | 1.00 | |
| Gregg Hutchison, Computer Technician | 0.70 SNRS 0.30 NFS | 0.25 | 0.45 | | | |
| Sharon Kelly, Secretarial Specialist | 1.00 SNRS | 0.25 | 0.42 | 0.33 | | .16 R |
| Tricia Liedle, Office Supervisor | 1.00 WC | | 1.00 | | | .25 R |
| Christine Lockert, Administrative Coordinator | 1.00 SNRS | | 1.00 | | | 1.00 R |
| Ann Mack, Cartographer | 1.00 CSD | | | | 1.00 | |
| Bev Martin, Secretarial Specialist | 1.00 CSD | | | | 1.00 | |
| Duane Mohlman, Data Systems Coordinator | 1.00 CSD | | | | 1.00 | |
| Will Myers, Field Research Assistant | 1.00 CSD | | | | 1.00 | |
| Judy Otteman, Staff Assistant | 1.00 CSD | | | | 1.00 | .20 S |
| Steve Ress, Communications Specialist | 0.80 WC 0.20 CIT | | 0.80 | | | |
| Jim Roberts, Hydrogeologic Coordinator | 1.00 CSD | | | | 1.00 | |
| Diana Smith, Project Assistant | 1.00 SNRS | 0.34 | 0.13 | 0.53 | | .53 E |

| Name, Title | Current Appt.* | Teaching | Research | Extension/ Outreach | Survey | Soft Funding |
|---|---|-------------|--------------|---------------------|--------------|---|
| Matt Vanderpol, Computer Tech | 1.00 CSD | | | | 1.00 | |
| Jacki Vogel, Clerical Assistant | 0.50 CSD | | | | 0.50 | |
| Susan Vosler, Staff Secretary | 1.00 SNRS | .12 | .48 | .40 | | .12 T |
| SUBTOTALS | CSD 11.25 SNRS 6.70 WC 1.80 CIT 0.20 NFS .30 | 0.96 | 5.98 | 1.56 | 11.25 | .12 T 1.71 R .53 E .95 S |
| Natural Resources Business Center | | | | | | |
| Sandy Cook, Staff Assistant | 1.00 NRBC | | | | | |
| Pat DeStefano, Clerical Assistant | .75 NRBC | | | | | |
| Lois Erickson, Accounting Clerk | 1.00 NRBC | | | | | |
| Pam Gandara, Grants Specialist | 1.00 NRBC | | | | | |
| Gladys Kozisek, Clerical Assistant | .20 NRBC | | | | | |
| Connie Paxton, Clerical Assistant | 1.00 NRBC | | | | | |
| Jerry Schluckebier, Accounting Clerk | 1.00 NRBC | | | | | |
| Christine Steggs, Administrative Team Manager | 1.00 NRBC | | | | | |
| Jacki Vogel, Clerical Assistant | .50 NRBC | | | | | |
| SUBTOTALS | 7.45 NRBC | | | | | 1.25 |
| TOTALS | | | | | | |
| Subtotal FTE | CSD 25.25 SNRS 43.00 WC 6.80 75.05 | 0.96 | 37.67 | 11.17 | 25.25 | .12 T 28.50 R 9.29 E 11.59 S 49.50 |
| Subtotal FTE | CIT 0.20 NRBC 7.45 NFS 1.50 | | | | | |
| TOTAL FTE | 9.15 84.20 | | | | | |

***Codes for Acronyms Used:**

- SNRS = School of Natural Resource Sciences
CIT = Communication & Information Technology
CSD = Conservation and Survey Division
NFS = Nebraska Forest Service
NRBC = Natural Resources Business Center
WC = Water Center

APPENDIX 2.3

BYLAWS for School of Natural Resources University of Nebraska Updated 6/24/03

CHAPTER I FOREWORD

These Bylaws shall be considered adjunct to the current Bylaws of the Board of Regents of the University of Nebraska; and Bylaws of the University of Nebraska-Lincoln, the Institute of Agriculture and Natural Resources, the College of Agricultural Sciences and Natural Resources and the College of Arts and Sciences.

CHAPTER II NAME

The name of the administrative unit governed by the Bylaws shall be known as the School of Natural Resources, hereinafter referred to as the School.

CHAPTER III ADMINISTRATIVE STRUCTURE

- 3.1 Director.** The School shall have a Director who shall be selected in accordance with Board of Regents and University of Nebraska-Lincoln Bylaws. The Director shall report to the Deans in all colleges and divisions whose Faculty are salaried in the School. The Director is the chief administrator of the School. The Director shall serve as the State Geologist, if qualified, or shall designate someone to serve as the State Geologist. The Director shall appoint an Associate State Geologist.
- 3.2 Associate Directors.** The Director shall be assisted by two Associate Directors, who will be official administrative representatives of the School and will have signatory authority. The Associate Directors shall be Faculty members with majority appointments in the School. The Associate Directors will serve as *ex officio* members of the Advisory Committee and will represent the School at functions that otherwise cannot be attended by the Director. The Director will appoint one of the Associate Directors to fulfill his/her duties in his/her absence.
- 3.3 Coordinators.** The School shall have Coordinators to assist the Director in administering and coordinating programs in the school, such as Teaching, Research, Extension/Outreach, and Survey. These Coordinators shall be Faculty members with majority appointments in the School.
- 3.4 Committees.** The School shall have various standing committees with specific defined authority and responsibilities. These committees shall, in addition to the discharge of their responsibilities, interact with the Director and provide counsel on matters pertaining to the areas of responsibility assigned to that committee.

CHAPTER IV MEMBERS

- 4.1 Membership.** The membership of the School is collectively referred to in these Bylaws as the Faculty and Staff. The Faculty shall consist of every person holding the rank of instructor or above who holds a full, joint, or courtesy/adjunct appointment in the School, including those with equivalent rank positions. The Staff shall consist of regular managerial/professional and office/service personnel who hold a full or joint appointment in the School.
- 4.2 Voting Privileges.** All Faculty and Staff shall have voting privileges on issues concerning the general welfare and operation of the School. Issues specific to Faculty or Staff shall be voted on by the respective group. Examples for Staff could include, but are not limited to, evaluation procedures and professional development opportunities. Examples for Faculty could include, but are not limited to, curriculum and promotion and tenure.
- 4.3 Nominating Committee.** The School shall have a Nominating Committee to select candidates for membership on the various committees of the School and to conduct elections for the various committees on an annual basis. Its goal is to seek well balanced committees with members representative of the various programs within the School.

The Nominating Committee shall consist of five Faculty and two Staff representatives appointed by the Director. The Chair and Vice Chair of the Staff Professional Development Committee shall fill the two staff positions. The members are to be representative of the broad spectrum of Faculty and Staff found in the School.

The Nominating Committee shall seek broad representation of individuals interested in serving on various committees. Nominations from the Faculty and/or Staff at large will be accepted by the Committee. All nominations for various committee positions shall be submitted to the Faculty and/or Staff for election. If necessary, runoff elections shall be held.

CHAPTER V MEETINGS AND VOTING

- 5.1 General SNR Meetings.** The School Faculty and Staff shall meet as a body at least twice each semester during the academic year. Additional meetings may be called as necessary.
- 5.2 Call of Meetings.** Faculty and Staff meetings and Standing Committee meetings may be called by any of the following: (1) The Director, (2) Any member of the Advisory Committee, (3) Any Standing or Ad Hoc Committee; or (4) One-third of the Faculty.
- 5.3 Presiding Over Meetings.** The Director or the Director's designated or elected representative shall preside at all meetings.
- 5.4 Meeting Announcement.** All meetings should be scheduled at least one week prior to the meeting time. A written agenda shall be distributed at least 24 hours before the meeting. All general and committee meetings shall be held in accordance with University rules concerning open meetings.

- 5.5 Meeting Records.** Written minutes shall be taken and provided to the Faculty and Staff prior to the next scheduled meeting.
- 5.6 Agenda Items.** Agendas will be developed to concentrate items pertaining to overall School business first and Faculty-related items second. This will allow members to attend only the appropriate parts of the meeting. Items may be placed on the agenda by: (1) The Director, (2) Any member of the Advisory Committee, (3) Any Standing or Ad Hoc Committee, (4) Any Faculty or Staff member (may suggest items to the Director for placement on the agenda), and (5) Action from the floor of a meeting with approval of the majority of the Faculty/Staff at the meeting.
- 5.7 Quorum.** A quorum consists of 50% or more of the members with a salaried appointment (at least 0.05 FTE) in the School.
- 5.8 Meeting Participation.** Faculty, Staff, and graduate and undergraduate students having majors in the School may participate in discussions at meetings.
- 5.9 Voting Policy.**
- 5.9.1 Voting at meetings shall be conducted in accordance with the latest edition of Robert's Rules of Order. Each member in attendance shall have one full vote. Voting by proxy shall not be allowed.
- 5.9.2 Changes in the Bylaws require submission to the members on a mail ballot. Other issues may be placed on a mail ballot by the Director in consultation with the Advisory Committee or by a vote of the members.
- 5.9.3 Issues voted upon with a mail ballot shall be decided by a simple majority of a quorum of the members, except for changes to the School Bylaws, which must be in accordance with 7.2. Mail ballots shall normally be due within ten working days of the mailing.

CHAPTER VI STANDING COMMITTEES

The Director and/or members of the Advisory Committee shall have power to establish *ad hoc* committees and subcommittees with defined terms. Other standing committees can establish subcommittees of their own committees. The Director may appoint one or two additional members to any committee. Each committee is to maintain a record of their discussions and actions and make them available to Faculty and Staff through the SNR website. Matters of a confidential or sensitive nature, (e.g. promotion, tenure, or personnel issues) will not be recorded or posted in the shared documents.

- 6.1 List of Committees.** Standing committees for the School shall be:
1. Advisory Committee
 2. Fund - Raising Committee
 3. Graduate Committee
 4. Natural Resources Undergraduate Curriculum Committee
 5. Outreach Committee

6. Promotion and Tenure Committee
7. Publications Committee
8. Research Committee
9. Safety Committee
10. Staff Professional Development Committee
11. Teaching Committee

6.2 Committees and Their Purposes. The purpose of each School committee (section 6.1) and the method for selecting members of each committee are as follows:

6.2.1 Advisory Committee

The Advisory Committee shall consist of five Faculty and two Staff representatives and the Associate Directors (*ex officio* members). Faculty representatives must have greater than 0.50 FTE of their appointment in the School. Representatives shall serve for three years and may not succeed themselves. A Chair and a Vice Chair shall be elected from the members of the Advisory Committee. The Chair shall work with the Director to plan the agenda for meetings of the Advisory Committee and to report on the meeting to the Faculty and Staff through the website. The Vice Chair shall serve one year as Chair-Elect and as such can function as the Chair when the Chair is not available.

Terms shall be staggered so that one or two new members are elected each year. The Advisory Committee shall work with the Director to develop budgets and shall provide input to the Director on operations of the School. The Committee shall also advise the Director on any matter pertaining to the general welfare of the School. The Committee shall have the responsibility of working with the Director on matters of concern to students, including grade appeals. The Director shall meet with the Advisory Committee at least once every three months.

6.2.2 Fund-Raising Committee

The Fund-Raising Committee shall be composed of at least four Faculty and one Staff representatives who shall serve staggered two-year terms. Members may serve two consecutive terms. The School's Communications Specialist shall be an *ex officio* member. The Committee shall consist of at least five, but not more than eight, members. The Committee shall select a Chair and a Vice Chair (Vice Chair shall serve one year as Chair-Elect and as such can function as the Chair when the Chair is not available).

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature (e.g. personal information about potential contributors) will not be reported to the Faculty and Staff.

6.2.3 Graduate Committee

The Graduate Committee shall be composed of five Faculty members and one graduate student. Four of the Faculty members must have their graduate Faculty home (as defined by the Graduate College) in the School. The fifth member should be one with a courtesy or partial appointment in the School who does not have his/her Graduate Faculty home in the School. Faculty members shall serve for a three-year term while the graduate student shall serve for a one-year term. Terms shall be staggered so that one or two of the Committee members are elected every year. Members may serve two consecutive terms. Graduate Committee Faculty members must be Graduate Faculty Members or Fellows. The School's Teaching Coordinator shall be an *ex officio* member of the Graduate Committee. The Graduate Committee shall recommend its own Chair, who shall be appointed by the Graduate College. The Chair must be a Graduate Faculty Fellow. A Vice Chair shall be elected at the time that the Chair is recommended and shall serve as chair-elect for the term of the Chair. The Vice Chair must also be a Graduate Faculty Fellow and can function as the Chair when the Chair is not available. The Committee shall have a graduate student representative, selected by the graduate student body of the School. This representative shall be on the Committee for graduate policy and procedure matters, but not for admissions.

The Graduate Committee shall approve admission applications for graduate study, review graduate student academic performance and progress annually, recommend any necessary changes in graduate student status, make recommendations pertaining to curricular changes in graduate courses in consultation with the School Curriculum Committee, suggest and make changes in graduate degree programs and areas of specialization, and develop and modify, as needed, a handbook on graduate student policies and procedures that shall be given to all graduate students in the School.

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature (e.g. details on admissions) will not be reported to the Faculty and Staff.

6.2.4 Natural Resources Undergraduate Curriculum Committee

The Natural Resources Undergraduate Curriculum Committee (NRCC) shall consist of the Chair of each Natural Resource major committees (as recognized by the Dean of the College of Agricultural Sciences and Natural Resources (CASNR)) plus the Teaching Coordinator for the School of Natural Resources serving as an *ex officio* member. Two to three additional representatives "at-large" will be elected by the Natural Resources Faculty (herein defined as any individual who has an appointment in the School, is a member of a major committee, teaches a course with a prefix of NRES or any of the individual major prefixes, or advises undergraduates in one of the Natural Resource majors). Two or three representatives will be elected each year so as to maintain an odd number of representatives. It shall be the responsibility of the School's Nominating Committee to prepare a ballot ensuring such representation. "At-Large" representatives will serve for two-year terms, and the terms of representatives will be staggered where possible (the School's Nominating Committee will determine duration of initial terms). The Committee shall select a Chair. The Committee shall also have an undergraduate student representative selected by the appropriate student body group.

The Committee is charged with: (a) initiating and reviewing alterations, recommendations, and suggestions regarding the core curriculum requirements for the B.S. degree in Natural Resources and seeking input from the entire Natural Resources Faculty on such changes; changes to the core can be approved by mail unless a specific call for a faculty meeting is made by at least one Faculty member; changes to the core can also be proposed by individual majors but any changes proposed by majors should be simultaneously submitted to the

NRCC; (b) assessing the B.S. Natural Resources degree program and coordinating the assessment of individual majors; (c) providing coordination of recruitment, retention, and placement activities for B.S. Natural Resources majors; (d) handling requests for courses that are designated NRES including new course proposals, course changes, and cross-listings; (e) advising undeclared Natural Resources majors or Pre-Natural Resources majors; (f) receiving copies of all changes proposed by major committees to the CASNR Curriculum Committee for informational purposes; (g) meeting annually with the Director for the purpose of informing, assessing, and visioning; and (h) any other matters regarding core curriculum or NRES courses. Responsibilities for individual majors shall remain the purview of the major committees.

Committee actions will be transmitted to all Faculty (as defined above in this section) for information or objection. Objections must be filed within two weeks to the Chair of the NRCC. Objections will be discussed at the next NRCC meeting, and if unresolved, the objections will be forwarded to the Director and brought to the next Faculty/Staff meeting for review and decision by faculty.

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature will not be reported to the Faculty and Staff.

6.2.5 Outreach Committee

The Outreach Committee shall be composed of at least four Faculty and two Staff representatives who shall serve staggered two-year terms. Members may serve two consecutive terms. The School's Extension/Outreach Coordinator shall be an *ex officio* member of the Outreach Committee. The Committee shall consist of at least six, but not more than ten, members. The Committee shall select a Chair and a Vice Chair (Vice Chair shall serve one year as Chair-Elect and as such can function as the Chair when the Chair is not available).

The Committee shall encourage and promote outreach functions within the School, including communications and program marketing strategies. It shall serve in an advisory role to the Director on matters relating to outreach, support for Faculty and Staff for outreach activities, setting of outreach priorities, and encouraging recognition of Faculty and Staff for excellence in outreach programs. The Committee shall serve as the point of contact for outreach programming in the School, and oversee the School's website.

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature will not be reported to the Faculty and Staff.

For this committee's purposes, outreach shall be defined as "the effort of University faculty to make available to constituents, educational programs, cultural, athletic activities, and resources. Examples include faculty who work at a University museum and engage the students of the state in learning through the museum collections, faculty of Teachers College who work with teachers across the state to learn a new classroom instruction technique. Although Extension and Outreach are used interchangeably, Outreach is a responsibility of all faculty members, while Extension designates those with a specific appointment."

6.2.6 Promotion and Tenure Committee

The Promotion and Tenure Committee shall be composed of seven Faculty members. Four members of this Committee must be fully promoted, i.e., rank as full professors. All members of this Committee must have greater than 0.50 FTE in the School or the Nebraska Forest Service (NFS). The Director, Associate Directors, and Coordinators may not serve on the Promotion and Tenure Committee. Members shall be elected to staggered three-year terms and may serve two consecutive terms. The Committee shall select a Chair and a Vice Chair (Vice Chair shall serve as Chair-Elect for one year and as such can function as the Chair when Chair is not available.).

The Committee shall report annually to the Director on recommendations for promotion of Faculty, granting of tenure, reappointment of Faculty, and progress toward tenure and/or promotion. For those instances where a Faculty member is to be hired into the School with tenure, the request for granting of tenure must be presented to the Promotion and Tenure Committee for its recommendation prior to the offer of tenure to the candidate. All recommendations of the Promotion and Tenure Committee are to be independent of those of the School's administration.

For Faculty with less than a 0.50 FTE appointment in the School, the Promotion and Tenure Committee shall communicate their evaluations of the Faculty member to the home unit. The School's Promotion and Tenure Committee likewise has the responsibility to seek input from Promotion and Tenure Committees in units where the School Faculty member has less than a 0.50 FTE appointment.

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature (e.g. promotion and tenure discussions) will not be reported to the Faculty and Staff.

6.2.7 Publications Committee

The Publications Committee shall be composed of at least one Faculty and three Staff representatives. Members shall serve staggered two-year terms and may serve two consecutive terms. The Committee shall consist of at least four, but not more than ten members. The Committee shall select a Chair and a Vice Chair (the Vice Chair shall serve as Chair-Elect for one year and as such can function as the Chair when the Chair is not available.)

The Committee shall develop guidelines for review of all School publications (paper and electronic); develop a plan to increase the School's non-technical publications; identify strategies for funding publishing; and shall periodically review the School's inventory of publications, and assess those that are selling for format, style, etc.

6.2.8 Research Committee

The Research Committee shall be composed of : (1) two Faculty appointed by the Director to represent two of the School's centers (currently the Center for Advanced Land Management Information Technologies, Great Plains Regional Center of the National Institute for Global Environmental Change, High Plains Regional Climate Center, National Drought Mitigation Center, and Water Center); (2) three Faculty holding research appointments reflecting the diverse research interests of the School; and (3) one representative of the School's managerial/professional research staff. All four of the non-center appointments are to be elected. Committee members shall be appointed or elected for staggered three-year terms

and may serve two consecutive terms. The School's Research Coordinator shall Chair this committee as an *ex officio* member.

The Research Committee shall foster and facilitate basic and applied research within the School. The Committee shall (1) advise the Director on matters pertaining to research, and (2) assist the Director or his/her designee in identifying and implementing actions designed to enhance the physical and institutional infrastructure (e.g., field facilities and labs, centers) required to support research.

The Committee shall (1) identify needs and requirements for enhancing physical and institutional infrastructure to support research, (2) propose measures and actions to increase the quality and volume of research, (3) seek ways to assist Faculty and Staff in acquisition of external funding, (4) work to establish recognition of the School's research capabilities and special expertise within funding agencies and among the School's clientele, and (5) carry out other assignments as requested by the Director.

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature will not be reported to the Faculty and Staff.

6.2.9 Safety Committee

The Safety Committee shall be composed of at least three Faculty and three Staff representatives. Members shall serve staggered two-year terms and may serve two consecutive terms. The Committee shall consist of at least six, but not more than ten, members. The Committee shall select a Chair and a Vice Chair (the Vice Chair serves as Chair-Elect for one year and as such can function as the Chair when the Chair is not available). The School's Safety Liaison shall serve as an *ex officio* member.

The Committee shall (1) develop a safety plan for the School, (2) shall assess the safety plan every five years, and (3) shall make a brief safety presentation annually at a General meeting. The committee shall encourage and promote a safe work environment. The committee shall serve in an advisory role to the Director on matters relating to safety and shall serve as the point of contact for safety-related planning for the School.

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature (e.g. personnel issues) will not be reported to the Faculty and Staff.

6.2.10 Staff Professional Development Committee

This Committee shall be comprised of one Faculty and eight Staff, with equal representation from office/service/technical and managerial/professional employees. The members are to be representative of the broad spectrum of programs found in the School. Members shall serve staggered, two-year terms. The Committee shall recommend its own Chair and Vice Chair (Vice Chair shall serve as Chair-Elect for one year and as such can function as the Chair when the Chair is not available). The Chair and Vice Chair shall serve as *ex officio* members of the Nominating Committee and shall seek nominees from among the eligible Support Staff nominees shall reflect the diverse programs in the School.

The Committee shall advise the Director on matters relating to Staff. The Committee shall encourage recognition of Staff excellence, encourage and promote professional development

for Staff, encourage and promote open lines of communication between Staff, Faculty, the Director, Associate Directors, the Administrative Team Manager and, if applicable, Coordinators, and serve as a point of contact for Staff in the School.

The Staff Professional Development Committee shall make recommendations to the Director on the process for evaluation of Staff, on professional development opportunities for the Staff (and, in some instances, their supervisors), and on the setting of priorities for Staff.

The Chair of the Staff Professional Development Committee shall be invited, when appropriate, to provide a report to the Faculty and Staff or to meet with the Director and the Advisory Committee to provide input on issues that will impact the Staff or to provide suggestions on the operations or general welfare of the School.

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature (e.g. personnel issues) will not be reported to the Faculty and Staff.

6.2.11 Teaching Committee

The Teaching Committee shall be composed of seven members. Committee members shall be appointed or elected for staggered three-year terms and may serve two consecutive terms. The School's Teaching Coordinator shall Chair this committee as an *ex officio* member.

The Teaching Committee shall foster and facilitate teaching within the School. The Committee shall (1) advise the Director on matters pertaining to teaching, and (2) assist the Director or his/her designee in identifying and implementing actions designed to enhance the physical and institutional infrastructure (e.g., classrooms, field experiences and labs) required to support teaching.

The Committee shall (1) identify needs and requirements for enhancing physical and institutional infrastructure to support teaching, (2) propose measures and actions to increase the quality and volume of teaching, (3) seek ways to assist Faculty and Staff in acquisition of external funding, (4) work to establish recognition of the School's teaching capabilities, and (5) carry out other assignments as requested by the Director.

The committee shall maintain a written record of their discussions and actions and shall report these to the Faculty and Staff through the SNR website. Matters of a confidential nature will not be reported to the Faculty and Staff.

CHAPTER VII AMENDMENT OF THE BYLAWS

7.1 Bylaws Conformance. These Bylaws are intended to conform with Bylaws of the Board of Regents of the University of Nebraska, the Bylaws of the University of Nebraska-Lincoln and the Bylaws of the College of Agricultural Sciences and Natural Resources and the College of Arts and Sciences. Changes in Bylaws of the above groups are assumed to imply necessary change in the School Bylaws.

7.2 Bylaws Amendments. These Bylaws may be amended only by mail ballot. Such amendments must be in accordance with 7.1. Discussion of any proposed changes shall occur at a Faculty/Staff meeting before ballots are mailed. Proposed amendments shall be presented in writing two weeks prior to the Faculty/Staff meeting. Changes in the School

Bylaws can be initiated by the Director and the Advisory Committee, or by a petition of 10% of the School Faculty. Approval of amendments to the Bylaws requires a two-thirds majority of those voting, provided that a quorum of the Faculty vote.

7.3 Counting Mail Ballots. The Associate Directors and a member of the Faculty shall tabulate the votes and report the results of the voting.

Operating Procedures for School of Natural Resources University of Nebraska

I. Appointments in the School

The School will consist of individuals who have an interest in and a recognized contribution to make to natural resource and environmental programs. There must be compelling rationale for having an appointment in the School. The criteria for acceptance of an individual faculty member who holds the rank of instructor or above (including equivalent rank faculty) shall be substantial participation in the work of the School, including:

- Teaching a course that is formally part of the School curriculum
- Participating in a multi-disciplinary research project that is part of the School's themes, programs or focus areas.
- Participating in any School-related relevant activity that requires investment of significant time and effort on behalf of the School or students in the School (*e.g.*, graduate student advising and outreach programs).

School appointments will include faculty whose academic home is in the School, joint appointments with less than .50 FTE, courtesy appointments, adjunct appointments, professional affiliates, and extension educator affiliates.

A. Procedures and Criteria for Affiliation with the School:

1. Full or Joint Appointments

Anyone wishing to have all or a portion of their FTE in the School should send their request to the appropriate Vice Chancellor. Those holding joint appointments shall have a percentage of their appointment in the School and the remaining percent of their appointment in another administrative unit(s). Those having the greatest portion of their FTE in the School shall have their academic home in the School. Before submitting a request, the faculty member should visit with the current unit administrator to discuss potential impacts of the transfer. The unit administrator may send a letter to the Vice Chancellor supporting the request or expressing concerns about the proposed transfer. The Vice Chancellor shall seek input from the cognizant Deans and the Director of the School concerning the appropriateness of the request. The Director shall obtain a vote of the SNRS Faculty following discussion of the request at a faculty meeting. The Director shall use the results of the faculty vote in formulating a response to the Vice Chancellor. Transfer of financial, technical and office support shall be determined by the cognizant Deans in cooperation with the School Director and the Unit Administrator of the unit from which the faculty member is transferring. Individuals may use the same process to transfer all or a portion of their appointment from the SNRS to another unit.

Joint appointments in the School shall be made in conformance with guidelines established for the University of Nebraska. When a faculty member requests a joint appointment, the School Director will work with the chairs, heads, directors and other University administrators to apply a mechanism that enables credit-hour generation, advising, and other FTE-related activities to be fairly credited so as to enable primary supervisors to evaluate School activities in the context of the home-unit activities and to avoid compromising home-unit programs.

The percentage appointment should be appropriate for the task. A position description that is mutually agreeable to all concerned parties shall be written. These position descriptions shall be reviewed periodically and adjusted as necessary to reflect changing activities and responsibilities.

Evaluations for promotion, tenure, progress towards promotion and tenure, and for merit increases shall be administered by the unit that is the academic home for the faculty member. Input for making these evaluations shall be sought from all concerned parties.

Matters pertaining to financial and other kinds of support for individuals holding joint appointments shall be negotiated between the appropriate unit administrators and approved by the cognizant Deans.

2. Courtesy Appointments

A faculty member of any University of Nebraska unit may request a courtesy appointment in the School of Natural Resource Sciences (SNRS). The interested faculty member initiates the request with a letter and a résumé to the School Director. After reviewing the request, the Director asks for approval of the appointment through a simple majority vote of faculty in attendance at a regular SNRS faculty meeting. If approved, a PAF is processed by completing the section regarding courtesy appointments. Unit Heads/Chairs from the faculty member's home unit and SNRS sign the completed PAF. All courtesy appointments will be reviewed every five years to determine if the appointment should be continued. If a faculty member leaves SNR, and wishes to have a courtesy or adjunct appointment, he/she is to indicate this in the resignation letter.

3. Adjunct Appointments

Adjunct appointments are similar to courtesy appointments except the person is not a current faculty member of the University of Nebraska. The person typically is a faculty member from another university or a member of some federal or state government agency. SNRS may initiate the request for an adjunct appointment or it may be requested by the individual. The person shall provide the Director with information (résumé, etc.) that the Director shall provide to the SNRS faculty for review and approval. The appointment will be approved by a simple majority vote of faculty in attendance at a regular faculty meeting. After approval, a PAF will be processed. All adjunct appointments will be reviewed every five years to determine if the appointment should be continued.

4. Professional Affiliates

Professional affiliate appointments are designed to encourage collaboration with non-university professionals who contribute to the teaching, research, or outreach missions of the School. Eligible persons are scientists or other professionals working for a consultant, state or federal agency, business, industry, or other profession related to the mission of the School. The School views the affiliates as active collaborators, and therefore, the candidate shall have developed a working relationship with one or more faculty members over a two-year period. The interested person shall submit a résumé, letter of nomination by a faculty sponsor, two letters of recommendation from outside the School, and a personal statement of interests and goals for developing their affiliation. Affiliate nominee files will be reviewed by the faculty and appointment shall be approved by a simple majority vote of faculty in attendance at a regular SNRS faculty meeting. After approval, a PAF will be processed. With evidence of continued substantive involvement in the School, the affiliate status shall be renewed annually. The affiliate status will end after the professional is no longer actively involved in a mission oriented relationship in the School.

5. Extension Educator Affiliates

An Extension Educator, who is a member of the University of Nebraska Cooperative Extension Division, may request an affiliate appointment with the School. The intent of the Educator Affiliate position is to provide increased communication and involvement between Extension Educators and the School. Educator Affiliates will be included, when appropriate, in faculty retreats, inservice training, professional development opportunities, committees and research, extension, and teaching activities. Affiliates are encouraged to be: liaisons with their EPU's and districts, strengthen the cooperation and participation in extension and research in the School, participate on appropriate committees, participate in authorship and review of extension and research publications, participate in student recruitment, placement and instruction, and be actively involved in School and project related reviews. The interested Educator shall submit their name to the Director for consideration as an Educator Affiliate. After approval by the Director and the faculty, the appointee will be an affiliate of the School until such time as he/she desires to change his/her affiliation status.

B. Promotion and Tenure Procedures:

Faculty transferring their academic home to the School may choose to be evaluated for tenure and promotion through their current P&T Committee until a promotion or tenure decision is reached or by the SNRS P&T Committee. Faculty must notify the Director of their decision at the time of appointment in the School. The composition, duties and responsibilities of the School P&T Committee are specified in the School Bylaws.

II. Budgetary and Financial Operations

A. General Responsibilities:

The overall responsibility for all budgetary and financial operations of the School resides with the Director. The Director shall seek input and counsel from the Advisory Committee and the Assistant Director in developing annual budgets and making allocations of appropriated dollars, regional research funds, overhead/royalty return funds and other funds at the disposal of the School. This group shall assemble, prioritize and approve/submit requests for equipment funds, funds to support team research, funds for support of graduate assistants, funds for support of priority programs, and other requests of general interest to the School.

B. Recommended Guidelines:

- 1) The proposed annual budget for appropriated funds and recommendations for use of overhead/royalty return funds shall be presented to the faculty for discussion and input.
- 2) At least 60% of overhead/royalty funds returned to the School shall be returned to the faculty/program that generated the funds.
- 3) Revolving funds will remain entirely with the program/individual who generates and administers them.
- 4) Appropriated dollars should be used, to the extent possible, to cover salaries of School faculty, staff and graduate assistants. Remaining funds should be used for general operations of the School and/or allocated to individual faculty.
- 5) Expenditure of funds at the disposal of the Director from overhead/royalty returns and revolving accounts to support salaries and assistantships should be kept to a minimum. They should generally be used to support travel outside of Nebraska; general operations of the School, including telecommunications, postage, copying, maintenance for School equipment agreements, licensing of programs, and purchasing of School equipment and supplies.

III. Support Staff

Many faculty coming into the School have support staff assigned to their programs. Initially, these assignments will remain the same. A periodic review of these assignments will be made by the Director with input from faculty supervisor(s) and the individual being reviewed. to determine if any changes in assignment are needed. This review will be made only for support staff funded at least partially from state appropriated or other general School funds.

This process will focus not only on the current assignment, but will also explore opportunities for career development and advancement. Input from the Staff Professional Development Committee also will be sought related to such explorations.

Three support task groups have been identified who will generally serve all faculty and administrators in the School. These groups are: the Business Office, the Communications Team, and the Computer Support Group. Because of the nature of their special support within the School, some specifics about their operating procedures follow:

A. Business Office:

With the establishment of the School, a business office to service the faculty and staff of the School has been implemented. This office supports the business operations of the School, including the preparation of financial reports for all accounts on a monthly basis; processing of personnel action forms; and processing of requisitions, checks, credit card transactions, petty cash, and other such items.

Centers and other units associated with the School may be serviced by the business office based upon joint agreements between the Director, business office, and unit directors.

B. Communications Team:

The role of the School Communication Support Team shall be to ensure that two critical lines of communication for the School are retained: 1) among internal support staff, faculty, and administration; and 2) among clientele-groups within and outside of the University. Initially these functions will continue to be performed by communications support staff within the units forming the School.

C. Computer Support Groups:

An Information Technology Support Team will provide technical and specialized computing services to the School. The focus of the team will be to provide quality customer service. Initially, all School computer support staff persons will be team members. These computer specialists will be expected to keep abreast of changes in computer technology, to help train individuals in implementing computer programs and other software, to trouble shoot, to help set up computers used in research, teaching and service activities; to provide counsel and advice on computer matters to the Director, faculty, and other support staff; to interact with the University computer community, and to participate in other appropriate activities.

A School Computing Committee (composed of faculty and members of the Information Technology Support Team) will be formed to advise the Director on computing issues, to develop and implement appropriate computing guidelines for the School, and to plan for the long-term development of computing.

IV. Graduate Student Policies and Procedures

Graduate students are vital to the success of the School. They should be treated with dignity and respect, and provided with a quality education that prepares them for future careers. The role of an advisor is critical to the success of a graduate student. Therefore, an advisor is expected to: visit with a student on a regular basis and provide adequate supervision and guidance, promote adherence to sound ethical and scientific principles, provide honest feedback, and ensure that supervisory committees provide program approval, progress appraisal, and feedback on theses and dissertations in a timely manner.

The School shall have a handbook of policy and procedure guidelines for graduate students. This handbook shall be given to a graduate student upon admission to the School. It shall be revised as appropriate to keep it consistent and up-to-date with changes in degree programs and curriculum in the School, and Graduate School policies. The Graduate Committee of the School shall work with the Director in making changes in the graduate handbook.

Faculty in the School should be familiar with the contents of the graduate student handbook so that they can help ensure that students, advisors, and supervisory committees adhere to the policies and procedures set forth in the handbook.

Graduate students are expected to present research results in departmental seminars and at professional/scientific meetings. The advisor will seek funds to pay expenses for attendance at these meetings to present a paper. The advisor shall also work closely with the student to ensure that such presentations are of a high quality.

V. External Advisory Panel

The School is expected to develop and maintain interactions with several federal and state agencies, private groups and individual citizens. An external advisory panel shall be established to provide input from constituency groups for setting priorities and developing School programs.

The School Director shall work with the administration of IANR, other appropriate UNL administrators, members of the Advisory Committee and other University units affiliated with the School in establishing and maintaining the external advisory panel.

The Director, other appropriate UNL administrators, and selected School faculty shall meet with the external advisory panel at least annually to provide information about progress and programs of the SNRS and to seek counsel, guidance, and input from the panel relative to the performance of the School in addressing the needs of the academic and scientific community, policy makers, federal and state governmental agencies, private groups, and the general public.

VI. Outside Employment/Consulting

Faculty and staff in the SNRS are encouraged to engage in professional activities outside the University to broaden their experience and keep them abreast of current developments when such activities do not interfere with their regular duties or present a conflict of interest. Faculty and staff in the School should follow the policies and guidelines for the units in which they have the majority of their appointments. Some general guidelines are given below.

All consulting activity shall conform to University of Nebraska Board of Regents Bylaws (Section 3.4.5) and shall be approved in advance by the Unit administrator, cognizant dean(s) and the Vice Chancellor. Consulting requests that involve acceptance of retainer fees, professional employment for more than two days per month, charging of fees for using university facilities or equipment or providing professional service to departments or agencies of state government must be approved in advance by the Board of Regents. Administrators approving consulting requests will ensure that the proposed activity benefits the University and does not result in a conflict of interest for the employee or a public image problem for the SNRS.

- Faculty should not consult within Nebraska if the consulting service could be considered to be a part of their normal duties.
- Faculty and staff shall not be allowed more than two working days per month except that five working days may be approved if the consulting is international. No more than twenty-four working days may be used for consulting in any fiscal year.
- Academic year employees must receive approval in advance for consulting conducted during the summer. Academic year employees on continuing appointments are full-time academic-administrative employees and subject to Board of Regent Bylaws throughout the year.
- Faculty and staff are not permitted to consult for a fee with another entity of the University of Nebraska-Lincoln. Services rendered to another entity of the University should be recognized through overload pay that is agreed to in advance by the employee and cognizant administrators.

Faculty and staff should not agree to serve as a paid expert witness for one party in hearings or litigation involving two Nebraska companies, organizations, or individuals. Likewise, serving as a paid expert witness representing an out-of-state entity in litigation against a Nebraska company, organization or individual is not appropriate. It is preferable that a faculty or staff member be subpoenaed as an expert witness and not employed by either party in litigation. If requested to serve as a paid expert witness in

hearings or trials where the SNRS may be perceived as favoring one side in a dispute, the faculty member should recommend the services of a colleague from another state or a retired faculty member possessing appropriate expertise.

The Board of Regents has indicated that it does not want to approve consulting requests after-the-fact. If possible, faculty/staff should fill out consulting forms approximately six weeks before the date of the Board of Regents meeting. Although many consulting activities do not require Board of Regents approval — see above for cases which do require Regents — one should fill out the University of Nebraska Application for Permission to Engage in Professional Activity Outside the University and, for those whose appointment is in IANR, the IANR Consulting Request Information Form sufficiently in advance of the consulting activity to make sure that approval is obtained before the consulting is undertaken.

APPENDIX 2.4

IANR Annual Report of Faculty Accomplishments, Impacts and Professional Development Guidelines and Format University of Nebraska-Lincoln

This describes the format for preparing the report of your accomplishments subsequent to your last report. Each goal/objective from last year will constitute a separate heading to report corresponding accomplishments. Thus, the basis for the entire accomplishment report is dependent upon well thought out goals and objectives that are measurable and have impact. Please indicate which IANR Strategic Plan program theme or operational priority or unit Action Plan for which the goal is specific. Keep in mind that this is an annual accomplishments and impacts report. Keep the focus on accomplishments and impacts.

Faculty on combined appointments should not report to each Division/College separately. Because accomplishments will primarily relate to goals and objectives, Division or College specificity will be a by-product of goals and Action Plans.

Limit the report to no more than five pages. Organize your material according to your longer term goals and specific objectives, i.e., each set of goals and objectives must have corresponding accomplishments and be identified with an IANR Strategic Plan program theme or operational priority or unit Action Plan. Faculty in the College of Agricultural Sciences and Natural Resources will use the Teaching Load and Adjustment to Teaching Load forms as in the past. Send the completed forms to the CASNR office. The format is as follows:

A. Personal Data

- ◆ Name
- ◆ Date report is completed
- ◆ Department/District and percent research, teaching or extension
- ◆ Courtesy and adjunct appointments
- ◆ Attach position description as a separate page (not part of the five-page limit)
- ◆ Honors and awards received since last report

B. Report on goals and objectives from last year

- ◆ List each goal/objective as you recorded them in last year's ARFA, identify which IANR Strategic Plan program theme, operational priority or unit Action Plan they address.
- ◆ Describe accomplishments and impacts for each goal. Accomplishments should tell what happened, what you did. Impact should relate what difference your effort made. Grants, contracts, publications, new courses, new methodology, new linkages, new recruiting techniques, etc., are examples of accomplishments. Impacts should detail changes in behavior in personal, economic, physical, or emotional well being. **Potential impact that is noteworthy should also be reported.** (Repeat this sequence for each set of goals and objectives, including professional development goals and accomplishments.)
- ◆ Describe progress on last year's professional development plan.

C. Identify longer term goals and specific objectives for next year and appropriate Action Plan, program theme or operational priority. (Goals are general statements; objectives include what, when and who.)

D. Identify a professional development plan for next year that will help you attain your goals and address IANR's Action Plans, program theme, or operational priority.

E. Organizational citizenship activities

(Include active assignments for the past year only; these are activities that you do to enhance the stature of the University, IANR, your unit and yourself, locally, nationally or internationally.)

F. Report in summary form accomplishments, impacts, initiatives or significant contributions that do not seem to fit under the above.

**Academic Performance Evaluation and Professional Development of Faculty
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln**

| |
|-----------------------|
| Budgeted Time: |
| % Teaching _____ |
| % Research _____ |
| % Extension _____ |
| % Service _____ |
| % _____ |

Faculty Member's Name: _____ Evaluation Period: _____

SAP Personnel No. _____ Appointment Title (Rank) _____

Department/Unit: _____ Date Prepared: _____

The performance level of the faculty member in each performance area and overall should be indicated with a () in the appropriate boxes. **U** = Unsatisfactory Performance; **B** = Below Expectations; **M** = Meets Expectations; **E** = Exceeds Expectations; **X** = Exceptional Performance. Not all performance areas have equal weight in overall evaluation.

| Performance Areas | Evaluation | | | | | Comments |
|--|------------|---|---|---|---|----------|
| | U | B | M | E | X | |
| Planning | | | | | | |
| Goals and objectives related to unit, IANR, or UNL vision and strategic plans. Linkages to accomplish goals have been established. Goals and objectives are appropriate. | | | | | | |
| | | | | | | |
| Accomplishments | | | | | | |
| Accomplishments focused on goals and objectives. Provides leadership to reach goals and objectives. Demonstrates creativity/flexibility in meeting | | | | | | |

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| goals/ objectives. Accomplishments meet appropriate scholarly criteria. | | | | | | | |
| | | | | | | | |
| acts | | | | | | | |
| Potential impacts are described. Impacts are documented. Impacts are related to stated goals and objectives. Impacts are reflected in research, teaching or extension and service in the discipline and in the public policy. | | | | | | | |

| | | | | | | |
|--|---------------|--|--|--|--|-----------------|
| Performance Areas (continued) | uation | | | | | Comments |
| | | | | | | |
| Organizational Competencies | | | | | | |
| Continuous improvement/professional development. Decision making/problem solving. Openness to change. Organizational citizenship. Relationships and communication. Teamwork. Other. | | | | | | |
| | | | | | | Comments |

| | | | | | | |
|---|--|--|--|--|--|--|
| Overall Evaluation: Please mark only one category | | | | | | |
| | | | | | | |

This Academic Performance Evaluation and Professional Development form has been examined by the employee on _____

____ (Date). _____ Employee Signature. Comments by employee: _____

This Academic Performance Evaluation and Professional Development form has been examined with the employee on _____

____ (Date).

Supervisor's Signature _____ Employee's Signature

CHAPTER 3 - RESOURCES AND INFRASTRUCTURE

3.1 Human Resources

Faculty

The formation of the School of Natural Resource Sciences (SNRS) in 1997 brought together for the first time a large faculty with a wide diversity of disciplinary specializations in the area of natural resources. The merger of SNRS, Conservation and Survey Division (CSD), and Water Center (WC) to form the School of Natural Resources (SNR) in July 2003 significantly increased this diversity by including additional faculty and staff in water, soil, and geologic sciences. In addition, in the years since 1997, an impressive group of faculty with full, joint, and courtesy/adjunct appointments have evolved into the present-day SNR. A complete list of faculty by current appointment and FTE percentages in teaching, research, extension/outreach, survey, and administration is provided in Appendix 2.1.

Faculty with full (100%) appointments in SNR total 61. An additional 13 faculty positions have joint appointments in SNR, primarily from the School of Biological Sciences, Department of Geosciences, and the Nebraska Forest Service. Total SNR faculty FTE is 65.1 with another 7.8 from the units mentioned above. The most current FTE breakdown by teaching, research, extension/outreach, survey, and administrative appointments for SNR and the other units (combined) is given below in Table 3.1.

Table 3.1 SNR Faculty Appointments

| Appointment | Total FTE | Teaching | Research | Extension/ Outreach | Survey | Administrative |
|--------------------|------------------|-----------------|-----------------|--------------------------------|---------------|-----------------------|
| SNR | 65.10 | 7.80 | 24.92 | 6.51 | 23.12 | 2.35 |
| Other units | 8.50 | | | | | |
| Total | 73.60 | | | | | |

Courtesy and adjunct appointments within SNR have increased significantly since 1997. Courtesy appointments are given to University of Nebraska-Lincoln faculty at their request, subject to a vote of the SNR faculty. Currently, courtesy appointments have been extended to 53 faculty. Adjunct faculty appointments (27) are given to non-UNL faculty and represent scientists employed by state and federal agencies within and outside of Nebraska, consultants, and university faculty in other states. Both courtesy and adjunct appointments work on various research and outreach projects with SNR faculty. These appointments are reviewed periodically to determine if their continuation is in the best interest of SNR and the appointee. The faculty in these positions offer a considerable resource for SNR faculty, staff, and students. Their level of involvement in SNR meetings and committees varies considerably. A complete list of courtesy and adjunct faculty is provided in Appendix 3.1.

SNR faculty can generally be divided into disciplinary categories. Categories and FTE breakdown for each category are provided below in Table 3.2. Joint appointments with other UNL units and courtesy and adjunct faculty in these disciplinary categories are not included. A complete list of faculty, grouped by areas of interest is provided in Appendix 2.1. More detailed information on each faculty member is included in their vitae, see Chapter 9.

Table 3.2 SNR Faculty by Discipline and Funding Source

| Discipline | SNR FTE on State Funds | SNR FTE on Grant Funds | Total SNR FTE |
|--------------------------------------|-------------------------------|-------------------------------|----------------------|
| Forestry | 2.80 | 0.25 | 3.05 |
| Geology | 7.20 | 0.00 | 7.20 |
| Grassland and Agro-Ecology | 2.91 | 2.29 | 5.20 |
| Agricultural Meteorology/Climatology | 6.54 | 4.06 | 10.60 |
| Remote Sensing/GIS | 3.75 | 1.80 | 5.55 |
| Soil Science | 5.00 | 4.00 | 9.00 |
| Water | 14.40 | 2.60 | 17.00 |
| Wildlife | 4.65 | 0.85 | 5.50 |
| Other | 2.00 | 0.00 | 2.00 |
| TOTAL | 49.25 | 15.85 | 65.10 |

The SNR faculty is both large and diverse, as demonstrated by the data summarized above. The unit considers the faculty adequate to meet most of the current natural resource research needs in the state, but inadequate to meet future teaching and extension/outreach needs, as well as emerging disciplinary and interdisciplinary research areas that SNR desires to place more emphasis on in the future. In particular, the human dimension aspects of natural resources management is a significantly underdeveloped area in SNR. To address this area, SNR anticipates increasing faculty through joint and courtesy appointments within UNL and a limited number of new hires. Additional faculty in this area will likely be hired through external funds or as replacements for retiring faculty.

The newly created SNR has not had the time and opportunity to discuss and prioritize its faculty positions for the future. Demographic data suggests that there will be numerous faculty retirements in the next three to five years in critical teaching, research, outreach/extension, and survey program areas. We realize that establishing priorities for faculty hires in the near term will allow SNR to address these needs in a timely manner and aid in competing for additional funds from IANR's faculty position pool. Faculty positions that become available through retirement or the departure of faculty from the university for any reason automatically revert to the IANR Vice-Chancellor for reallocation. All departments compete for those positions. SNRS began to identify new faculty positions in 2002. Because the merger with CSD and the Water Center was proposed by the IANR administration, further discussion of these positions was placed on hold until after the merger. We realize that it is critical for these positions to be discussed and prioritized in the near future through a systematic and participatory process.

The positions listed below were identified by the SNRS faculty as potential new faculty positions in support of existing or new program areas, not as replacements for current positions that might become available through retirements or the departure of faculty from the university. These positions have not been prioritized and do not include the *Ecosystem Modeler* position already approved by IANR Administration, but not yet released for budgetary reasons.

Ecological Economist

Teaching .25; Research .75. Teach undergraduate and graduate courses in ecological economics and economic ecology. Conduct research on the policy tradeoffs in natural resources management and improving understanding of the interaction between human and natural/physical systems through systems approaches and modeling. Research conducted would be in close association with scientists in the other program areas of SNR and in support of the human dimensions program area within SNR.

GIS Specialist

Teaching .40; Research .60. Teach undergraduate and graduate courses in GIS with emphasis on linkages to natural resources issues. Conduct interdisciplinary research with faculty in SNR's program areas of water, climate, soils and geology, agroforestry, and fish and wildlife.

Environmental Meteorologist

Teaching .25; Research .75. Air quality is intended to be the primary thrust of this position because of increasing concerns over odors associated with feedlots, waste treatment facilities, and other industrial facilities. Agricultural and urban applications of insecticides, herbicide, fungicides, or fertilizer that may travel beyond intended targets are also important as they impact on air and water resources and the quality of ecosystems. Air quality is also an important consideration in building design in order to control the level of undesirable levels of toxic materials for inhabitants. The environmental meteorologist would work closely with other faculty in agricultural and engineering departments and with meteorology faculty in Geosciences. Teaching responsibilities would be at the undergraduate and graduate levels.

Water Quality/Aquaculture Specialist

Teaching .15; Research .35; Extension, .50. Teach Limnology and Lake and Reservoir Management. Conduct research on principles and practices of lake/reservoir ecology, restoration, and management; extension activities working with private fish producers, lake owners, aquatic resource managers and regulatory agencies.

Natural Resources Policy Specialist

Teaching, .25; Research, .50; Extension, .25. Develop new undergraduate and graduate courses in natural resources and environmental policy. Conduct research on the use, management, and preservation of Nebraska's natural resources and work with local, state, and federal agencies and the legislature on natural resource and environmental issues. This position would be in support of the newly proposed human dimension program within SNR and could be a joint position with the Department of Agricultural Economics and/or the Department of Community and Regional Planning.

Hydrologic Scientist

Teaching, .40; Research .60. Teach undergraduate and graduate in hydrologic sciences and ecohydrology. Conduct research that emphasizes physical, chemical, and/or modeling approaches to study the complex terrestrial-hydrologic interactions of riverine ecosystems, including groundwater-surface water interaction, river ecology, watershed hydrology, surface water resource allocation and management, surface water or watershed modeling and/or river-atmospheric interactions.

Environmental/Contaminant Soil Microbiologist

Teaching, .25; Research .75. Teach undergraduate course in environmental microbiology and graduate course in contaminant microbiology/toxicology. Conduct research on microbial aspects of soil/sediment dynamics in natural and disturbed ecosystems, with a focus on processes associated with contaminant assimilation, detoxification and remediation/restoration of compromised soil and water environments.

Soils Conservation and Management

Teaching .45; Research .45; Extension .10. Teach graduate and undergraduate courses on soils mapping, conservation and management, with emphasis on linkages to natural resources issues. Graduate courses would include conservation and management of soils. Research on conservation and management of soils, with emphasis on linkages to other natural resource issues. Extension and outreach program with Nebraska state agencies and NRCS/USDA.

Stream/Wetland Ecologist

Teaching .30; Research .70. Teach new 400/800 level course in stream ecology and current courses in Advanced Limnology and fisheries biology. Conduct research on the interrelationships among the biota, chemistry, and hydrology of stream and/or rive habitats in the Great Plains. Interface with Nebraska Game and Parks Commission, U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Forest Service, and other Nebraska state agencies.

CSD had not identified potential new faculty positions prior to the merger. They discussed the replacement of faculty that recently retired or departed the university. CSD currently has openings for three full positions, as well as two positions recently made half-time as a result of phased retirements. Two of the full-time openings are due to retirement and one from a faculty member leaving for a job elsewhere. Two job descriptions have been written and received tentative approval by CSD. They proposed filling these positions with persons that have primary responsibilities in geological survey, in order to maintain current programs. These position descriptions are:

Quaternary Geomorphologist/Assistant Professor

Research 1.00. Develop and implement research and scholarly service programs with respect to surficial processes and their Quaternary stratigraphic record in Nebraska, emphasizing some combination of glacial and fluvial and/or eolian processes and using field data collection and geographic information systems (GIS). Continue participation in USGS STATEMAP and EDMAP surficial geologic mapping. Provide support to programs in groundwater development and land-use management.

Research Geologist/Assistant Professor

Research 1.00. Develop and conduct a program of field-based research and scholarly service in areas including, but not limited to, stratigraphy, sedimentology and geological natural resource evaluation and management. Continue CSD participation in USGS STATEMAP and EDMAP geologic mapping. Research will focus on the Tertiary strata of Nebraska, but a working knowledge of the geology of Nebraska is expected.. Preference will be given to those with backgrounds in GIS, biostratigraphy or other closely related disciplines.

SNR administration and faculty would appreciate the insights of the CSREES review team on specific new faculty positions that would strengthen SNR programs.

Staff resources

SNR is supported by 89 staff filling 90 positions; 38 of which are nonexempt (hourly) and 52 of which are exempt (salaried). A summary of the staff is in Table 3.3.

Table 3.3 SNR Staff by Function and Funding Source

| General Function | Number of full- or part-time positions | State-Funded FTE | Soft-Funded FTE | Total FTE |
|------------------|--|------------------|-----------------|-----------|
| Analyst | 2 | 0 | 2.00 | 2.00 |

| | | | | |
|----------------------------------|----|-------|-------|-------|
| Business | 9 | 6.20 | 1.25 | 7.45 |
| Chemist | 2 | 0 | 2.00 | 2.00 |
| Climatologist | 2 | 1.00 | 1.00 | 2.00 |
| Coordinator | 8 | 1.00 | 6.00 | 7.00 |
| GIS/Cartography/Database Support | 4 | 3.75 | 0 | 3.75 |
| IT/Computing | 3 | 2.40 | 0.30 | 2.70 |
| Manager | 3 | .50 | 1.70 | 2.20 |
| Office/Clerical | 16 | 7.35 | 6.65 | 14.00 |
| Publications/Editor | 2 | 1.80 | 0 | 1.80 |
| Specialist | 15 | 2.75 | 11.85 | 14.60 |
| Technician (hourly) | 11 | 2.00 | 8.50 | 10.50 |
| Technologist (salaried) | 13 | 3.00 | 9.50 | 12.50 |
| Total | 90 | 31.75 | 50.75 | 82.50 |

Note: one employee is filling two part-time positions; total number of staff is 89

Office/Clerical staff resources

SNR is supported by 14 office/clerkal staff positions (14.00 FTE) filled by 16 employees. The services provided by these staff include clerical support to the Director, Associate Directors, Coordinators, Center Directors, and faculty and staff; specialized word processing and skills for preparation of manuscripts, grant proposals, other publications; specialized graphic and presentation design skills for web sites, web-based course information, and presentations; and database skills for developing and maintaining workshop information. The current employees in these positions are highly skilled and not only provide technical knowledge, but also serve as a tremendous resource for identifying improvements for delivering information/products to our customers, developing solutions for problems, and maintaining an effective communication system within the School. Included in these positions is support for the Earth Science Information Center Office and the Sales & Publications area, which is closely associated with business operations.

A summary of the office/clerical staff by title can be found in Table 3.4:

Table 3.4 SNR Office/Clerical Staff by Title

| General Title | Number of positions | State-Funded FTE | Soft-Funded FTE | Total FTE |
|---------------------------|---------------------|------------------|-----------------|-----------|
| Clerical Assistant | 6 | 1.61 | 2.89 | 4.50 |
| Project Assistant | 2 | .47 | 1.53 | 2.00 |
| Staff Secretary | 3 | 1.88 | .62 | 2.50 |
| Staff Assistant | 1 | .80 | .20 | 1.00 |
| Web Programming Assistant | 1 | 0 | 1.00 | 1.00 |
| Office Supervisor | 1 | .75 | .25 | 1.00 |
| Secretarial Specialist | 2 | 1.84 | .16 | 2.00 |
| Total | 16 | 7.35 | 6.65 | 14.00 |

General Support

Additional general support is provided to the School by 20 staff (17.70 FTE) in the areas of Information Technology/Computing, Geographic Information Systems, cartography, data systems support, drilling and field services, business services (see NRBC information below), and publications and editorial services.

Natural Resources Business Center staff resources

The Natural Resources Business Center (NRBC) provides business and administrative services to five units on campus: Environmental Studies Program, Nebraska Forest, Nebraska LEAD Program, Service/Nebraska Statewide Arboretum, and the School of Natural Resources. Services include human resources management, budgeting, purchasing, payroll, accounting, grants management, and administrative support. Each staff member is a specialist in his/her focus area. The NRBC is supported by funds collected from the units served.

Technical staff resources

The School and its Centers are supported by 54 positions (50.8 FTE) that provide specialized technical support to teaching, research, extension, and survey activities and programs in the School and its five Centers. These staff coordinate extension, research, and educational projects, have tremendous expertise, and are the backbone of the organization. Of the 50.8 FTE, 8.25 FTE are state-funded, while the remaining 42.55 FTE are funded from grants and contracts.

Staff involvement

It is worthy of note that when SNRS was formed in 1997 that considerable attention was given to the importance of staff participation in the governance of the unit. As the By-Laws for the unit evolved, a Staff Professional Development Committee was formed which provides a forum for staff issues. In addition, there are staff representatives on the Advisory Committee, Research Committee, and Outreach Committee. The participation of staff in the newly formed SNR will continue and be enhanced.

Faculty and Staff: Demographics and Gender and Ethnic Diversity

SNR faculty and staff are well distributed by age as demonstrated by Table 3.5. Sixteen faculty are in the 56-60 age group, of some concern if these faculty choose to retire between the ages of 62 and 65. We also have 5 faculty in the 61-65 age group and 3 faculty 66 years of age or older. Replacing a large number of faculty within a short time frame is difficult and disruptive to the continuity of teaching, research, and extension/outreach programs. During the current budget climate, a significant reduction in senior faculty within a short period of time is also of concern because of the danger of losing tenure-leading faculty lines. Overall, however, SNR faculty are in the early to mid-points in their professional career, providing the opportunity for years of service to the institution. For example, 38 of 74 faculty are under the age of 50. The age distribution for staff is skewed more toward younger ages—68 of 89 staff are under the age of 50. SNR staff are a tremendous resource to the unit providing technical support for many research and extension/outreach programs, as well as clerical support for faculty and technical support staff.

Table 3.5 Employees by Age

| Age | Faculty | Staff | Totals |
|--------------|-----------|-----------|------------|
| 20-25 | 0 | 3 | 3 |
| 26-30 | 0 | 16 | 16 |
| 31-35 | 4 | 12 | 16 |
| 36-40 | 9 | 10 | 19 |
| 41-45 | 17 | 18 | 35 |
| 46-50 | 8 | 9 | 17 |
| 51-55 | 12 | 7 | 19 |
| 56-60 | 16 | 11 | 27 |
| 61-65 | 5 | 1 | 6 |
| 66+ | 3 | 2 | 5 |
| TOTAL | 74 | 89 | 163 |

SNR faculty are evenly distributed by years of service to UNL, although there is a large number of faculty that have recently (1 to 5 years) joined the institution (see Table 3.6). Thirty-two of 74 faculty have ≤10 years at UNL. This balance between younger and more senior faculty is a strength in SNR. Not surprising is the large number of staff that have joined SNR in the last 10 years (58 of 89 staff).

Table 3.6 Employees by Years of Service

| Years of Service | Faculty | Staff | Total |
|------------------|-----------|-----------|------------|
| 1-5 | 22 | 45 | 67 |
| 6-10 | 10 | 13 | 23 |
| 11-15 | 9 | 12 | 21 |
| 16-20 | 5 | 8 | 13 |
| 21-25 | 12 | 6 | 18 |
| 26-30 | 10 | 3 | 13 |
| 31-35 | 5 | 2 | 7 |
| 36-40 | 0 | 0 | 0 |
| 41-45 | 1 | 0 | 1 |
| 46-50 | 0 | 0 | 0 |
| 50+ | 0 | 0 | 0 |
| TOTAL | 74 | 89 | 163 |

Ethnic diversity and gender diversity among faculty and staff are provided in Tables 3.7 and 3.8, respectively. About 9.5% of the faculty are of ethnic background, while only 1 of 89 staff are of ethnic background. Ethnic diversity by gender is 8.8% for male faculty and 16.7% for female faculty. For staff, ethnic diversity is 1 in 44 for male staff. No female staff are of ethnic background.

Table 3.7 Employees of Ethnic Diversity

| Ethnicity | Faculty | Staff | Totals |
|---------------------|-----------|-----------|------------|
| All others | 7 | 1 | 8 |
| White, non-Hispanic | 67 | 88 | 155 |
| TOTALS | 74 | 89 | 163 |

Table 3.8. Ethnic Diversity by Gender

| Faculty | Male | Female | Total |
|--------------------|------------|-----------|------------|
| All others | 6 | 1 | 7 |
| White, non- | 62 | 5 | 67 |
| Total | 68 | 6 | 74 |
| Staff | | | |
| All others | 1 | 0 | 1 |
| White, non- | 43 | 45 | 88 |
| Total | 44 | 45 | 89 |
| GRAND TOTAL | 112 | 51 | 163 |

3.2 Financial and Physical Resources

Budgetary Information

The School of Natural Resources receives funding from state appropriations, grants and contracts, indirect cost recovery, and revolving income. A summary for the past 5 years can be found in Table 3.9.

Table 3.9 SNR Budget Summary

| Funding | FY1998 | FY 1999 | FY 2000 | FY 2001 | FY 2002 | FY 2003 Est. Actual |
|---------------------------------|--------------|--------------|--------------|--------------|--------------|------------------------|
| Appropriations ¹ | \$5,200,215 | \$6,107,644 | \$6,211,472 | \$6,205,632 | \$6,274,950 | \$6,200,219 |
| Grants & Contracts ² | 5,237,139 | 5,883,193 | 5,242,654 | 5,821,095 | 5,480,825 | 6,339,063 |
| Indirect Cost Recovery | 131,415 | 120,874 | 166,488 | 160,165 | 190,757 | 212,370 |
| Revolving Income | 108,280 | 140,220 | 83,059 | 198,005 | 209,412 | 92,770 |
| Total | \$10,677,049 | \$12,251,931 | \$11,703,673 | \$12,384,897 | \$12,155,944 | \$12,844,422 |

*¹ Includes Hatch funds, salaries/benefits, permanent and one-time allocations.

**² Includes Federal Formula Fund allocations, such as Regional Research, McIntyre-Stennis, and Integrated Pest Management.

Computing resources and laboratories

The SNR Information Technology Support Team provides technical and specialized computing services to SNR faculty and staff. The IT Support Team includes the IT Manager, Jim Hines, and two computer technicians. Currently, the IT Support Team is housed on both East and City Campus in three buildings. They are responsible for maintaining over 400 computers and 8 servers. SNR also has laptops and audio-visual equipment that is available to all SNR faculty and staff on a check out basis. SNR centers and program areas also have laptops and other computer equipment that are housed within their office facilities, primarily for use by faculty and staff within these groups. This equipment has, for the most part, been purchased from external funds designated to these centers or program areas. Clerical and NRBC computers were purchased primarily by SNR.

Financial resources for purchasing and maintaining computers within SNR come from two sources. State appropriated funds are used to support administrative needs and to provide general computer and server support. These funds are allocated by the SNR director to the IT manager. Other computer needs are funded by faculty through external project funds in research, extension/outreach, and teaching.

General or open computer laboratories for students are limited in SNR currently. UNL does provide open computer laboratories. Many of SNR's graduate students have computers that are designated for their use, usually located in their office.

With the pending move of SNR to Hardin Hall, all computer staff and services will be consolidated into one building complex. This will improve the efficiency of the IT Support Team in providing computer

services to SNR faculty and staff. Additional space will also be allocated to the computing needs of faculty, staff, and students through new computer teaching labs and specialized computer laboratories.

Other space related to the program

See Chapter 4 (Section 4.3, pg. 4-20) for a comprehensive list of laboratory, field and other off-campus facilities in or available to SNR.

3.3 Hardin Hall

The creation of SNRS in 1997 and the recent creation of SNR, which merged SNRS, CSD, and WC in 2003, has resulted in faculty and programs being scattered among at least nine buildings on UNL's East and City Campuses. Associated with the merger with CSD, there are also numerous faculty and staff located at other out-state facilities in Norfolk, North Platte, Oshkosh, and Scottsbluff. This lack of adjacency of faculty and staff was a hindrance to SNRS from the time it was created, and is anticipated to continue to be a hindrance for SNR programs. In addition, the lack of adjacency also has hindered the creation of a sense of community among faculty and staff within this diverse and large unit. We also believe that it has affected the visibility of the individual units that were merged and hampered our early undergraduate and graduate student recruitment efforts.

Construction of a new facility for SNR has been a priority for IANR and UNL administration since the formation of SNRS in 1997. Funding in the amount of \$17,055,000 has been garnered from the USDA (\$9.6 million), Nebraska Deferred Maintenance Bond Fund (\$6.655 million), and IANR and LB 1100 funds (\$800,000). The original plan was to construct a new Natural Resources Research Complex (NRRC) building on East Campus. The resources described above were to be used to construct Phase I of this complex and would have included only a portion of SNRS, plus CALMIT. A number of laboratories, program areas, and graduate students offices would not have been included in Phase I of the building because of a shortage of construction funds. A Phase II was planned to include CSD, but no funds were available in the foreseeable future to realize this goal. A Phase III was also planned, which would have represented a federal complex to house all or portions of NRCS, USGS, and other federal agencies located in Lincoln.

In 2002, as a result of budget reductions at UNL, most of the programs of the Division of Continuing Studies (DCS) were closed. DCS was housed in the Clifford Hardin Center for Continuing Studies located at 33rd and Holdrege, the entrance to UNL's East Campus. This facility includes conference rooms, an auditorium, hotel complex, and offices for DCS staff. The Hardin Center includes approximately 144,500 square feet. Concurrent with the decision to close DCS, a decision was made by IANR administration to merge the existing units of CSD and WC into SNRS, bringing together many of the natural resources faculty and programs at UNL. With the closure of DCS, the possibility of diverting the construction funds originally allocated to the construction of Phase I of the NRRC to the renovation of the Hardin Center, with the inclusion of a new lab wing, was immediately considered by IANR and UNL administration. Following a feasibility study conducted by UNL's Facilities Management Unit, this project received the approval of UNL's Board of Regents and is proceeding forward (Appendix 3.2). Renovation and construction of the new lab facility for the newly named Hardin Hall is expected to begin in early 2004, with completion in August 2005. This facility will house all of the faculty, staff, and students and most of the laboratories of SNR. The new laboratory addition will include an additional 33,000 square feet, bringing the total space available in the building to more than 177,000 square feet. In addition to SNR, Hardin Hall will also house the Department of Statistics in the north wing of the complex.

As a part of the planning process, we have also considered opportunities for expansion of Hardin Hall to accommodate future SNR growth. The large, two-story auditorium that currently exists in the building will not be renovated at this time because of the shortage of construction funds. In the future, this auditorium could be eliminated, creating two floors of offices, computer laboratories, and classrooms. In addition, the Hardin Hall courtyard has adequate space to accommodate another lab wing or an expansion of the new lab wing that is currently included in the project. There also exists space north of Hardin Hall for the construction of the federal office and laboratory complex that was originally envisioned as part of the NRRC complex.

The total funding available for the renovation of Hardin Hall and the new lab wing is insufficient to allow for the full renovation of the facility or the construction of adequate laboratory space for SNR. In particular, the soils labs may not be included in the new facility. This deletion includes approximately 4,000 square feet of space. SNR is seeking additional funding to add these labs to the project. In addition, the majority of the space in the north wing of Hardin Hall will not be renovated. This portion of the facility will house SNR staff and graduate students, the Natural Resources Business Center, teaching labs and a classroom, and the Department of Statistics. The remainder of the complex, not including much of the lobby area, will be fully renovated. The 9-story hotel tower will house SNR faculty and many staff and will be fully renovated.

One of the major attributes of Hardin Hall is the large lobby space available, uncharacteristic of most university buildings. This large lobby space on the ground floor, plus additional lobby space in the basement and on the second floor of the south wing, will be used to promote SNR programs and provide space for interactions between faculty, staff, students, and the public. The first floor of the complex will also house an “outreach mall” that will provide direct access of SNR extension and outreach services and student recruitment to students and the public.

The consolidation of SNR faculty and staff into a single facility, with the exception of a few laboratories, is considered an important step forward in raising the visibility of natural resources programs at UNL and within IANR. It will also promote a sense of community within the unit, although we understand that this process will take considerable time to achieve because of the size of the unit and the diversity of programs within the unit.

APPENDIX 3.1

Faculty with Courtesy Appointments in the School of Natural Resources

J. David Aiken, Professor, Department of Agricultural Economics, University of Nebraska-Lincoln.

Mark R. Anderson, Associate Professor, Department of Geosciences, University of Nebraska-Lincoln.

Timothy J. Arkebauer, Associate Professor, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

Gwendolyn C. Bachman, Assistant Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Ezekiel Bahar, George Holmes Professor, Department of Electrical Engineering, University of Nebraska-Lincoln.

Royce E. Ballinger, Director of Nebraska EPSCoR, Assistant Executive Vice President and Provost, and Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Alexandra Basolo, Associate Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Frederick P. Baxendale, Professor, Department of Entomology, University of Nebraska-Lincoln.

Mary M. Beck, Professor, Department of Animal Science, University of Nebraska-Lincoln.

Erin Blankenship, Assistant Professor, Department of Biometry, University of Nebraska-Lincoln.

Istvan Bogardi, Professor, Department of Civil Engineering, University of Nebraska-Lincoln.

Dean E. Eisenhauer, Professor, Department of Biological Systems Engineering, University of Nebraska-Lincoln.

Kent M. Eskridge, Professor, Department of Biometry, University of Nebraska-Lincoln.

Charles A. Francis, Professor and Extension Crop Specialist, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

Thomas G. Franti, Associate Professor, Department of Biological Systems Engineering, University of Nebraska-Lincoln.

Robert M. Gibson, Professor, School of Biological Sciences, University of Nebraska-Lincoln.

DeLynn R. Hay, Associate Professor, Biological Systems Engineering; and Program Leader, Cooperative Extension Division; University of Nebraska-Lincoln.

Laurie Hodges, Associate Professor and Extension Specialist, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

John Janovy, Jr., Varner Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Anthony Joern, Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Shripat T. Kamble, Professor, Department of Entomology, University of Nebraska-Lincoln.

Alan C. Kamil, Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Kathleen H. Keeler, Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Merlin P. Lawson, Professor, Department of Geosciences, Dean (Emer) of Graduate Studies and Dean (Emer) International Affairs, University of Nebraska-Lincoln.

James H. Locklear, Director, Nebraska Statewide Arboretum, University of Nebraska-Lincoln.

Richard J. Lodes, NRD Forester, Nebraska Forest Service, University of Nebraska-Lincoln.

Svata M. Louda, Charles Bessey Professor, School of Biological Sciences, University of Nebraska-Lincoln.

William R. Lovett, Forester, Nebraska Forest Service, University of Nebraska-Lincoln.

Gary D. Lynne, Professor, Department of Agricultural Economics, University of Nebraska-Lincoln.

David B. Marx, Professor, Department of Biometry, University of Nebraska-Lincoln.

Dennis L. McCallister, Associate Professor, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

David P. Mooter, Community Forester and Nebraska Forest Service Forester, Omaha, NE.

Lowell E. Moser, Sunkist Fiesta Bowl Professor, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

Ram M. Narayanan, Professor, Department of Electrical Engineering, University of Nebraska-Lincoln.

Brent B. Nickol, Professor and Vice Director, School of Biological Sciences, University of Nebraska-Lincoln.

Guillermo Ortí, Assistant Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Robert Palmer, Professor, Department of Electrical Engineering, University of Nebraska-Lincoln.

Anne Parkhurst, Professor, Department of Biometry, University of Nebraska-Lincoln.

Darryll Pederson, Professor, Department of Geosciences, University of Nebraska-Lincoln.

Diana Pilson, Assistant Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Thomas O. Powers, Associate Professor, Department of Plant Pathology, University of Nebraska-Lincoln.

Eric J. Rasmussen, Rural Fire Training Instructor & Associate Forester, Nebraska Forest Service, University of Nebraska-Lincoln.

Terrance P. Riordan, Professor, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

Clinton M. Rowe, Associate Professor, Department of Geosciences, University of Nebraska-Lincoln.

Walter H. Schacht, Associate Professor, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

James Stubbendieck, Director of Center for Great Plains Studies; Professor of Range Ecology, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

Raymond J. Supalla, Professor, Department of Agricultural Economics, University of Nebraska-Lincoln.

Dale Swartzendruber, Professor (Emeritus), Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

William E. Wagner, Jr., Assistant Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Daniel T. Walters, Professor, Department of Agronomy and Horticulture, University of Nebraska-Lincoln.

Donald Westover, Fire Program Leader, Nebraska Forest Service, University of Nebraska-Lincoln.

Anthony J. Zera, Associate Professor, School of Biological Sciences, University of Nebraska-Lincoln.

Vitaly A. Zlotnik, Professor, Department of Geosciences, University of Nebraska-Lincoln.

Faculty with Adjunct Appointments in the School of Natural Resources

Ann S. Bleed, Deputy Director and State Hydrologist, Nebraska Department of Natural Resources, Lincoln, NE.

Kevin E. Church, Program Coordinator, Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

Craig A. Davis, Assistant Professor, Department of Zoology, Oklahoma State University, Stillwater, OK.

Mary Ellen Dix, Research Entomologist, USDA Forest Service, Forest Health Management, Washington, DC.

John W. Doran, USDA-ARS Soil Scientist, USDA-ARS Soil & Water Conservation Research Unit, University of Nebraska-Lincoln.

Michael G. Dosskey, Assistant Professor, USDA Forest Service, National Agroforestry Center, Lincoln, NE.

William E. Easterling, Associate Professor, Department of Geography, Pennsylvania State University, University Park, PA.

Kevin P. Gallo, Adjunct Associate Professor and Physical Scientist, USGS EROS Data Center, NOAA/NESDIS, Sioux Falls, SD.

Michael Glantz, ESIG, National Center for Atmospheric Research, Boulder, CO.

LeRoy Hahn (Emeritus), Professor, USDA-ARS MARC, Clay Center, NE.

Rick Holland, Assistant Professor, Nebraska Game and Parks Commission, Lincoln, NE.

Ned Klopfenstein, Assistant Professor, USDA Forest Service, Moscow, ID.

Rezaul Mahmood, Assistant Professor, Department of Geography and Geology, Western Kentucky University, Bowling Green, KY.

Linda O. Mearns, Scientist, ESIG, National Center for Atmospheric Research, Boulder, CO.

Jeffrey L. Privette, Physical Scientist/Instructor, Department of Biospheric Sciences, NASA's Goddard Space Flight Center, Greenbelt, MD.

Gregory A. Ruark, Director, USDA National Agroforestry Center, University of Nebraska-Lincoln.

Julie A. Savidge, Associate Professor, Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO.

Rick Schneider, Coordinator for Nebraska Natural Heritage Program, Nebraska Game and Parks Commission, Lincoln, NE.

Michele Schoeneberger, Research Soil Scientist/Project Leader, USDA Forest Service, Rocky Mountain Station, National Agroforestry Center, Lincoln, NE.

Thomas F. Seibert, Private Consultant, Fort Collins, CO.

Gerry Steinauer, Nebraska Game and Parks Commission, Lincoln, NE.

David E. Stooksbury, State Climatologist/Assistant Professor, Department of Biological and Agricultural Engineering, Driftmier Engineering Center, University of Georgia, Athens, GA.

Richard T. Straight, Associate Forester, USDA Forest Service, Rocky Mountain Station, National Agroforestry Center, Lincoln, NE.

J. Scott Taylor, Upland Game Program Manager, Nebraska Game and Parks Commission, Lincoln, NE.

Kurt VerCauteren, Research Wildlife Biologist, USDA/APHIS/WS, National Wildlife Research Center, Fort Collins, CO.

Mark P. Vrtiska, Water-fowl Program Manager, Nebraska Game and Parks Commission, Lincoln, NE.

Gary D. Willson, Research Coordinator for Great Plains Cooperative Ecosystem Studies Unit, National Park Service, Lincoln, NE.

CHAPTER 4 - ACADEMIC PROGRAMS

Executive Summary

The School of Natural Resources (SNR) has strengths on which to build a leading program in natural resources and ecosystem science. Strengths include a variety of science disciplines (climate and bio-atmospheric sciences, biological sciences, geospatial information, human dimensions, earth sciences, water sciences and ecosystem science).

Our accomplishments to date (since 1997) in the undergraduate program include:

- establishment of the Natural Resources Undergraduate Curriculum Committee [a formal College of Agricultural Sciences and Natural Resources (CASNR) advisory group to the CASNR Curriculum Committee],
- administrative authority for five of the six UNL Natural Resources majors,
- responsibility of awarding University- and Foundation-endowed natural resources scholarships,
- proposal for revision of the Bachelor of Science in Natural Resources core curriculum.

Accomplishments in the graduate program include:

- revision of the M.S. degree with a major in Fisheries and Wildlife to an M.S. degree with a major in Natural Resource Sciences,
- establishment of a Ph.D. in Natural Resource Sciences,
- establishment of graduate student application and admittance procedures,
- preparation of a graduate faculty and graduate student handbook,
- establishment of numerous specializations in the graduate major in Natural Resource Sciences.

Other accomplishments include:

- preparation of recruitment and retention plans for both graduate and undergraduate majors
- plans for centrally locating natural resources faculty and teaching facilities in renovated Hardin Hall.

SNR faces a number of issues in undergraduate and graduate education as we head into the future in natural resources and ecosystem science. The SNR has been and remains in a state of flux with the creation of the School of Natural Resource Sciences (SNRS) six years ago, the recent merger, and multiple changes in directorship. Issues include:

- Strengthen undergraduate programs: (a) improve or develop courses that attract a large number of undergraduate students, (b) improve the visibility of various majors, (c) develop an undergraduate student database, (d) build GIS into undergraduate and graduate curriculum, (e) more fully integrate all Natural Resources courses, (f) formalize independent study courses (g) review majors, and (h) increase involvement of undergraduate students in research;
- Strengthen graduate programs: (a) implement the assessment tool, (b) quality control of graduate students in program, (c) prepare graduate students to become better teachers, (d) develop new graduate professional programs, and (e) develop a full complement of specializations for the Ph.D. program;
- Develop strong recruitment and retention programs for both undergraduate and graduate students: (a) increase recruitment efforts and faculty involvement, (b) enhance scholarships, internships, and job placement efforts, and (c) establish an external SNR Advisory Group;
- Increase focus on teaching: (a) involve more faculty in teaching, (b) recognize and reward teaching, (c) provide state-of-the-art teaching laboratory facilities, (d) hire replacement faculty for undergraduate teaching, (e) improve evaluation of teaching, (f) institute regular evaluation of student progress, and (g) cross-list all appropriate BIOS courses;
- Provide state-of-the-art teaching laboratory facilities: (a) teaching classrooms in the new building, (b) teaching laboratories in the new building, (c) computer laboratories, and (d) external teaching facilities.

CHAPTER 4 - ACADEMIC PROGRAMS
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ACADEMIC PROGRAMS

4.1 Introduction

The School of Natural Resources (SNR) is comprised of faculty from units within the Institute of Agriculture and Natural Resources (IANR), the College of Arts and Sciences, and other University colleges that focus on critical natural resource and environmental issues. Seventy-four faculty have full or partial appointments in SNR (9 of whom have 50% or less of their appointment in SNR) (see Appendix 2.1); 52 faculty in Agronomy & Horticulture, Agricultural Economics, Animal Science, Biological Sciences, Biological Systems Engineering, Electrical Engineering, Entomology, Geosciences, and other departments have courtesy appointments in SNR.

4.1.1 Teaching Vision and Goals

The SNR is committed to building from traditional disciplinary strengths in the physical, biological, and social sciences by providing a quality academic experience for students that prepares them to assume roles as scientists, managers, and users of natural resources during the 21st century. SNR fosters an integrated approach to natural resource and ecosystem science through academic, scholarly service, disciplinary research, and outreach programs. Our academic programs take advantage of research within the School providing an understanding of the complex relationships and interactions within and among natural and managed ecosystems. The School encourages the use and protection of natural resources by developing or applying strategies that are ecologically sound, economically viable, and socially responsible. Collaboration and mutual respect within and among disciplines as well as with private and governmental agencies enhances the undergraduate and graduate experience with the School.

4.1.2 Teaching Administration and FTE

Teaching Coordinator. Specific responsibilities of the SNR Teaching Coordinator (0.25 FTE, non-administrative appointment) include advising the Director regarding student issues; serving as *ex officio* member on the Natural Resources Undergraduate Curriculum Committee (NRUCC) and the SNR Graduate Committee; serving as SNR resource person on education; encouraging faculty award nominations, assisting in the dissemination of student fellowship and assistantship information; assisting in recruitment activities; planning and presiding at SNR retreats regarding teaching matters; managing the five-year review and its implementation regarding teaching issues; and attending local, regional and national conferences regarding undergraduate and graduate education.

Teaching FTE. The SNR has a total budgeted Teaching FTE of 6.27 through the College of Agricultural Sciences and Natural Resources (CASNR), distributed among 24 faculty members and 1.10 Teaching FTE through the College of Arts and Sciences (CAS), distributed among 4 faculty members. Faculty and their budgeted teaching appointments are listed in Appendix 4.1. Faculty curriculum vitae are found in Chapter 9. The unit generated 2,168 student credit hours (SCH) in the year 2001-2002 (1,848 in CASNR, 320 in CAS) with a Teaching FTE of 7.37 during this period (6.27 in CASNR and 1.10 in CAS), resulted in 293 SCH/FTE were generated (295 in CASNR and 291 in CAS). This ratio is lower than the CASNR average of 595.

Student Credit Hours per FTE. The trend in SCH/FTE has been more or less consistent since 1997 (Fig. 4.1), although discrepancies in reporting sources may be confounding the data (early data are from the Institutional Research and Planning Office, while more recent data has been compiled by CASNR).

Faculty Teaching FTE are evaluated annually by CASNR (using the Academic Appointment Calculation) and based on those results; the effort in large measure matches the resources (based on student enrollment, undergraduate and graduate student advising, teaching outreach efforts, and committees), although some adjustments may be warranted. In part, the low rate reflects the vacancy of teaching positions during the last five years and the 2 year delay in refilling these positions (attributed to possible reluctance of students to take classes with temporary faculty teaching and classes not offered). These positions were only recently filled (Larkin Powell was hired August 2001 and Drew Tyre was hired February 2003). Natural Resources is an integrative science and as such draws heavily on 100 and 200 introductory-level courses taught by faculty in other departments, particularly Agronomy and Horticulture, Biological Sciences, and Biological Systems Engineering. Thus, we utilize faculty within the School primarily in upper division and graduate-level courses specific to majors. These courses typically have lower student enrollment than larger service-type courses. This also caused the SCH/FTE ratio to be low compared to other majors within CASNR. The current difficulty in tracking student credit hour production for SNR may also contribute to the SCH/FTE but the effect is likely not significant. However, the need to retrieve timely and accurate data is essential in assessing programs.

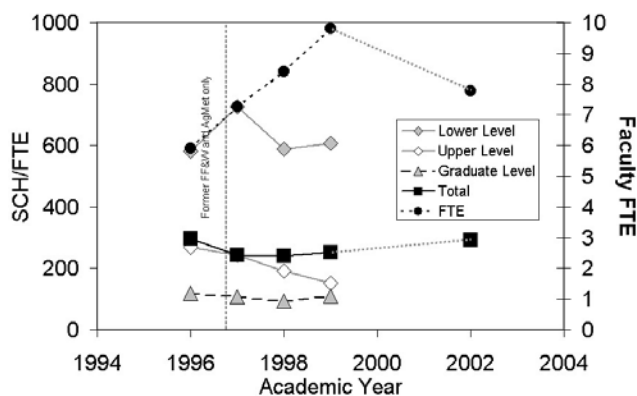


Fig. 4.1. Student Credit Hour (SCH) per FTE (SCH/FTE) for undergraduate and graduate level courses. Faculty Teaching FTE are reported as well. Inconsistencies in data and incomplete data result from different reporting sources (IRP for 1996-1999 data; CASNR for 2002 data)

To increase student enrollment, SNR needs to gain recognition through advertising existing courses and offering new courses. For example, discussions are underway to develop an introductory course to Natural Resources and Quantitative Skills in Natural Resources. An introductory course on Geospatial Information Science (GIScience, NRES 312) has been proposed; the course was offered Spring 2003 as an independent study course, taught by Larkin Powell. Progress is being made to incorporate geospatial information sciences and quantitative skills in undergraduate courses offered at Freshmen to Senior levels to better prepare our students to attract a larger student enrollment. Also, a plan to develop an umbrella Meteorology program with faculty in the SNR Climate and Bio-Atmospheric Sciences group and Meteorology/Climatology in Geosciences in CAS are being discussed.

4.1.3 Teaching Support

Teaching is supported primarily through CASNR, with some funding comes from the CAS and unit funds (Appendix 4.1); some faculty associated with SNR have teaching appointments in other units. In academic year 2002-03, CASNR provided \$541,728 in salary support for 6.74 Teaching FTE (average of \$80,375 per teaching FTE) and \$26,315 for clerical/secretarial and technical support. There are currently no teaching funds supporting managerial/professionals in SNR. The CASNR provided \$42,850 in graduate assistantships and \$21,713 in operating. Operating funds are distributed based on teaching loads (lecture and laboratory), and an average of \$180 per teaching faculty was provided. Including benefits, the total teaching support from CASNR was \$114,705/FTE. The Agricultural Research Division (ARD) provided \$84,428 in support of graduate research assistantships. The support from CASNR has gradually increased during the last six years while that from ARD has fluctuated about an average value of \$84,000 (Fig. 4.2).

Figure 4.2. State dollars supporting (a) graduate student assistantships and (b) faculty salaries and operating expenses starting from academic year 1997-1998 through 2002-2003 (source: NRBC).

Additional support for teaching comes from the CAS (providing for 1.10 FTE). In academic year 2001-02 CAS provided \$64,970 in faculty salary support (\$56,336 per teaching FTE); no teaching funds are available to support managerial/professionals, clerical/secretarial, or graduate assistantships. \$2,758 is provided for operating. Considering benefits, the total teaching support from CAS was \$75,155/FTE. All but one CAS faculty member is on an academic-year appointment. Annualizing the academic-year salaries and considering benefits, the total teaching support from CAS was \$87,917/FTE.

Additional Support. The SNR has yet to aggressively tap into external funds available for teaching, although progress is being made. Dr. Larkin Powell and associates (Johnson, Merchant, Walter-Shea, and Zanner) received \$5,100 from the UNL Teaching, Learning and Technology Roundtable for efforts in integrating geospatial information technologies into natural resources curricula. The CASNR has provided additional support for this effort (approximately \$9,000 toward the purchase of 10 GPS units, software and color laser printer). Faculty from Biological Sciences, Geosciences, and SNR successfully secured GAANN (U.S. Dept. of Education Graduate Assistance in Areas of National Need Program) funds for the Graduate Training Program in Ecology and Environmental Biology to facilitate understanding of the dynamics and complexity of natural systems through interdisciplinary efforts. Development of exceptional teaching capabilities in students is part of the training. The SNR Graduate Committee [Harvey (chair), Brandle, Shea, Narumalani, and Zanner] successfully secured funds for supplemental stipends (Othmer Fellowship \$7,500, applicable for recruitment of an outstanding Ph.D. student) through the UNL Graduate Studies Office. In addition, the Committee was successful in securing \$3,000 through a Graduate Student Recruitment Grant from the UNL Graduate Studies Office. The funds will be used for the production of our M.S. and Ph.D. Specialization Fact Sheets.

4.2 Academic Programs Administered through SNR

The SNR is the administrative home to five undergraduate majors in the Bachelor of Science in Natural Resources (BSNR) degree program within the CASNR. The five majors are: *Environmental Soil Science, Fisheries and Wildlife, Natural Resources emphasis within the Environmental Studies major, Rangeland Ecosystem, and Water Science* with two non-degree programs in *Pre-Forestry* and *Undeclared Natural Resources* majors (a sixth major in the BSNR, *Natural Resources and Environment Economics*, is administered through the Department of Agricultural Economics). Minors are available in these areas as well. Two graduate degree programs are administered by the SNR: a *Masters of Science* and a *Ph.D. with a major in Natural Resource Sciences*; specializations are currently offered in these programs. Courses with their academic home in SNR are designated with the NRES prefix to indicate courses in the area of Natural Resource Sciences. The undergraduate and graduate programs administered by SNR emphasize an interdisciplinary approach to education while providing students with a strong grounding in the major and specialization of their choice. The SNR Faculty also advise graduate students in other majors (e.g., Agronomy, Geology, Geography, Biological Sciences). In addition, faculty participate and advise students in an interdepartmental doctoral program in Horticulture and Forestry.

4.2.1 Undergraduate Programs

The undergraduate programs emphasize an interdisciplinary approach to education while providing students with a strong grounding in the major of their choice. Courses of instruction in these majors provide students with the tools to describe the characteristics of natural resource systems which include the atmosphere, hydrosphere, geosphere and biosphere. In addition, graduates of these majors are expected to understand the interactions within and among natural resource systems and evaluate the impacts of humans as stewards and managers of these systems. Along with technical expertise, each student develops problem-solving and communications skills which will enable them to take their place as professionals in a diversity of natural resources careers. The degree requirements for the BSNR apply to all Natural Resources majors and reflect the philosophy that there is a common foundation of knowledge essential for professionals in natural resource sciences. The curriculum of each major incorporates the minimum requirements for the BSNR, then each major is tailored with requirements specific to that major. The basic structure of the BSNR is provided in Appendix 4.2. A revised core curriculum has been proposed (Appendix 4.3).

Natural Resources Undergraduate Curriculum Committee. The undergraduate programs in natural resources are administered by SNR through the Natural Resources Undergraduate Curriculum Committee (NRUCC). The NRUCC was officially formed in the Fall of 2001 by the Dean of CASNR. The NRUCC consists of the Chair of each Natural Resource major committee, plus the Teaching Coordinator for the SNR (*ex officio*). Two to three additional representatives “at-large” are elected by the Natural Resources Faculty. Current Committee members are: Drs. Joe Skopp (chair, Environmental Soil Science), Tala Awada (SNR), Jim Brandle (Pre-Forestry), Dean Eisenhauer (Water Science), Bruce Johnson (Natural Resource and Environmental Economics), Bob Kuzelka (Environmental Studies), Ed Peters (Fisheries and Wildlife), Walter Schacht (Rangeland Ecosystems), and Dave Wedin (SNR). The Committee shall also have a graduate student representative and an undergraduate student representative selected by the appropriate student body group; no students have been yet identified.

The Committee is charged with (a) initiating and reviewing alterations, recommendations, and suggestions regarding core curriculum requirements for the BSNR; (b) assessing the BSNR degree program and coordinating the assessment of individual majors; (c) providing coordination of recruitment, retention and placement activities for the BSNR majors; (d) handling requests for courses that are designated NRES, including new course proposals, course changes and cross-listings; (e) advising of undeclared Natural Resource majors; (f) receiving copies of all changes proposed by major committees of the CASNR Curriculum committee for informational purposes; (g) annually meeting with the Director of the School for the purpose of informing, assessing and visioning; and; (h) any other matters regarding

core curriculum or NRES courses. Responsibilities for the individual majors remain the purview of the major's curriculum committees.

Majors in the Bachelor of Science in Natural Resources

*The **Environmental Soil Science major** is governed by an interdepartmental committee. Current members are: Drs. Joe Skopp (chair, SNR), Rhae Drijber (Agronomy & Horticulture), Dean Eisenhauer (Biological Systems Engineering), Bob Kuzelka (SNR), Dennis McCallister (Agronomy & Horticulture), Dan Walters (Agronomy & Horticulture), Martha Mamo (Agronomy & Horticulture), and Bill Zanner (SNR). This major provides students an understanding of soil as a natural resource and as a component of all terrestrial ecosystems. Students learn how soils influence ecological processes that take place above and below ground. An understanding of these processes will enable the student to deal with environmental management problems such as groundwater protection, natural resource management, urban and rural development issues, waste management, pollution abatement, and the most appropriate uses for a particular landscape, as well as agricultural production issues. Careers focus on environmental assessment, soil conservation, remediation of soil contamination, and management of soil-plant interactions. Through this major, students interested in preparing for graduate work in soils can aim toward a variety of specialty areas including soil biology, fertility, chemistry, physics, mineralogy, and morphology.*

Major Requirements: The core of the environmental soil science major is built on a base of 54-55 credits of natural resources (19 cr), biology (8 cr), chemistry (15 cr), physics (4-5 cr) courses, calculus and statistics (8 cr) courses, and 43-44 credits of major requirements and electives. The communications (9 cr), humanities and social science (21cr) requirements round out the 128-hour program.

*The **Environmental Studies major** is governed by an interdepartmental committee. Current members of the committee are: Bob Kuzelka (Director; SNR), Jim Carr (Chemistry), Johannes Knops (Biological Sciences), Dave Loope (Geosciences), LuAnn Wandsnider (Anthropology), and Allen Williams (Sociology). The environmental studies major is jointly offered with the CAS and CASNR. The core curriculum of the environmental studies major encompasses the natural and social sciences and the ethics of responsibility, as well as a senior thesis. The core curriculum is enhanced with seven areas of emphases; six offered through the CAS: anthropology, biology, chemistry, geography, geology, meteorology-climatology, and sociology; and one offered through CASNR: natural resources. The CASNR environmental studies major (natural resources area of emphasis) curriculum, is for the student interested in an interdisciplinary education focusing on the use, management, and conservation of renewable natural resources. The curriculum is based on the integration of ecological principles with the utilization and conservation of natural resources. The emphasis in natural resources prepares students for careers in public and private organizations that are responsible for planning the use and management of natural resources and protection of the environment. Students learn about subjects that prepare them for positions in fields such as natural resources inventory and planning, environmental protection, sustainable development, policy analysis, and natural resources management.*

Major Requirements: *The core requirements for the program in both CASNR and CAS include a senior seminar, senior thesis, and courses in natural resources policy, meteorology, environmental sociology, and environmental anthropology. Within CASNR, the additional requirements for the BSNR ENVR major include four additional general natural resources courses, five credit hours in math and statistics, 9 credit hours in communication, 24 credit hours in natural sciences, 18*

credit hours in humanities and social sciences, and one course each in plant resources, animal resources, integrated resources management, agricultural sciences, forestry and range management, management and administration, and soil and water sciences. During the senior year, students must complete a “capstone” senior thesis (ENVR 499 A & B) (including a written thesis and oral defense) and the environmental studies seminar (ENVR 496) under the guidance of a faculty adviser. Special program courses with credit hours in internships and independent studies are available and encouraged.

Minor Requirements: *A minor in Environmental Studies can be earned through 18 credit hours of formal course work, which must include a freshman introductory–interdisciplinary course, senior seminar, and 14 credit hours from the major’s CASNR/CAS core requirement course.*

The Fisheries and Wildlife major is governed by a committee with members from the SNR: Ed Peters (chair), Tala Awada, Jim Brandle, Gary Hergenrader, Kyle Hoagland, John Holz, Scott Hygnstrom, Bob Kuzelka, Larkin Powell, Drew Tyre and Dave Wedin. Fisheries and wildlife professionals are responsible for the conservation, protection, regulation, and management of our nation’s fish and wildlife resources. Their management strategies must provide for both consumptive (hunting, fishing) and non-consumptive uses (bird watching, non-game species enhancement, threatened and endangered species protection, and others). Students who successfully fulfill the requirements in the fisheries and wildlife major are prepared to enter postgraduate programs as well as competitively enter the work force. The curriculum reflects minimal civil service requirements of the federal government for wildlife and fisheries biologists and incorporates most course requirements for certification in professional societies. With judicious use of electives, graduates can also meet requirements for positions as zoologists and refuge managers. Further, the breadth of the curriculum prepares graduates to address complex environmental issues and to interact professionally with a multitude of natural resources disciplines to develop solutions for various situations. Typical careers for graduates of this major include fisheries or wildlife biologist with private consulting firms and utility companies, zoos, governmental resource management agencies at the local, state, or federal level. Many of our Fisheries and Wildlife majors also go on to advanced degree programs.

Major Requirements: The core of the Fisheries and Wildlife major is built on a base of 43-49 credits of biology (31-37 cr), chemistry (8 cr) and physics (4-5 cr) courses, and 37- 45 credits of major requirements and electives. The major requirements and electives focus on development of a professional who understands the interactions among resources and the policy decisions that interact with science in an integrated system of resource management. Mathematical and analytical skills requirements include one course each in calculus, statistics, and GISc. The communications (12 cr), humanities and social science (21 cr) requirements round out the 128-hour program. Within this framework, a student working with their faculty adviser can choose from an array of courses to design a program that fits their interests and career objectives. The program, with several built in prerequisites, is designed to encourage students to take basic biology, chemistry, and math early in their programs so that they can enroll in ecology (BIOS 220/222) during their sophomore year, followed by wildlife ecology and management (NRES 311), and then wildlife management techniques (NRES 350). From here students specialize by choosing advanced courses in fisheries, wildlife damage management, and others before enrolling in wildlife seminar, and integrated resource management during their senior year. Students are also encouraged to enroll in summer field courses, develop an internship with a conservation agency or non-government organizations, or design an independent study research project with a faculty member to round out their academic program.

Fisheries & Wildlife Minor: A minor in Fisheries & Wildlife can be earned through 18 credit hours of formal course work in forestry, fisheries and wildlife, with a minimum of 9 credit hours in courses 300-level or above.

The Pre-Forestry non-degree program is directed by Jim Brandle (SNR). This is a two-year program; students must transfer to another institution at the end of their freshman or sophomore year. The Pre-Forestry curriculum consists of 60-70 credit hours which are selected based on a student's background and career goals. A program of study is developed by the student and the adviser that involves one or two years at the University of Nebraska before transferring to the University of Missouri-Columbia or another accredited forestry school. An agreement with the University of Missouri allows Nebraska residents with the proper scholastic qualifications to enter that institution without paying out-of-state fees. Under this program, a student may enter the University of Missouri directly from high school or transfer after one or two years at the University of Nebraska. Students graduating from forestry programs find employment with federal, state, and local governments, and with private industry. Suggested courses while at UNL include an introductory course in biometry, general biology, botany, chemistry (I and II), and physics, physical geology and soil science, communication (public speaking, composition, technical writing), computer programming, and calculus.

The Rangeland Ecosystems major is governed by a committee with members from the Department of Agronomy & Horticulture and from SNR: Walter Schacht (chair, Agronomy & Horticulture), Lowell Moser (Agronomy & Horticulture), Jim Stubbendieck (Agronomy & Horticulture), and Dave Wedin (SNR). The Rangeland Ecosystems major is an integration of disciplines involved in the study, conservation, and utilization of rangelands. Students in this major develop a strong background in the plant and physical sciences in preparation for studying the ecology and management of rangelands in upper-level course work. A foundation of the major is multiple use, emphasizing integrated rangeland management for water, wildlife, forage, recreation, and aesthetics. Students will learn through course work, seminars, capstone experiences, and optional internships with state and federal agencies, research organizations, and private industry. The rangeland ecosystems major is designed for students whose career interests involve management of rangeland habitats/ecosystems. Graduates of the major will likely pursue careers as managers of rangeland resources on private or public land with a specialization in habitat management, rangeland restoration/monitoring, or grassland management. Specifically, this curriculum prepares students for employment with environmental consulting firms, natural resources districts, public land management agencies, land use planning agencies, and federal and state wildlife divisions. The curriculum meets the civil service requirements of the federal government for range conservationist positions in such agencies as the Natural Resources Conservation Service, Bureau of Land Management, and USDA Forest Service. The breadth of the curriculum prepares students for postgraduate education in most disciplines related to natural resources.

Major Requirements: Thirty-three hours of range, wildlife, and soil courses are required, including the capstone course (NRES 423), to provide students with a strong base in resource management and planning. The curriculum requires an additional 12 hours in natural resource policy and economics to prepare students for land management issues and decision-making. The major also requires about 40 hours in biology, chemistry, physics, and mathematics. The curriculum includes up to 18 hours of electives which can be used for further specialization.

Rangeland Ecosystem Minor: The minor requires 18 hours with 14 hours in the core courses (Soil 153, RNGE 240, RNGE 340, and RNGE 440) and 4 hours from one or more of the other range courses (RNGE 242, RNGE 442, RNGE 444, RNGE 445, RNGE 496).

The Water Science major is coordinated by an interdepartmental committee whose members include: Dean Eisenhauer (chair, Biological Systems Engineering), Ed Harvey (SNR), Kyle Hoagland (SNR), Bob

Kuzelka (SNR), Darrell Martin (Biological Systems Engineering), Darryll Pederson (Geosciences), Ed Peters (SNR), Joe Skopp (SNR), Ray Supalla (Agricultural Economics), Elizabeth Walter-Shea (SNR). The major in water science is designed to educate students in basic and applied sciences related to water resources. The goal is to educate individuals to gather and synthesize information from several disciplines, formulate ecologically and economically rational alternatives, and effectively implement various water-based programs. The curriculum is designed to meet the needs of students who intend to pursue careers in agencies that form or implement policy at all levels of government, in public and private organizations that manage water and land resources, in private consulting companies that offer water management services and in a broad range of nonprofit institutions interested in water resources. The program also provides students the opportunity to prepare for advanced education in several areas of graduate study.

Major Requirements: Of 128 credit hours required for the BSNR, 34 credits are in an integrated water science curriculum designed to provide both breadth and depth in the understanding of water resources. The water science major also requires approximately 32 credit hours of science and mathematics. In addition, the student must select an area of specialization consisting of approximately 14 credit hours that are approved through advising (e.g., Aquatic Biology, Groundwater Hydrology, Hydrologic Science, Surface Hydrology, Watershed Management, Water Policy, and Water Quality). The specialization allows students to develop an individualized area of study. To complete the major the student also must take 33 credit hours of communication, humanities, and social science courses.

Water Science Minor: The minor requires 18-19 hours, with 6 hours in two Water Science core courses (WATS 281 and WATS 354), and 12-13 hours in advanced science, policy and management courses.

The non-declared natural resources major can participate in a non-degree program coordinated by the NRUCC with Dave Wedin serving as chair. The program is designed for students who are interested in a bachelor of science degree in natural resources, but are uncertain about a specific major. Students may be in the program for two years (62 credit hours). Students may declare a major at any time during this program, but must declare a major at the completion of 62 hours.

Student Enrollment. Currently, 134 students are enrolled in Natural Resources majors. Approximately 94% of the students in the Natural Resources majors come from Nebraska. Most of the majors have more male than female students (Fig. 4.3). Very few represent ethnic minorities; CASNR has an active minority recruitment program so that this can potentially change. Student enrollment in all majors is down from peak enrollments in the mid-1990s. The decline in enrollment is College-wide. Part of the decline may be attributed to the delay in refilling two Fisheries and Wildlife faculty positions, which have only recently been filled. With permanent faculty teaching and advising in these positions we expect student recruitment and retention to increase.

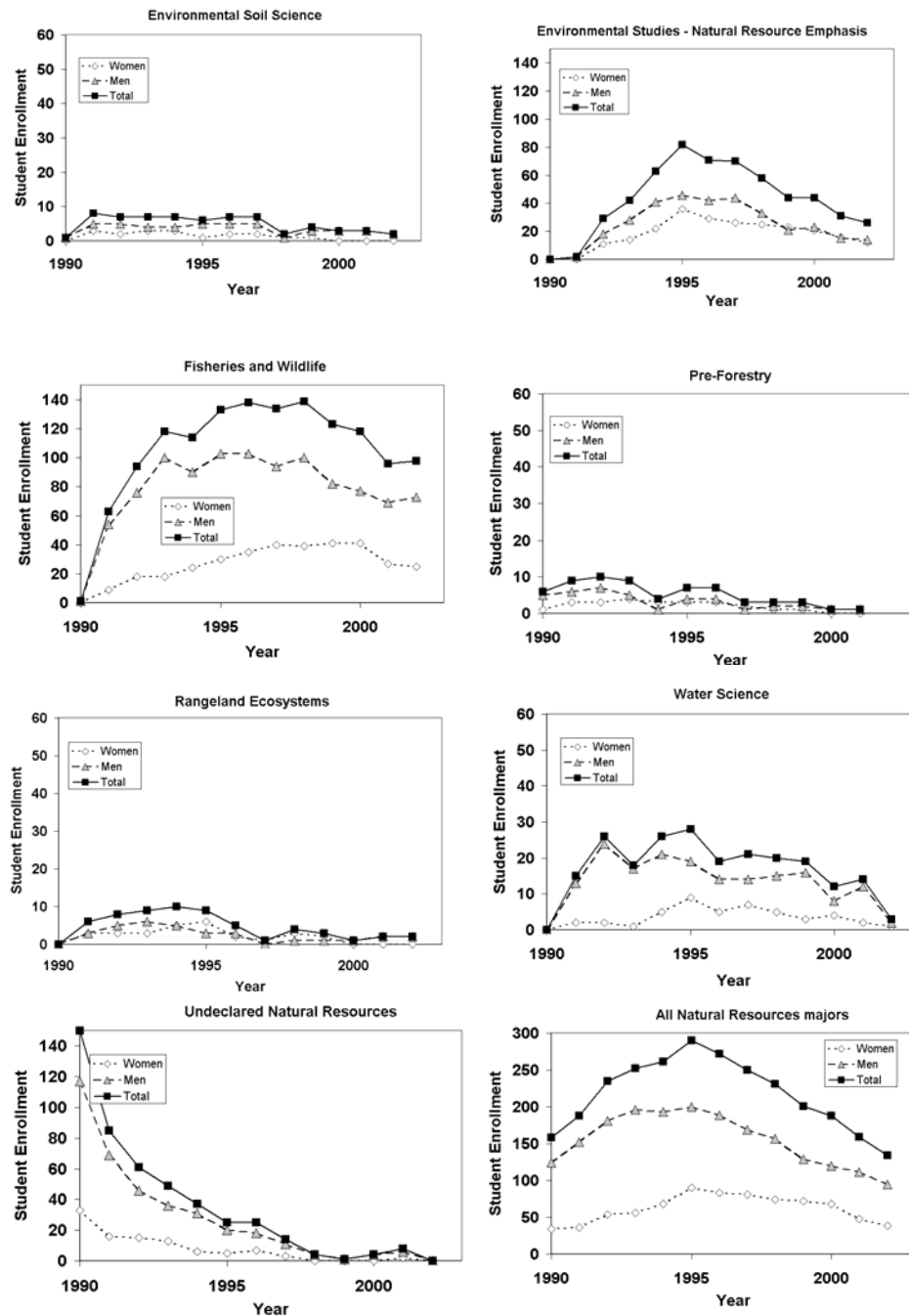


Figure 4.3 Undergraduate student enrollment from 1990 through 2002 (total and by gender) for Natural Resources majors administered by SNR (source: CASNR).

Courses of Instruction for the undergraduate majors are provided in Appendix 4.4. Faculty in SNR teach 73 courses, with only three at the 100-level, six at the 200-level, eight at the 300-level, six at the 400-level and 33 at the 400/800-level.

Curricular Changes. Curriculum changes have been proposed for the core of the BSNR as well as for each major. Higher mathematics requirements for most of the majors have been implemented, as well as the requirement for GIS-related courses. Discussions about the introductory courses required of all

CASNR students are now underway. Natural Resource majors are in favor of eliminating the requirement of NRES 103 in favor of a required course as an Introduction to Natural Resources. Also, a course in GIS is being considered as a requirement of most if not all majors. This process has started with the assumption of no change in the CASNR requirements or to course offerings organized by the Life Sciences Curriculum Coordinating Council (changes in the introductory Biology and Chemistry sequence apparently have been proposed by the Council). However, it is anticipated that it will take at least a year to finalize these proposals and have the respective College and University Curriculum Committee act on them. Additional changes have been proposed for the CASNR core, but it is unlikely that approval will occur before Fall 2003. The proposed new core is listed in Appendix 4.3.

Assessment. Program assessment for CASNR undergraduate majors is expected by the North Central Accreditation Association, but more importantly, is critical in providing a relevant, well taught and well enrolled undergraduate program. Assessment tools for individual majors are being developed across CASNR. In 1999, a draft set of *Degree Objectives and Expected Competencies for BS in Natural Resources Majors* was completed by the SNRS Curriculum Committee and approved by CASNR. Along with that document, a *Learning Objectives Grid* was developed (Appendix 4.5). The *Competencies* document provides general expectations for all Natural Resources students (across all majors), while the *Grid* is a tool to be used by faculty in assessing the performance of graduating seniors. The *Learning Objectives Grid* lists specific skills within four areas: Natural Resources Specific Skills, Communication Skills, General Problem Solving Skills, and Quantitative Problem Solving Skills. Each student is ranked as “adequate,” “inadequate” or “can’t evaluate.” Even though this assessment is done for individual students, it does not effect their graduation, or reference letters from UNL. The purpose is to use the students’ performance as an index of how well we, as faculty and staff, are doing in achieving our goals for the program.

In addition to degree objectives for the Natural Resources program, each major is expected to develop its own major-specific degree objectives and assessment tools. Objectives and assessment tools have been developed for Environmental Studies (Natural Resources emphasis) and Fisheries and Wildlife, our two largest majors (Appendix 4.6). Although assessment has been handled informally in our low-enrollment majors (Environmental Soil Science, Natural Resources and Environmental Economics, Rangeland Ecosystems, Water Science), one of the charges to the new Natural Resources Undergraduate Curriculum Committee is to ensure that an assessment program is developed for each major. That effort will continue in the 2003-2004 academic year. A complete assessment program will include input from alumni, potential employers, and other stakeholders, as well as assess the competencies of our graduating seniors.

The Environmental Studies program has already undertaken a broader program assessment, beyond faculty assessing the competencies of graduate seniors. The faculty assessments had been done in the two senior capstone courses, ENVR 496 Senior Seminar and ENVR 499 (A & B) Senior Thesis. In fact the input from such faculty assessments was not very useful in assessing the program and its student products. In 2000 a comprehensive assessment of the program by previous graduates of the program was undertaken. This assessment also asked employers of graduates about the program’s student product. A similar assessment will be done in the fall of 2003. In addition a comprehensive assessment of the program by graduating seniors is done each spring. Together these assessments have lead to changes in the program such as:

17. Revising ENVR 496 to include presentation sessions based on student assessments;

18. Revising ENVR 499 from a single 3 credit hour course to a 1 credit hour thesis preparation course and a 2 credit hour thesis completion course, which ensure that the student takes two semesters to complete the course;

19. Restructuring support staff for the program to include the program director at 50% FTE and an academic advisor at 60% FTE, with one located on East Campus and one located on City Campus;
20. Creating a program advising center with regular office hours in the Nebraska Union (City Campus);
21. Developing and implementing an aggressive recruitment program to include recruitment from current UNL students in other or undeclared majors since about 50% of the program graduates transfer into the program for other UNL majors or institutions;
22. Developing and implementing a series of special events to better tie together currently enrolled students in the program.

The Natural Resources and major-specific *Learning Objectives Grids* have been used for several years for the Fisheries and Wildlife major. The assessments of the major from several years ago (e.g., 1999-2001) made clear a number of problems with both the curriculum and the management of the major. Several factors may have contributed to these problems including the transition of the former Forestry, Fisheries and Wildlife Department to the School of Natural Resource Sciences (which as a whole had a very different FTE balance across teaching and research); the retirement of Ron Case, former coordinator of the major, in 2000; the delay in hiring of several faculty with significant teaching FTE's, and developments in the discipline that simply were not reflected in our existing courses (e.g. GIS). Since 2002, under the leadership of Ed Peters, current coordinator for the Fisheries and Wildlife major, a number of problems seen in our earlier assessments are being addressed:

7. A one credit fall orientation course for incoming freshman was added in Fall 2002. New students meet the faculty and are introduced to the natural resource disciplines in field exercises, attend group advising sessions, and begin to develop the professionalism we expect;
8. An introductory course in geospatial methods (GIS, GPS, RS) was first offered in Spring 2003 by Larkin Powell. Considering our strengths in these areas at the graduate level, our undergraduate exposure to this key aspect of 21st century natural resource science and management was previously inadequate;
9. The prerequisite structure of our core courses has been revised and enforced. Students now take introductory ecology (BIOS 220) in the fall of their sophomore year, Wildlife Ecology and Management in the spring of their sophomore year, and Wildlife Techniques in the fall of their junior year, so that they are well positioned for the upper level courses;
10. A number of courses that had been taught by temporary instructors are now taught by three recently hired, tenure-track faculty with teaching appointments: Larkin Powell, Tala Awada and Drew Tyre.

Recruitment and Retention. Recruiting efforts have primarily been handled by the Teaching Coordinator and the major chairs and directors through the CASNR Recruitment, Retention and Placement Committee (all major chairs and/or recruitment personnel). The major events include the CASNR Open House (Fall) and UNL Big Red Road Show (initiated Spring 2003), the Career Development Event FFA contest (spring), and the Biology Careers Workshop (summer). Other activities include the week long Range Youth Camp at the 4-H Camp near Halsey (attended by 45 high school students on average), and the range judging events scattered throughout the state (attended by several hundred students). It is mostly the undergraduate teaching faculty who participate in these recruiting activities; however, all faculty are expected to participate in recruitment efforts as opportunities arise.

An undergraduate recruitment and retention plan has been developed (Appendix 4.9). Implementation will begin with the hiring of a recruitment coordinator.

Clubs are a tool for engaging students to ensure a sense of belonging and to aid in retention. Clubs advised by SNR faculty include:

The **Environmental Resource Center** is a student-run organization that coordinates environmental information and services for students, faculty, and stakeholders. A student board made up of representatives from UNL student environmental organizations to include those mentioned above governs it. The center has a suite of rooms for student use in the Nebraska Union (City Campus) and has a presence in the East Campus Union Student Activity Center.

The **Range Management Club** is a small but active club that promotes student understanding of rangeland ecosystems and management. Members work with other local organizations (including the Wildlife Club and the Soil and Water Resources Club) on natural resource projects, compete nationally and internationally on exam teams, prepare oral presentations and displays for a wide variety of audiences, attend state and international professional meetings, and tour rangeland ecosystems throughout the western U.S. The club also facilitates applications for scholarships, development of career goals, and contact with prospective employers. Overall, the club promotes student development toward careers in natural resources management. Dr. Walter Schacht (SNR courtesy, Agronomy & Horticulture) has advised the club for the last nine years.

The **Soil and Water Resources Club** was organized to bring together students with an interest in soil and water resources and offer opportunities not normally found in the conventional classroom. The intent has been to stimulate the interest of graduate and undergraduate students in soil and water resources and promote the art and science of good land and water use. Club members have the opportunity to participate in many unique and education activities. Past activities include tours of saline wetlands and campus research facilities, assisting with the annual Children's Groundwater Festival and attending the annual, national SWCS meetings. Drs. Bill Zanner (SNR) and Tom Franti (SNR courtesy, Biological Systems Engineering) advise the club.

The **Soil Judging Team** competes in intercollegiate soil judging events that occur across the country, primarily in land grant institutions. Students are required to describe soil

morphology (color, textures, structure and horizonation) and determine landscape setting, land use limitations, and taxonomy. The University of Nebraska competes in a division with Iowa State, Kansas State, the University of Missouri, Southwest Missouri State, the University of Minnesota, Southwest (Minnesota) State, North Dakota State, and South Dakota State. The team is coached by Dr. Bill Zanner (SNR).

The **Wildlife Club** affords students opportunities to develop their leadership skills within the context of fisheries and wildlife conservation activities. Students interact with fisheries and wildlife professionals through presentations at club meetings by the Nebraska Game and Parks Commission, Nebraska Department of Environmental Quality, U.S. Fish and Wildlife Service, and numerous non-governmental conservation organizations. Interactions with biology, fisheries and wildlife graduate students, and faculty provide club members with opportunities to explore potential graduate research opportunities. Club members conduct hunter safety education and Project Wild classes with Game and Parks Commission educators, participate in programs at local conservation projects, and organize weekend camping and canoe trips during the academic year. For 38 years, the Wildlife Club and the Lincoln Journal-Star Newspaper have co-sponsored the Wildlife Awards Banquet each spring and for over 25 years club members have participated in regional Wildlife Student Conclaves. The club advisers are Dr. Ed Peters (28 years) and Dr. Larkin Powell (2 years).

Scholarships. A variety of scholarships are available as a recruiting and retention tool within CASNR and SNR (Appendix 4.7). Any faculty member can offer a \$600 scholarship to a “recruit” if that student has an ACT score ≥ 27 and will enroll in a CASNR major. Also, as part of the normal application procedure, new students that apply by January 15 are automatically considered for UNL-wide freshman scholarships.

Several major-specific scholarships are available and awarded at the end of the spring semester (Appendix 4.7). Some of the scholarship funds are managed by the Nebraska University Foundation and CASNR, while others are awarded through the NRUCC. Scholarships in the Natural Resources majors are currently coordinated by Dr. Dave Wedin.

4.2.2 Graduate Programs

The SNR offers graduate programs leading to a Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Natural Resource Sciences with emphasis in the areas of bio-atmospheric, biological, earth and water resources, as well as remote sensing and geographic information systems (GIS). The broad diversity of climate, flora, fauna, habitat, hydrology, soils and surface and subsurface geology across Nebraska provides a multitude of opportunities for field studies in each of the resource areas. Faculty also conduct research in other states and countries. Laboratory and computer facilities are available for performing up-to-date analyses pertaining to all the resource areas, as well as water chemistry, GIS, computer modeling, and remote sensing and image analysis. Unique opportunities for cooperative research are available through many state, federal, and private natural resource organizations. Courses are offered within the various *program areas* within SNR: Atmospheric Resource Sciences; Earth and Soil Resource Sciences; Biological Resource Sciences; Hydrologic Resource Sciences; and Remote Sensing and GIS.

The faculty of SNR also advise students in other majors as part of the interdisciplinary nature of our research. Students advised by SNR faculty have received degrees in majors such as Agronomy, Geosciences and Geography. An interdepartmental doctoral program in Horticulture and Forestry is also available.

Master of Science Degree with a major in Natural Resources Sciences. *The Master of Science (M.S.) degree provides students with an interdisciplinary education in natural resource sciences, encompassing the biological, atmospheric, water, earth and geospatial information resources, as well as in related human and community dimensions. Applicants for admission to the program must have an undergraduate grade point average of at least 3.0 (on a 4.0 system), submit scores for the general Graduate Record Examination (GRE minimum scores of 500 for the Verbal, 620 for the Quantitative, and 4.0 for the Analytical Writing are guidelines for admittance), three letters of recommendation, a statement of purpose, and satisfy the general admission requirements of the Graduate College. Admission to full graduate standing in the M.S. program requires an earned baccalaureate and demonstrated proficiency in mathematics, physics, chemistry, life sciences, and earth sciences. A TOEFL score of at least 500 (or equivalent) is required for students whose native language is not English and who have not earned a baccalaureate in the United States. The M.S. program may be completed under the thesis or non-thesis option conforming to the general requirements of the Graduate College.*

Doctor of Philosophy Degree with a major in Natural Resource Sciences. *The Ph.D. degree with a major in Natural Resource Sciences was officially initiated in January 2002. The degree provides students with advanced interdisciplinary education, encompassing biological, atmospheric, water, earth and geospatial information resources, as well as related human and community elements. Students applying for admission to the Ph.D. program must provide evidence of preparation in his/her anticipated field of emphasis, have maintained a GPA of at least 3.2 (on a 4.0 system), and submit scores for the general Graduate Record Examination (GRE minimum scores of 500 for the Verbal, 620 for the Quantitative, and 4.0 for the Analytical Writing are used as guidelines for admittance), three letters of recommendation, a statement of purpose, and satisfy the general admission requirements of the Graduate College. A TOEFL score of at least 550 (or equivalent) is required for students whose native language is not English and who have not earned a baccalaureate in the United States. Admission to Candidacy for the Ph.D. degree requires the successful completion of written and oral comprehensive examinations.*

Doctor of Philosophy Degree with a major in Horticulture and Forestry. Some SNR faculty participate in an interdepartmental doctoral program in Horticulture and Forestry, administered through the Department of Agronomy & Horticulture. The committee which oversees this program include: Ellen Paparozzi, Gerald Horst, Alexander Pavlista and Terry Riordan (all Agronomy & Horticulture), and Jim Brandle (SNR).

Degrees in Other Majors. The faculty of SNR also advise students in other majors as part of the interdisciplinary nature of our research. Students advised by SNR faculty have received degrees in majors such as Agronomy, Geosciences, and Geography.

SNR Graduate Committee. The SNR Graduate Committee is comprised of five elected faculty members, the SNR Teaching Coordinator as *ex officio* member and one graduate student. Faculty members serve for a three-year term while the graduate student serves for a one-year term. Terms are staggered so that 1-2 of the Committee members are elected each year; members may serve two consecutive terms. All Graduate Committee faculty members must be Graduate Faculty Members or Fellows. The Graduate Committee recommends a Chair, subject to approval by the Graduate College. The Chair must be a Graduate Faculty Fellow. The Vice-Chair can function as the Chair when the Chair is not available. The graduate student representative is selected by the graduate student body of the School. This representative serves on the Committee for graduate policy and procedure matters, but not for admissions. The Graduate Committee recommends admission applications for graduate study, reviews graduate student academic performance and progress annually, recommends any necessary changes in graduate student status, makes recommendations pertaining to curricular changes in graduate courses in consultation with the NRUCC, suggests and makes changes in graduate degree programs and areas of specialization, and develops and modifies, as needed, a handbook on graduate student policies and procedures that is given to all graduate students in the School.

Current SNR Graduate Committee members are: Ed Harvey (chair), Jim Brandle, Sunil Narumalani (vice-chair), Pat Shea, Bill Zanner, student representative (vacant) and Elizabeth Walter-Shea (*ex officio*).

Specializations. Eleven specializations are currently available at the masters level: Agroforestry, Aquatic Ecology, Bioatmospheric Interactions, Climate Assessment, Environmental Studies, Geographic Information Systems (GIS), Great Plains Studies, Hydrologic Sciences, Remote Sensing, Soil Science, and Wildlife Ecology. Students can also pursue a Masters degree with a minor in Water Resources Planning and Management. At present, the Great Plains Studies, Hydrologic Sciences and Soil Science specializations are available at the doctoral level. A student does not have to declare an area of specialization.

The **Agroforestry Specialization** (M.S.) provides students with a learning environment with an emphasis on the development of an understanding of the role of woody plants in crop production systems, recognizes students who have attained an advanced knowledge of agroforestry sciences and the ecological implications of woody plants in the agroecosystems and supports interactions and cooperation among the community of scientists and students working on agroforestry issues

The **Aquatic Ecology Specialization** (M.S.) is designed to provide a rigorous, focused graduate program that draws on faculty expertise in both aquatic sciences and ecology at UNL, and the diversity of aquatic habitats in the Great Plains region.

The **Bio-Atmospheric Interactions Specialization** (M.S.; Ph.D. pending approval) provides students a unique learning environment to promote understanding of the interactions between the atmosphere and the biosphere, recognizes students who take advantage of this environment to advance

their knowledge of bio-atmospheric sciences and encourage cooperation among the community of scientists and students within the bio-atmospheric research area.

The **Climate Assessment and Impacts Specialization** (M.S.; Ph.D. pending approval) provides students with a learning environment that promotes an understanding of the interactions between climate and society and methodologies for climate assessment and impact. Students will conduct research that draws on the expertise of multiple faculty from among the community of scientists working on climate assessment, climate impacts, and problem-oriented policy research.

The **Environmental Studies Specialization** (M.S.) serves a variety of students concerned about environmental issues and change. The program provides a thorough, holistic view of the environment and human-environmental interaction and the technical skills for active participation in an environmental career.

The **Geographic Information Systems Specialization** (M.S.) focuses on computer-based tools that facilitate analysis of geospatial data (e.g., data on soils, water resources, climate, terrain, land use, wildlife and human populations). Students specializing in GIS learn how to build such systems and how to apply GIS in land suitability modeling, risk assessment, decision-support, conservation planning, landscape ecology, and other areas. The GIS program area is closely linked and integrated with the specialization in remote sensing.

The **Great Plains Studies** interdepartmental specialization (M.S. and Ph.D.) fosters the study of people and the environment in the sparsely populated Great Plains. Regional inquiry invites an analysis of the relationships between the natural and managed environment and the cultures brought to it by various indigenous and immigrant populations, as well as the implications of these relationships for the future. The specialization is facilitated by the Center for Great Plains Studies, which is the oldest and largest interdisciplinary, intercollegiate, regional research and teaching center in the United States. The Center is the only interdisciplinary program chartered by the University of Nebraska Board of Regents for all campuses of the University.

The **Hydrologic Sciences Specialization** (M.S. and Ph.D.) revolves around the many components and processes of the earth's hydrologic cycle including; atmospheric moisture transport, surface hydrology, groundwater, limnology, wetlands, water chemistry, isotope hydrology, soil water dynamics, contaminant transport, environmental geophysical methods, and numerical modeling. Active research includes both field and laboratory investigations in Nebraska and around the world.

The **Remote Sensing Specialization** (M.S.) focuses on the non-contact recording and analysis of information acquired by specialized electronic devices that sample various parts of the electromagnetic spectrum. Students specializing in remote sensing learn about the fundamental physical concepts of remote sensing, the many different types of field, aircraft, and satellite sensors, how to process and analyze digital-image data, and the varied applications of the technology.

The **Soil Science Specialization** (M.S. and Ph.D.) allows students to develop expertise relevant to Soil Science and a variety of areas including soil remediation, fate of contaminants in soil, soil geomorphology, and basic soil physics, soil chemistry or soil microbiology.

The **Wildlife Ecology Specialization** (M.S.) provides students a learning environment to promote understanding of the ecological aspects of wildlife and their habitats. Students gain an advanced knowledge of wildlife sciences. As in other areas of SNR, this specialization fosters interactions and cooperation among the community of scientists and students conducting research on wildlife.

Student Enrollment. Currently, SNR faculty advise a total of 66 graduate students (27 M.S., 11 M.A., and 28 Ph.D., with 19 M.S. and 10 Ph.D. students in the Natural Resource Sciences major). Since the formation of the School in 1997, 59 graduate students who were advised by SNR faculty have graduated from UNL (Fig. 4.4). Of these students, 26 majored in Natural Resources Sciences (24 M.S., 2 Ph.D.), while 33 majored in other programs while being advised by SNR faculty. While we envision more students being advised in the Natural Resource Sciences major, we anticipate that students will continue to be advised in other majors as well, due to the interdisciplinary nature of the research of our faculty.

Tracking of graduate students advised by SNR faculty, particularly non-Natural Resource Sciences majors, proves to be a challenge. However, progress has been made to collect data; last year faculty were surveyed to report all graduate students advised, regardless of major. We plan to survey faculty for graduate student information on an annual basis as part of the Annual Report of Faculty Activities.

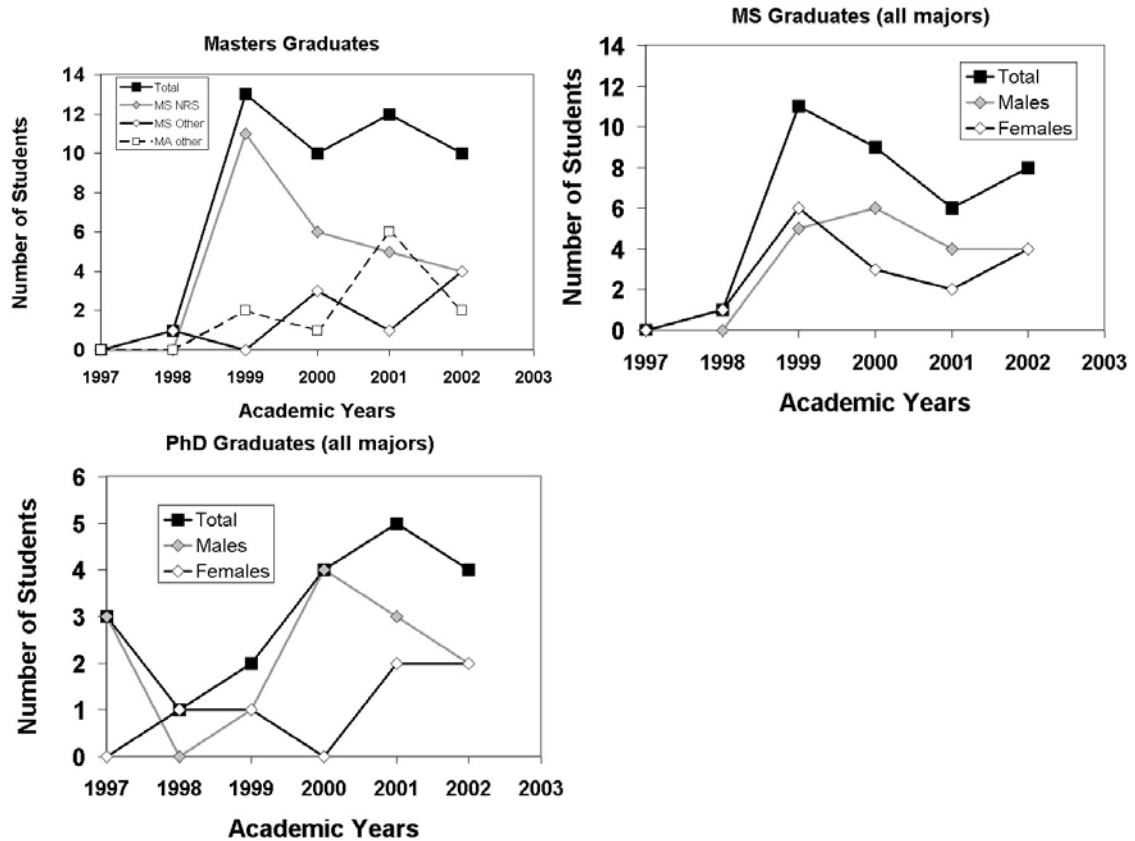


Figure 4.4. Number of students graduated in M.S. and Ph.D. programs advised by SNR faculty from academic years 1997-98 through 2002-2003 (Note: 2002-2003 numbers are projections based on Fall 2002 graduates) (source: faculty and departmental surveys).

Courses of Instruction. SNR faculty teach 50 graduate courses offered in the various science disciplines (Appendix 4.1 and 4.8): 33 at the 400/800 level, 11 at the 800 level and 6 at the 900 level.

Curricular Changes. The Natural Resources graduate seminar course (NRES 891) has been revised and will continue to be monitored and evaluated, to provide an overview of natural resources principles, emphasizing student presentations and grantsmanship. One semester is devoted to writing and

presentation skills while the other semester focuses on covering contemporary issues in Natural Resource Sciences.

Assessment. Members of the SNR Graduate Committee are currently discussing an assessment plan which will soon be presented to the SNR faculty. The plan will use several instruments to measure outcomes for graduate students. Measures currently under consideration include:

- 23) Results of qualifying, comprehensive, and licensure exams;
- 24) Checklist rating of theses and dissertations for specific research skills or content mastery criteria;
- 25) Publication records of students during graduate program;
- 26) Number of publications derived from dissertations or theses;
- 27) Students' self perceptions of/satisfaction with the adequacy of their preparation across a variety of domains, provided by Office of Graduate Studies;
- 28) Student evaluations of graduate teaching assistants;
- 29) Number of nationally competitive grants, fellowships, and awards received by graduate students;
- 30) Annual evaluation.

Recruitment and Retention. Recruitment of graduate students is the responsibility of the Graduate Committee in cooperation with the faculty of the School. Efforts include development of single sheet fact sheets for each specialization. Efforts are underway to develop a simple but high-quality brochure to be distributed to all that inquire, at professional meetings attended by the faculty, and through mailings to programs that are likely to have baccalaureate graduates that could be recruited to the School. The website for the SNR was recently revised to include recruitment as its first priority to make it a major part of its recruitment activities.

The Graduate Committee controls the awarding of three state-supported Graduate Assistantships to high quality students applying to the School. All other students are supported by grant funds or funds otherwise controlled by individual faculty members. The minimum stipend level for M.S. students is \$13,500 and for Ph.D. students is \$14,500. The Committee was successful in receiving Othmer funds from the UNL Office of Graduate Studies, an additional stipend of \$7,500 awarded during the first year of a student's Ph.D. program (requires GPA of 3.5 or higher, Ph.D. program and used in recruiting new applicants).

A recruitment and retention plan has been developed (Appendix 4.10). Implementation will begin with the hiring of a recruitment coordinator.

4.3 Facilities for Education

Faculty, staff and students have access to a number of campus laboratories and field sites within the state of Nebraska (Fig. 4.5). However, some classes have not had laboratory sections because teaching lab space is currently inadequate (e.g., NRES 310 two separate laboratories are used to teach the one course; half of the class is held in one lab while the second half is held in another). Faculty have limited access to computer laboratories and wet laboratories. Yet, SNR has taken advantage of what space is identified, primarily research laboratories, which limits opportunities in teaching and research.

The Lincoln area is close to a variety of habitats that afford fisheries and wildlife classes relatively easy access for laboratory class periods and weekend field exercises. The Salt Valley reservoirs and Lincoln

and Nebraska State Parks and Wildlife management areas are used extensively by SNR classes. In addition arrangements with private landowners allow access to streams in eastern Nebraska. Weekend field trips to more remote locations are used frequently, so that undergraduate students can get a sense of field research with faculty and graduate students.

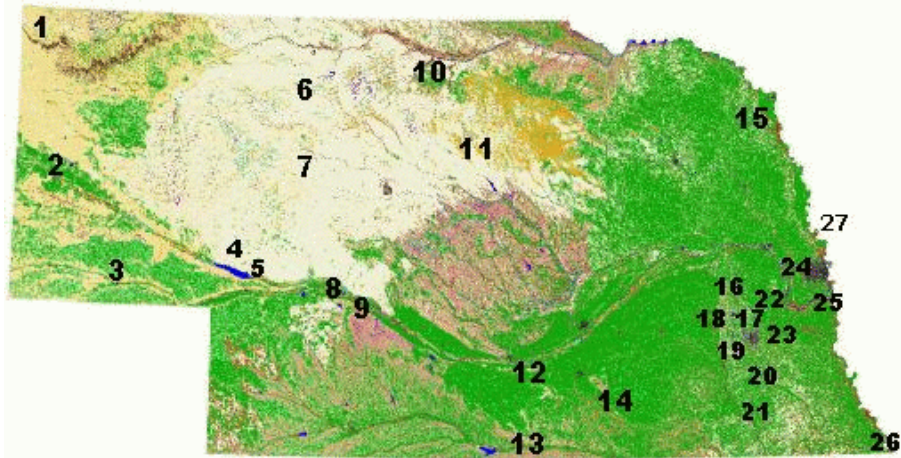


Figure 4.5. Field research areas across the state of Nebraska (source: <http://snrs.unl.edu/wedin/nefieldsites/>)

| University of Nebraska Properties | Cooperating Institutions |
|-------------------------------------|--|
| 2 Panhandle REC* | Audubon Society |
| 3 High Plains Laboratory | 19 Spring Creek Prairie/Rowe Sanctuary |
| 5 Cedar Point Biological Station | |
| 7 Gudmundsen Sandhills Laboratory | <hr/> |
| 8 West Central REC | The Nature Conservancy |
| 9 Cedar Canyon Demonstration Forest | 1 Cherry Ranch |
| 11 Barta Brothers Ranch | 4 Arapahoe Prairie |
| 14 South Central REC | 6 Jumbo Valley Fen |
| 15 Haskell Agricultural Laboratory | 10 Niobrara Valley Preserve |
| 16 Madigan Prairie | 12 Central Platte Preserves |
| 18 Nine Mile Prairie | 13 Willa Cather Prairie |
| 20 Reller Prairie | 17 Little Salt Fork Marsh |
| 21 Dalbey-Halleck Farm | 26 Rulo Bluffs |
| 22 ARDC | |
| 23 Prairie Pines | US Fish & Wildlife Service |
| 24 Allwine Prairie | 27 DeSoto National Wildlife Refuge |
| 25 Horning State Farm | |

* REC = Research and Extension Center

Campus Laboratories:

- **Aquatic Ecology Laboratory**, located in the Services Building on UNL East Campus, includes an indoor microcosm facility with 32 artificial streams and 25 1,000-L tanks for experimental studies.
- **Climate & Bio-Atmospheric Laboratory**, located in 19 L.W. Chase Hall (UNL East Campus), functions primarily as an undergraduate/graduate teaching laboratory for Climate and Biospheric Sciences courses in SNR and Biological Systems Engineering. The laboratory houses eight computers on a local area network and the associated countertop space is used to set up laboratory experiments. Computers and computer software are upgraded as needed to keep pace with technology.
- Two **computer teaching laboratories** on UNL East Campus are currently available for all CASNR faculty. These laboratories are located in:
 - 210 Kiem Hall, 33 computers seating 2 students each. The laboratory accommodates regular courses that meet throughout the semester (e.g., NRES 312- Introduction to GIS) and support ArcView 8.2 and ArcView 3.3.

- 228 Animal Science can be scheduled for laboratories on an infrequent basis (i.e., for coupled computer labs you want to include in your lab course that normally meets elsewhere). This lab also supports ArcView 8.2 and ArcView 3.3

Students have access to the Goodding Student Computer Laboratory in the Plant Sciences Building for work on assignments outside of class. The computers in this lab support ArcView 8.2 and ArcView 3.3.

- **Fisheries and Wildlife Laboratory.** Over the past 25 years, teaching of fisheries and wildlife courses has been conducted in the only available space in Natural Resources Hall (a converted hallway). Teaching efforts have fared well despite the outdated and poor condition of the laboratory space.
- **GIS Laboratory,** located in Nebraska Hall in the Center for Advanced Land Management Information Technologies (CALMIT), provides state-of-the-art image processing and analysis systems and facilities. Students have access to the most modern hardware and software for geospatial data processing including ArcInfo, ArcView and related products. Instruction and research in GIS is carried out in collaboration with CALMIT.
- **Groundwater Chemistry Laboratory** located in 107 Nebraska Hall, serves as a small research and teaching facility for scientists and students with an interest in hydrogeochemistry. The laboratory is also part of the University of Nebraska Water Center's Core Facility, and thus, provides analytical services at reduced cost to researchers, agencies, and other local clientele to assist in evaluating groundwater and surface water quality across the Great Plains region. The lab is equipped with state-of-the-art analytical instruments including an atomic absorption spectrometer equipped with a graphite furnace and vapor generation unit, an ion chromatograph, and a UV-visible spectrometer for analyzing anions, cations, and trace metals in water samples.
- **High Plains Regional Climate Center,** located in 15 L. W. Chase Hall, maintains an Automated Weather Data Network in the High Plains region that provides a wealth of climate data for teaching and research applications. In addition, the National Drought Mitigation Center and the High Plains Regional Climate Center are part of SNR and are involved in many state, regional, national, and international climate assessment activities that provide students with an excellent learning environment. Students have the opportunity to interact with experts at other universities, as well as with scientists in federal agencies and at regional and international organizations
- **Soil Environmental Chemistry and Xenobiotics Laboratories,** located in 225 Keim Hall and 372 Plant Sciences, are well equipped for environmental assessment of managed or disturbed ecosystems. The laboratories contain state-of-the-art equipment such as gas chromatographs (GC), GC/MS, HPLCs (including photodiode array and radioisotope detectors), scintillation counter, UV-VIS and FT-IR spectrophotometers, sample oxidizer, accelerated solvent extractor and a Microtox/Mutatox analyzer. Chemical fate and transport of contaminants can be assessed with a soil column transport system. Two anaerobic chambers and an Eh/pH-Stat are available for strict control of environmental variables.
- **Soil Geomorphology and Physics Laboratories** are also well equipped with instruments for measuring clay mineralogy (XRD), soil hydraulic properties and solute transport and field equipment such as the truck mounted Giddings soil probe.
- **Water Sciences Laboratory** (part of the Water Center), provides cutting-edge analytical capabilities for pesticides and their metabolites, heavy metals, and stable isotopes.

Field Sites

- **Agricultural Research and Development Center (ARDC)**
 - First-rate field facilities and hardware systems for data collection are available. CALMIT maintains numerous field data-collection vehicles and boats, and is an equal partner with two other UNL units in the Nebraska Aircraft Remote Sensing Facility, which operates a Piper Saratoga aircraft equipped for remote-sensing purposes.

- **Agro-Meteorology Laboratory** is a field laboratory where agrometeorological and micrometeorological research is conducted. The laboratory is surrounded by 50 acres of cropland (planted according to specific research needs). A full range of meteorological sensors are available for measurement of radiation and energy balance components, as well as profiles of temperature, humidity and wind speed above and within plant canopies. Sensors are available for eddycovariance measurement of fluxes of momentum, sensible heat, water vapor, and CO₂. Radiometers are available to measure incident and reflected radiation in broad-band and continuous visible and near-IR spectrum, as are instruments to measure leaf spectral reflectance and transmittance. Remote sensing field reference panels are calibrated under ambient conditions at the laboratory using a specially designed goniometer. Most of the micrometeorological and remote sensing instruments are portable and are often used at remote sites. In addition, the laboratory grounds serve as the permanent “home” for three fully equipped monitoring stations: (1) High Plains Regional Climate Center Automated Weather Data Network (AWDN); (2) National Atmospheric Deposition Program (NADP); and (3) USDA UV-B Monitoring Program.
- **Agroforestry Laboratory** located adjacent to the Agro-Meteorology laboratory includes 450 acres of agricultural land protected by shelterbelts. This fully functional farm is self sufficient and provides support for teaching efforts in sustainable agricultural systems. First rate data collection systems are available for monitoring microclimatic conditions in shelter-belt systems.
- **Panhandle Research and Extension Center**
- **West Central Research and Extension Center**
- **Northeast Research and Extension Center**
- **Barta Brothers Ranch** is located about 20 miles south of Long Pine in Rock and Brown Counties. The property was acquired from Jim and Clifford Barta in 1996. The ranch is about 6,000 acres in size with over 5,500 acres categorized as upland range. There is about 120 acres of contiguous subirrigated meadow and over 100 acres of discontinuous subirrigated meadow and wetland scattered over the ranch. The building site covers about 35 acres and includes a wide variety of tree resources.

Other Locations

- **Prairie Pines** is located northeast of Lincoln, NE, at 3100 N. 112th St. Prairie Pines was founded in 1959 by Walt and Virginia Bagley, who recently donated the property to the University of Nebraska. This 145-acre property has been transformed from farmland to an area of diverse woodland and grassland habitats. Included in this property are 20 acres of woodland containing more than 200 species of woody plants, 10 acres of virgin prairie, and 30 acres of seeded prairie grasses and wildflowers. Also present are field windbreaks and waterways. A Christmas tree plantation encompasses 10 acres. Prairie Pines is also an affiliate site of the Nebraska Statewide Arboretum and is being used for field experience in natural resources courses (e.g., NRES 477/877 Great Plains Field Pedology).
- **Cedar Point Biological Station** in western Nebraska, 300 miles west of Lincoln, north of Ogallala. The main lodge of the field station is just over a mile off Nebraska State Highway 61 on the south shore of Lake Ogallala in Keith County, NE. Cedar Point was founded in 1975 and has established a strong educational program and an outstanding record of research productivity. The station has grown from an initial 16 buildings and 15.4 ha to the current 29 buildings and 360 ha of juniper-forested canyons, rugged bluffs overlooking the North Platte River valley, and rolling uplands of shortgrass and mixed-grass prairie. Additionally, Cedar Point has an important presence in the Sandhills as manager of Arapaho Prairie, 518 ha of ungrazed sandhills prairie owned by the Nature Conservancy, which is also available for research and education purposes. The biological station is principally operated by the School of Biological Sciences (some SNR faculty have taught there).

- **Gudmundsen Sandhills Laboratory** is located in the heart of the Nebraska Sandhills in Grant, Hooker, and Cherry counties. Since GSL's inception, research and educational programs have become more ecologically diverse and team oriented. Joint projects with animal, range, soil, veterinary, economics, entomology, geology, hydrology, forestry and wildlife have increased our understanding of the Sandhill's ecosystem and have resulted in advances in range livestock nutrition, beef cattle reproduction, grazing systems, rangeland ecology, low cost cattle management, groundwater issues, and wildlife management.
- **Cedar Canyon Demonstration Forest** is located in Lincoln County, NE, approximately 8 miles southeast of North Platte near Box Elder Canyon. The Cedar Canyon Demonstration Forest was deeded to the Nebraska Forest Service in the Fall of 1992 from the USDA Farmers Home Administration. The property is composed of 640 acres of land situated on bottom lands of stream valleys, canyons, and steep uplands.
- **Haskell Agricultural Laboratory** was formed for the sole purpose of obtaining an experimental station to serve northeast Nebraska.
- **Madigan Prairie** is located in Saunders Co, between Valparaiso & Weston. Madigan is 1 m east of the Butler Co. line, 2 mi south of Route 92. Madigan Prairie was donated to the Foundation in 1978. It consists of 23 acres of 'virgin' tallgrass prairie, never grazed or plowed. The prairie is bounded on the south by a pond and forest, and on the east by forest. Adjacent to the southeast corner of Madigan Prairie is Red Cedar Recreation Area, managed by the Lower Platte South Natural Resources District. Current management practices at Madigan include regular mowing. Within these conditions, the reserve appears to have maintained native flora characteristic of pre-European occupation of the region.
- **Nine Mile Prairie** is located approximately 9 miles northwest of Lincoln, Nine-Mile Prairie is a 230-acre (97-hectare) relict tallgrass prairie owned by the University of Nebraska Foundation. It is located in on the northwest edge of Lincoln, in Lancaster County.
- **Reller Prairie** is located within a natural watershed at the junction of three stream branches at the headwaters of Salt Creek.
- **Allwine Prairie** is located northwest of Omaha in Douglas County, Nebraska. The Preserve, originally a 160-acre farm northwest of Omaha, was donated to the University by Mr. Arthur Allwine in 1959. The 65-hectare area is now a reestablished grassland research area.
- **Horning State Farm** is located 2 miles south of Plattsmouth in Cass County, NE. It comprises 240 acres that includes native woodland, planted woodland, plantable grassy areas, bluegrass pasture, and arboretum and wildlife areas. Tree species include Austrian pine, Rocky Mountain juniper, Ponderosa pine, eastern red cedar, green ash, bur oak, Scotch pine, white pine, honeysuckle, Japanese larch, black locust, Russian olive, hackberry, sycamore, red oak, Jack pine, Douglas fir, black cherry, eastern cottonwood, and honeylocust. The arboretum area includes a building, residence, yard, demonstration and meeting areas. The facility is used as part of the semester long project in NRES 310 (Introduction to Forest Management) and is operated by the Nebraska Forest Service.
- **Audubon Society Sanctuaries: Spring Creek Prairie** is located three miles south of Denton, NE. The Society owns/manages 626 acres. This includes approximately 500 acres of native tallgrass prairie. It also includes a stream, several ponds, wetland and spring areas, and a bur oak woodland. The topography is hilly. The soils are glacial till with large amounts of sand. The list of plant species is over 350 and the bird list is over 150. The area also has deer, coyotes, badgers, pocket gophers, beaver, snapping turtles, and yellow-bellied racers. The prairie has been used for field experiences in classes (e.g., NRES 477/877 Great Plains Field Pedology). **Rowe Sanctuary** is located on the Platte River near Gibbon, Buffalo County. About 1200 acres, almost 3 miles of river channel. Major ecosystems besides the river channel include mixed grass prairie, hay and grazing meadows, wood lots (primary species are cottonwood, green ash, mulberry), wetlands, small stream, CRP (primarily weed and wildlife plants) and ag lands.
- **Nature Conservancy sites**

4.4 The Next Five Years

A number of issues have been raised which need to be addressed over the next five years. These include:

I. Strengthen undergraduate programs

- *Improve or develop courses that attract a large number of undergraduate students* (meeting science requirement in degree program), courses that appeal to a broader need of the university. Possible candidates for this include the development of courses on the “Introduction to Natural Resources” (possibly taught as part I and II; this would replace the required CASNR-based AGRI/NRES 103 “Introduction to Agriculture and Natural Resource Systems”), “Quantitative Skills in Natural Resources,” “Foundation of Natural Resource Sciences,” and an “Introduction to Microclimate,” summer courses and internship programs. NRES 211 (Wildlife Biology and Conservation) has been assigned to faculty of the Fisheries and Wildlife undergraduate major committee to be revised to attract non-majors seeking to fulfill a science requirement. Courses that would attract a teacher “audience” need to be considered. Also consider offering summer and evening courses as well as short courses.
 - *Improve the visibility of various majors.* The undergraduate bulletin/brochures/web pages are being re-evaluated to highlight the various majors. The graduate student and faculty handbooks will be revised. Tools for student assessment will be revised and implemented (to be accomplished within the year).
 - *Develop undergraduate student database* (to be accomplished within the year). Finalize process of populating and maintaining a database to better track current and past students.
 - *Build GIS and quantitative skills into undergraduate and graduate curriculum* (initiate within the year). Evaluate and revise the current BSNR core curriculum to include quantitative courses to support geographical information sciences (GIScience) and mathematic/statistical skills. Develop GIScience related courses (expectation that CASNR will help defray the cost); one such course has been proposed and is pending approval by CASNR and UNL Curriculum Committees (NRES 312 Introduction to Geospatial Information Sciences). Issues related to this objective include the acquisition of a graduate teaching assistantship, reassignment or reallocation of faculty teaching FTE, and computer and related equipment hardware and software needs. Also, skills needed by employers and points in curriculum where they could be taught need to be identified.
 - *Conceptual integration of Natural Resources courses.* All Natural Resources courses should integrate the following education objectives: ecological literacy, critical thinking, quantitative skills, and communication. Enforce prerequisites to ensure a stepwise progression in the educational process, culminating in integrative capstone courses and conduct a formal exercise to develop threads in these areas.
 - *Formalize Independent Study courses.* A number of courses are offered as NRES 496/896 Independent Study that should be developed into official NRES courses.
 - *Review majors.* SNR needs to review the current majors (established before the formation of the School) and job opportunities associated with these as well as potential new majors (e.g., ecosystem science). Possible majors/options include:
 - fold Rangeland Ecosystems major into Fisheries & Wildlife major
 - change current Rangeland Ecosystems major into a “new” major entitled “Ecosystem Science”
 - develop Ecosystem Science option in the Environmental Studies major (within CASNR)
 - develop Ecosystem Science option in Fisheries & Wildlife major
- The NRUC has been asked to hold a series of sessions to discuss options and to bring these to the faculty (to be accomplished within the year). Also, discussions to develop a Meteorology/Climatology umbrella program at UNL between faculty from Geosciences and SNR

are being considered. Undergraduate tracks within the majors need to be considered. A means of recognizing and rewarding faculty for their efforts in developing new programs needs to be formally recognized by upper administration.

- *Increase involvement of undergraduate students in research.* Faculty who advise undergraduates and teach undergraduate courses involve students in their research. The majority of our faculty, however, do not advise or teach undergraduate students, meaning the majority of faculty may very well not be actively involving undergraduates in their research activities. Thus, some means of bridging the disconnect between research and teaching is needed. Possibilities include:
 - develop new majors or tracks
 - develop new lower level courses
 - utilize Undergraduate Creative Activities and Research Experiences (UCARE) (past participants include: Scott Hygnstrom, Larkin Powell, Bill Zanner, Dave Gosselin, Kyle Hoagland)
 - build a student culture in the new SNR building; also utilize e-mail and web communication of undergraduate opportunities

II. Strengthen graduate programs

- *Implementation of Assessment tool.* An assessment plan is being considered by the SNR Graduate Committee for implementation as a means of evaluating the effectiveness of our M.S. and Ph.D. programs.
- *Quality control of graduate students in program.* Implement an annual review of students and effectiveness of their supervisory committees. Also, consider the implementation of a qualifying exam for Ph.D. students during their first year in the program.
- *Prepare graduate students to become better teachers.* Training, coursework and in class experience are needed to teach graduate students effective teaching techniques, testing, student involvement, and equipment use.
- *Develop new graduate programs* (to be initiated within the year). New programs to be considered are a professional M.S. degree (5-year program to extend current 128 credit hour limit of the BSNR) and a human dimensions focused Master of Arts degree in SNR.
- *Develop a full complement of specializations for the Ph.D. program.* Specializations were developed for the M.S. program in the early formation of SNRS; new proposals for the Ph.D. specializations are required. Currently, only a few specializations have been approved.

III. Develop strong recruitment and retention program (undergraduate and graduate students)

- *Increase recruitment efforts and involvement.* We need a coordinator of recruitment activities (managerial/professional level). Dr. Myra Wilhite was hired for a 6-month period to develop recruiting plans for SNR (Appendix 4.9 and 4.10); the plans outline the need for a 0.5-1.0 FTE recruitment coordinator. All Natural Resource majors (plus SNR Teaching Coordinator) are represented on the NRUCC (this was not the case prior to December 2001). A stronger focus on the Natural Resource majors at CASNR-sponsored recruitment events has been the result.
- *Enhance scholarships, internships and job placement efforts.* The SNR Graduate Committee recently was given responsibility of awarding three state-funded graduate assistantships (and \$7500 in Othmer funds for supplemental stipend). The number of School supported assistantships to be used in recruitment efforts needs to be further increased. Develop a strong internship program for undergraduate program (faculty contacts within the disciplines will be essential for identifying internship opportunities and conducting on-site visits and evaluations; the recruitment coordinator will play a vital role in the internship effort). Faculty must encourage students to use the UNL Student Employment Career Services. Submit education/training grants to support

undergraduate/graduate students in research and outreach. Students will be tracked more effectively with the new student database.

· *Establish an external SNR Advisory Group* (within the year). The external SNR Advisory Group (as discussed in Chapter 2) will be utilized for guidance in undergraduate/graduate curriculum, internship placement and job placement.

IV. Increase focus on teaching

· *Involve more faculty in teaching and recruitment.* Convert or offer entry level courses to current upper level courses (e.g., NRES 408/808 “Microclimate: The Biological Environment”). Involve faculty in advising current/new majors/options. Faculty research component should be used as a teaching resource; engage research faculty in classrooms through laboratory exercise, data discussion or other guest lecture learning exercises. Encourage research faculty to utilize UCARE (Undergraduate Creative Activities and Research Experiences). Hold semi-annual teaching faculty meetings.

· *Recognize and reward teaching.* Develop a mechanism to recognize and reward faculty for quality teaching (provide input into annual evaluation and seek awards from local, regional, and national organizations and agencies). Develop a committee (SNR Teaching Recognition Committee) to focus on rewarding faculty for teaching (to be accomplished within the year).

· *Provide state-of-the-art teaching laboratory facilities.* Utilize the SNR Teaching Recognition Committee (as identified in the above bullet) to develop proposals/contacts to acquire needed equipment for teaching laboratories (to be initiated within the year).

· *Hire replacement faculty for undergraduate teaching.* Replacements must be hired in a timely manner that maintains continuity in the teaching program. Needs must be evaluated, selection criteria identified, authorization for hire sought, and initiate the selection process at least one year before the candidates would be expected to teach courses. Upcoming retirements include: Bob Kuzelka (Director, Environmental Studies, anticipated retirement date of December 2003) and Ed Peters (Fisheries Faculty, anticipated retirement date of July 2005). Future faculty retirements in the next 5 to 10 years include: Jim Brandle, Al Weiss and Lowell Moser (Rangeland Ecosystem major and professor in Agronomy & Horticulture; a position with a joint appointment with the Department of Agronomy and Horticulture will be pursued).

· *Evaluation of teaching.* Annual Report of Faculty Activities (ARFA) should report the CIEQ scores for all courses of instruction; promote peer-review and professional evaluation of teaching. The SNR Director or Research/Teaching Associate Director should conduct exit interviews of undergraduate and graduate students. Some activities are underway; for example, Drs. Larkin Powell and Bill Zanner are participating in the UNL Peer-Review of Teaching project (a two-person faculty team with the goal of helping faculty members document their teaching and to involve teams in discussions of teaching and student learning).

· *Regular evaluation of student progress.* For undergraduate students, mandatory advising, advisor-provided passwords for class registration and/or minimum standards for acceptance into the Natural Resources majors. For graduate students, annual student progress reports completed by the student and supervisory committee and reviewed by the SNR Graduate Committee.

· *Cross-listing BIOS courses.* Biological Sciences (BIOS) courses, especially those taught by SNR faculty, should be cross-listed with Natural Resource Sciences courses (NRES). In fact, the academic home of the courses taught by SNR faculty should be moved to NRES (e.g., BIOS 220 “Principles of Ecology” taught by Drs. Wedin and Knops, BIOS 462/862 “Animal Behavior” taught by Freeman, BIOS 476/876 “Mammalogy” taught by Genoways and Freeman).

V. Provide state-of the art teaching laboratory facilities.

Designs for new teaching laboratories teaching classrooms and computer laboratories have been tentatively planned; the new facilities should provide vastly improved opportunities in the near future.

- *Teaching classrooms in the new building* should include a variety of sizes and spatial layouts with multi-media capabilities.
- *Teaching laboratories in the new building* should include a variety of layouts and wet and dry lab capabilities.
- *Computer laboratories* should include up-to-date computer hardware and software, GIS capabilities and teaching capabilities.
- *External teaching facilities* should be established at Prairie Pines as well as an arboretum/grassland laboratory on the grounds of Hardin Hall.

Appendix 4.1 Faculty Teaching FTE and course assignments (Academic Year 2001-02)
 [numbers in () indicate approved or pending changes since Academic Year 2001-02]

| Faculty Member | FTE | Course # | Course Title | Offered |
|-------------------|-------------------|---|---|--|
| Awada, Tala | 0.00 (0.20) | NRES 310 NRES 406/806 ² | Intro to Forest Management Plant Ecophysiology: Theory and Practice | F S |
| Ayers, Jerry | 0.25 ¹ | GEOL 442/842 NRES 496/896 | Environmental Geophysics Current Topics in Geohydrology | F S |
| Brandle, James | 0.30 | NRES 310 NRES 417/817 NRES 849 | Intro to Forest Management Agroforestry Sys. In Sustain. Ag. Woody Plant Growth & Development | F F F even |
| Comfort, Steve | 0.00 (0.10) | NRES 451/851 | Soil Environmental Chemistry | S even |
| Dewey, Ken | 0.40* | METR 100 METR 351 METR 451 METR 498 | Severe and Unusual Weather Basic and Applied Climatology Severe Storms Meteorology/Climatology Research Seminar | S F S even S odd |
| Genoways, Hugh | 0.15 | NRES 476/876 | Mammalogy | S even |
| Gitelson, Anatoly | 0.25* | NRES 496/896 | Quantitative Remote Sensing | S even |
| Gosselin, Dave | 0.10 | NRES 299 | Indep. Study: Earth System Science Educators Indep. Study: Ecosystems of Nebraska Indep. Study: Integrated Earth Science Res. | F odd |
| Harvey, Ed | 0.20 | NRES 419 NRES 419L NRES 468/868 NRES 917 NRES 353/853 | Chemistry of Natural Waters Chemistry of Natural Waters Laboratory Wetlands Environmental Isotope Hydrology Hydrology | S even S even F even S odd F odd |
| Henebry, Geoff | 0.20* | NRES 810 | Landscape Ecology | F odd |
| Hergenrader, Gary | 0.10 | | | |
| Hoagland, Kyle | 0.16 | NRES 468/868 NRES 866 | Wetlands Advanced Limnology | F even S |
| Holz, John | 0.00 (0.15) | NRES 459/859 NRES 496/896 | Limnology Indep. Study: Lake & Reservoir Ecol & Mgmt | S odd S even |
| Hu, Steve | 0.10 | NRES 467/867 | Global Climate Change | F even |
| Hubbard, Ken | 0.10 | NRES 469/869 | Bio-Atmospheric Instrumentation | F odd |
| Hygnstrom, Scott | 0.30 | NRES 348 NRES 448/848 | Wildlife Damage Management Advanced Topics in Wildlife Damage Mgmt | S S odd |
| Jess, Mike | 0.10* | LAW 774 CIVE 916 | Environ. Law & Water resource Mgmt. Seminar Econ. & Legal Aspects of Water Res. Systems Seminar | F odd F |
| Knops, Johannes | 0.20 ¹ | BIOS 220 BIOS 457/857 BIOS 497/897 BIOS 809 | Principles of Ecology Ecosystem Ecology Special Topics in Biological Sciences Professionalism | F S |
| Kuzelka, Robert | 0.35 | NRES 323 NRES 415/815 NRES 475/875 ENVR 496 ENVR 499A | Natural Resources Policy Water Resources Seminar Water Quality Strategy Environmental Studies Seminar Environmental Studies Senior Thesis | F/S S F S F/S |
| Lemen, Cliff | 0.16 | NRES 211 NRES 311 | Wildlife Biology and Conservation Wildlife Ecology and Management | F S |
| Mason, Joe | 0.25* | | | |

| | | | | |
|------------------------|--|--|--|----------------------------|
| Merchant, Jim | 0.25* | NRES 412/812 NRES 418/818 | Introduction to GIS Introduction to Remote Sensing | F F |
| Narumalani, Sunil | 0.30 ¹ | GEOG 420/820 GEOG 422/822 | Remote Sensing III - Digital Image Analysis Advanced Techniques in GIS | S S |
| Peters, Ed | 0.75 | NRES 101 NRES 463/863 NRES 464/864 NRES 889 | Orientation Fisheries Science Fisheries Biology Ichthyology | F F F even S even |
| Powell, Larkin | 0.60 | NRES 311 NRES 350 NRES 399 NRES 862 | Wildlife Ecology & Management Wildlife Management Techniques Indep. Study: Intro to Geo Info Science Conservation Biology | S F S odd S even |
| Reinhard, Karl | 0.25 ¹ | GEOL 446/846 | Palynology | F |
| Rundquist, Don | 0.35 | GEOG 419/819 GEOG 898 | Remote Sensing II: Non-photo. Sensors Field Techniques in Remote Sensing | F S |
| Shea, Pat | 0.20 (0.10) | NRES 896 NRES 896 | Indep. Study: Herbicide Chem.: Metab. & Action Indep. Study: Read Environ. Remed. & P... | S even F |
| Skopp, Joe | 0.50 | NRES 281 NRES 307 NRES 461/861 NRES 858 NRES 961 | Introduction to Water Science Analysis of Earth Systems Soil Physics Soil Physical Determination Advanced Soil Physics | S F S S |
| Swinehart, Jim | 0.15* | GEOL 106 GEOL 469/869 | Environmental Geology Regional Field Geology | S (2/3) F |
| Tyre, Drew | 0.00 (0.40) | NRES 450/850 | Biology of Wildlife Populations | S |
| Verma, Shashi | 0.15 | NRES 408/808 NRES 954 | Microclimate: The Biological Environment Turbulent Transfer in the Atmos. Sfc. Layer | F S odd |
| Walter-Shea, Elizabeth | 0.15 (0.35) | NRES 408/808 NRES 908 | Microclimate: The Biological Environment Solar Radiation Interactions: Earth's Surface | F S even |
| Wedin, Dave | 0.60 (0.40) | BIOS 220 NRES 423/823 NRES 424/824 | Principles of Ecology Integrated Resource Management Forest Ecology | F S F |
| Weiss, Al | 0.15 | NRES 906 NRES 907 | Crop Growth & Yield Modeling Agricultural Climatology | S even S odd |
| Wilhite, Don | 0.10 | NRES 852 | Climate and Society | F odd |
| Zanner, Bill | 0.30 | SOIL 279 NRES 468/868 NRES 477/877 NRES 896 | Soil Evaluation Wetlands Great Plains Field Pedology Indep. Study: Soil Genesis: Great Plains | F even S S |
| Total | 6.42 CASNR 1.00 CAS- SNR 1.05 CAS 0.55 Other 9.02 | | | |

*Geosciences, Conservation and Survey, or other-funded appointment

¹CAS funding

²proposed course

Team taught courses include: NRES 101 (Orientation), NRES 404 (Fisheries & Wildlife Seminar), NRES 491/891 (Natural Resources Seminar)

Thesis/Independent Study courses include: NRES 299, 399, 499, 899, 999

Appendix 4.2 Bachelor of Science degree in Natural Resources Core Requirements (2002-2003)

| Required Areas | Credit Hrs |
|--|------------|
| AGRI/NRES 103 Food, Agricultural & Natural Resource Systems | 3 |
| Senior Capstone Course | 3 |
| Selected Natural Resources Courses | |
| (minimum of one course from each of the following areas): | 15 |
| <i>Animal Resources</i> | |
| AGRO 360 Applied & Environmental Microbiology..... | 3 |
| BIOS 112 and 112L Intro to Zoology/Lab..... | 4 |
| BIOS 320 Principles of Ecology | 3 |
| BIOS 386 Vertebrate Zoology | 4 |
| NRES 211 Wildlife Biology & Conservation..... | 3 |
| NRES 311 Wildlife Ecology & Conservation | 3 |
| <i>Geologic and Soil Resources</i> | |
| GEOL 101 Physical Geology | 4 |
| GEOL 105 Life of the Past..... | 3 |
| GEOL 106 Environmental Geology..... | 3 |
| GEOL 109 Oceanography..... | 3 |
| SOIL 153 Soil Resources | 4 |
| <i>Plant Resources</i> | |
| AGRO 204 Resource-Efficient Crop Management..... | 3 |
| AGRO 360 Applied & Environmental Microbiology..... | 3 |
| BIOS 109 General Botany..... | 4 |
| BIOS 220 Principles of Ecology..... | 3 |
| BIOS 374 Diversity of Plants..... | 4 |
| BIOS 455 Great Plains Flora | 3 |
| BIOS 471 Plant Taxonomy..... | 4 |
| NRES 417 Agroforestry Systems in Sustainable Agriculture..... | 3 |
| NRES 424 Forest Ecology..... | 4 |
| NRES 459 Limnology..... | 4 |
| RNGE 240 Forage Crop & Range Management..... | 4 |
| <i>Water and Climatic Resources</i> | |
| GEOG 150 Physical Geography..... | 3 |
| METR 200 Meteorology..... | 4 |
| NRES 281 Introduction to Water Science..... | 3 |
| NRES 408 Microclimate: The Biological Environment..... | 3 |
| WATS 354 Soil Conservation & Watershed Management..... | 3 |
| Mathematics and Analytical Skills(beyond college algebra) | 5 |
| Natural Sciences 20-21 | |
| BIOS 101 and 101L General Biology and Lab | 4 |
| Biological Sciences | 4 |
| CHEM 109 General Chemistry I | 4 |
| CHEM 110 General Chemistry II | 4 |
| Physics (one of the following) | 4-5 |
| PHYS 141 Elementary General Physics..... | 5 |
| PHYS 151 Elements of Physics..... | 4 |
| PHYS 211 General Physics..... | 4 |
| MSYM 109 Physical Principles in Agriculture | 4 |

Communications* 9

| | |
|--|---|
| Written Communication | 3 |
| Oral Communication | 3 |
| Communication and Interpersonal Skills electives | 3 |

Humanities and Social Sciences 21

| | |
|---|----|
| ECON 211 or 212 or AECN 141 | 3 |
| Elective | 3 |
| Essential Studies (one 3 credit course in each of the following): | 15 |
| C. Human Behavior, Culture & Social Organization | |
| E. Historical Studies | |
| F. Humanities | |
| G. Arts | |
| H. Race, Ethnicity & Gender | |

Major Requirements and Electives (Natural Resources) 52

Total Credit Hours Required for Graduation 128

Appendix 4.3 Bachelor of Science degree in Natural Resources Core Requirements (Proposed).
 Highlighted areas indicate proposed changes from the present requirements given in Appendix 4.2

| Required Courses | Credit Hrs |
|--|------------|
| Natural Resources 21-23 | |
| AGRI/NRES 103 | 3 |
| Senior Capstone Course | 3 |
| Geographical Information Science Course (NRES 312*, 412 or 418) | 3-4 |
| BIOS 220 Principles of Ecology | 3 |
| NRES 323 Natural Resources Policy | 3 |
| Earth Science course (one of the following): | |
| GEOL 100 Introduction to Geology | 3 |
| GEOL 101 Physical Geology | 4 |
| GEOL 106 Environmental Geology | 3 |
| METR 200 Weather and Climate..... | 4 |
| SOIL 153 Soil Resources | 4 |
| WATS 281 Introduction to Water Science | 3 |
| Course in Natural Resources/Environmental Economics | 3 |
| Mathematics and Statistics (choose from the following) 5 | |
| STAT 218 Statistics..... | 3 |
| MATH 102 Trigonometry | 2 |
| MATH 104 Calculus for Managerial and Social Sciences | 3 |
| MATH 106 Analytical Geometry and Calculus I..... | 5 |
| Note: Proficiency at the college algebra level must be demonstrated either by a placement exam or through course work. If MATH 103 is taken, only 2 cr hrs can be counted towards this requirement | |
| Natural Sciences 20-21 | |
| BIOS 101 and 101L General Biology and Lab | 4 |
| Biological Sciences (except BIOS 220) | 4 |
| CHEM 109 General Chemistry I | 4 |
| Physics (one of the following) | 4-5 |
| PHYS 141 Elementary General Physics | 5 |
| PHYS 151 Elements of Physics | 4 |

| | |
|---|------------|
| PHYS 211 General Physics..... | 4 |
| MSYM 109 Physical Principles in Agriculture | 4 |
| <hr/> | |
| Communications* | 9 |
| Written Communication | 3 |
| Oral Communication | 3 |
| Communication and Interpersonal Skills electives | 3 |
| <hr/> | |
| Humanities and Social Sciences | 18 |
| ECON 211 or 212 or AECN 141 | 3 |
| Essential Studies (one 3 credit course in each of the following): | 15 |
| C. Human Behavior, Culture & Social Organization | |
| E. Historical Studies | |
| F. Humanities | |
| G. Arts | |
| H. Race, Ethnicity & Gender | |
| <hr/> | |
| Required Credit Hours in Minimum Requirements | 69 |
| Major Requirements and Electives (Natural Resources) | 59 |
| <hr/> | |
| Total Credit Hours Required for Graduation | 128 |
| <hr/> | |

* NRES 312 proposed course in Introduction to Geographic Information Sciences

Appendix 4.4 Undergraduate Courses of Instruction

Undergraduate courses for the five BSNR majors administered by SNR are listed below. Courses numbered 4xx/8xx are offered for both undergraduate (4xx) and graduate (8xx) credit. (ES) courses fulfill the Essential Studies requirement. (IS) courses fulfill the Integrative Studies requirement. Note: courses offered in the Fisheries and Wildlife program are listed with the prefix NRES.

Environmental Studies (ENVR)

ENVR 496. Environmental Studies Seminar (1 cr) Prereq: Senior standing and environmental studies major or minor. Topic varies. Consists of a series of invited speakers dealing with topics related to an environmental theme selected for its appropriate and timely nature by the Environmental Studies Coordinating Committee.

ENVR 497. Internship in Environmental Studies (1-4 cr) Prereq: Environmental studies major, prior arrangement with and permission of faculty member in student's area of emphasis. For seniors and some juniors who wish to gain experience in off-campus settings that are directly relevant to environmental studies.

ENVR 498. Independent Study (1-4cr) Prereq: Environmental studies major; prior arrangement with and permission of program director and emphasis adviser.

ENVR 499A. Environmental Studies Senior Thesis (1 cr) Prereq: Junior standing; environmental studies major or minor; prior arrangement with and permission of program director and emphasis adviser or academic adviser. Pass/No Pass. Preparation for writing the senior thesis.

ENVR 499B. Environmental Studies Senior Thesis II (2 cr) Prereq: ENVR 499A. Second course in a two-semester sequence, consisting of ENVR 499A and 499B. The thesis is to be written under the supervision of the emphasis adviser or adviser, or a faculty member designated by the adviser. A committee of two (the faculty member guiding the thesis and an additional member with expertise in the thesis topic) will review the thesis. Write a senior thesis.

Fisheries and Wildlife (NRES)

NRES 101. Forestry and Natural Resources Orientation (1 cr I, II) Lec 1. Prereq: Freshman, first-year College of Agricultural Sciences and Natural Resources, (CASNR) or transferring student with a major in CASNR. P/N only. Overview of courses, options, schools, careers, employment opportunities, concepts and future trends in natural resources.

NRES 103. Introduction to Agriculture, and Natural Resource Systems [ES][IS](AGRI 103, LIBR 110A) (3 cr I, II) Lec 2, disc 1. Agricultural and natural resource systems. The interrelationship and the impact of increased human involvement on these systems.

NRES 170. Introduction to Great Plains Studies (ANTH, GEOG, GPSP* 170, SOCI) (3 cr) Required for Great Plains Studies majors and minors. Interdisciplinary study of the natural environment, social environment, human heritage, arts and humanities of the Great Plains.

NRES 211. Wildlife Biology and Conservation [ES] (3 cr I) Lec 3. Prereq: Sophomore standing or permission. Open to non-majors. Not intended for a fisheries and wildlife major. Credit in NRES 211

will only count toward the free electives requirement for the degree for fisheries and wildlife majors. Introduction to wildlife ecology and biology, interrelationships between humans and wildlife, and basic principles in wildlife management. Natural history of selected Nebraska wildlife, controversial issues concerning wildlife, and international wildlife management

NRES 212. Landscape Plants I (HORT* 212) (3 cr I) Lec 2, rct 1. Prereq: HORT 130. *Several required off campus field trips will be scheduled for Saturdays. Identification using botanical and common names for herbaceous annuals, perennials, grasses, ground covers, vines, trees, and shrubs commonly found in Great Plains gardens, parks, and landscapes is stressed through field visits.*

NRES 213. Landscape Plants II (HORT* 213) (3 cr II) Lec 2, lab/ field 2. Prereq: HORT 212. *Continuation of HORT 212, stressing site requirements, landscape use, natural history, and specific needs of herbaceous ornamentals, grasses, ground covers, vines, trees and shrubs commonly found in Great Plains gardens, parks, and landscapes. Common cultivars and additional species not covered in HORT 212 also receive attention.*

NRES 270. Biological Invaders (PLPT* 270, HORT) (3 cr I) Prereq: 3 hrs biological sciences. *Impact of exotic species and invasive organisms: agricultural and medical emerging disease; predicting biological invasions; biological control; regulatory, monitoring and control efforts; ecological impact.*

NRES 281. Introduction to Water Science [ES] (GEOG, WATS* 281) (3 cr I) Prereq: GEOG 150 or permission. *Survey of the water resource in its geographical context, both world-wide and regionally. Basic principles of the hydrologic cycle, snow hydrology, rivers and river systems, lakes, plus other water topics. Reference made to man/water interactions.*

NRES 299. Independent Study in Forestry, Fisheries and Wildlife (1-5 cr I, II, III) Prereq: Permission. *Individual or group projects in research, literature review, or extension of course work under supervision and evaluation of a departmental faculty member.*

NRES 300. Toxins in the Environment (BIOS, ENTO 300) (2 cr II) Prereq: One semester biology and one semester chemistry. *Offered spring semester of odd-numbered calendar years. Introduction to the principles of toxicology as they apply to environmental contaminants, emphasizing agrochemical, but also including industrial and naturally occurring chemicals.*

NRES 307. Analysis of Earth Systems (4 cr I) Lec 3, lab 2. Prereq: CHEM 110; PHYS 141, 151 or equivalent; AGRI 271 or CSCE 137. *The use and conservation of renewable and nonrenewable resources from the point of view of formal systems analysis. mass balance and use (or transformation) rates are used to estimate rates of resource use and the impact of feedback or recycling on system behavior. Spreadsheets and other software are used to carry out mass balance calculations and to calculate the time for nonrenewable resource depletion and the impact of recycling. Mass balance concepts are used to evaluate contaminant behavior. Population models are introduced to describe the behavior of biotic resources.*

NRES 308. Biogeography (GEOG* 308) (3 cr) Prereq: GEOG 150 or BIOS 101 and 101L, or permission. *Introduction to the basic concepts of biogeography, the study of distributions of plants and animals, both past and present. Biogeography is a highly interdisciplinary science, relying heavily on ecology, geological science and climatology. Global in scope and offers the latest knowledge in understanding organism distributions and the factors that determine those distributions.*

NRES 310. Introduction to Forest Management (4 cr) Lec 3, lab 4. Prereq: BIOS 109 or permission. One all-day Saturday field trip is required. Discussion of the history, biology, and management of the world's forest resources with emphasis on the Great Plains region. Topics include: forest types and their relationship to site conditions, ecological principles of forest management, basic forest management practices, economic and policy decisions in forest management. The field-oriented lab emphasizes tree identification, forest ecology, forest management and wood products.

NRES 311. Wildlife Ecology and Management (3 cr II) Lec 3. Prereq: BIOS 320 and 322. Wildlife ecology and population biology and enhancement of wildlife populations through management. Emphasis on both game and nongame species. Basic concepts in conservation biology.

NRES 312 (proposed). Introduction to Geospatial Information Science (3 cr II) Lec. 2, lab 2. Prereq: Junior standing or above, basic computer skills, such as spreadsheets, word processors, and data and file management. Introduction to the theory and applications of geospatial information technology. Remote sensing, GPS data collection, GIS data types, editing GIS data, and spatial data analysis with emphasis on applications to natural resources using a problem-based learning format.

NRES 315. Study Tours in Natural Resource Management (1-3 cr each, max 6 I, II, III) Prereq: Permission. P/N only. Group educational experience combining lectures, discussions and/or seminars with tours to broaden a student's knowledge of specific aspects of natural resources management. Choice of subject matter and coordination of on- and off-campus study at the discretion of the instructor.

NRES 318. Aerial Photography in Land and Water Use (GEOG* 318) (3 cr) Lec 2, rct 1, lab 2. Applied photogrammetry and aerial photo interpretation as these areas relate to natural resources. Use of aerial photographs and photogrammetric principles by a land manager for mapping, inventorying, and managing, administering natural resources emphasized.

NRES 323. Natural Resources Policy [ES][IS] (3 cr II) Lec 3. Prereq: Junior standing. Conflicts and common ground perpetuated by increasing demands on our natural resources. Policy development and issue analysis stressed. Historical policy actions reviewed and evaluated.

NRES 348. Wildlife Damage Management (3 cr II) Lec 2, lab 3. Prereq: NRES 311. Fundamentals of prevention and control of damage caused by vertebrate pests, principally birds and mammals. Includes the philosophical, ecological, and behavioral basis for controlling population levels or individuals of pest specie.

NRES 350. Wildlife Management Techniques [IS] (3 cr I) Lec 2, lab 3. Prereq: NRES 311. Survey of techniques utilized in wildlife management emphasizing habitat analysis, field techniques, criteria of sex and age, and animal damage control.

NRES 388. Employment Seminar (AGRI* 388) (1 cr I, II) P/N only. Sophomore or junior standing in the College of Agricultural Sciences and Natural Resources recommended. Seminar to develop job-hunting skills as applied to the fields of agriculture and natural resources. How to go about the job-hunting process efficiently and effectively. Experiential in design. Students write resumes and letters of application, assess their own capabilities, research potential employers, and go through a mock interview.

NRES 399. Independent Study in Forestry, Fisheries and Wildlife (1-5 cr I, II, III) Prereq: 8 hrs forestry, fisheries and wildlife 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.

NRES 402/802. Aquatic Insects (BIOS 485/885; ENTO* 402/ 802) (2 cr II) Lec 2. Prereq: 12 hrs biological sciences or permission. Biology and ecology of aquatic insects.

NRES 402L/802L. Identification of Aquatic Insects (BIOS 485L/885L; ENTO* 402L/802L) (1 cr II) Lab 1. Prereq: Parallel ENTO/NRES 402/802/BIOS 485/885. Identification of aquatic insects to the family level.

NRES 403/803. Fundamentals of Crop Physiology (AGRO*, HORT 403/803) (2 cr II, first 8 wks) Lec 4. Prereq: BIOS 325 or equivalent. *To complete a basic course in crop physiology, students registering for AGRO 403/803 (NRES, HORT 403/803) should also register for at least one or more of the following for the second eight weeks: AGRO/804 (Field Crop Physiology), AGRO 441/841 (Forage and Range Physiology).* Principles of crop physiology as derived from the basic precepts of plant physiology/biochemistry and crop production/ecology.

NRES 404. Forestry, Fisheries and Wildlife Seminar (1 cr per sem, max 2 cr II) Lec 4. Prereq: Junior standing or above in natural resources or permission. Seminar involving technical aspects of forestry, fisheries, and wildlife management.

NRES 406/806 (proposed) Plant Ecophysiology: Theory and Practice (AGRO, HORT 406/806), (4 cr I) Lec. 3, lab 1. Offered fall semester of even-numbered calendar years. Prereq: Junior standing, 4 hours of ecology, 4 hours of botany or plant physiology, or permission. Principles of plant physiology which underlie the relationship between plants and their physical, chemical and biotic environments. An introduction to the ecological niche, limiting factors and adaptation. An overview of seed germination and ecology, plant and soil water relations, nutrients, plant energy budgets, photosynthesis, carbon balance and ecophysiological studies. A field/greenhouse experiment assigned to graduate students registered for 806 level.

NRES 408/808. Microclimate: The Biological Environment (AGRO, GEOG, HORT, METR* 408/808; WATS 408) (3 cr) Prereq: Junior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering; or permission. 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.

NRES 409/809. Horticulture Crop Physiology (HORT* 409/ 809) (4 cr II) Lec 3, rct/lab 3. Prereq: BIOS 325 or permission. Offered spring semester of even-numbered calendar years. Application of physiological principles to the growth, development, and survival of herbaceous and woody plants.

NRES 412/812. Introduction to Geographic Information Systems (GEOG* 412/812) (4 cr) Lec 3, lab 2. Lab exercises provide experience with GIS software. Introduction to conceptual foundations and applications of computer-based geographic information systems (GIS). GIS database development, spatial data analysis, spatial modeling, GIS implementation and administration.

NRES 413/813. Environmental Leadership: A Historical and Ethical Perspective [ES][IS](ALEC* 410/810) (3 cr) Lec. Chronological study of major figures in conservation and ecology that emphasizes historical and ethical development and relationships. Primary focus on the Great Plains.

NRES 415/815. Water Resources Seminar (AGRO*, GEOG 481/881; GEOL 415/815) (1 cr II) Prereq: Junior standing or above, or permission. Seminar on current water resources research and issues in Nebraska and the region.

NRES 416/816. Veterinary Entomology/Ectoparasitology (ASCI, ENTO*, VBMS 416/816) (2 cr II) Lec 2. Prereq: 10 hrs entomology or biological science or related fields or permission. Arthropods that cause or vector diseases in animals. Arthropod recognition and biology and disease epidemiology.

NRES 416L/816L. Veterinary Entomology/Ectoparasitology Lab (ASCI, ENTO*, VBMS 416L/816L) (1 cr II) Prereq: ENTO/ASCI/NRES/VBMS 416/816; or parallel. Identification of Arthropods to the family level.

NRES 417/817. Agroforestry Systems in Sustainable Agriculture (HORT 418/818) (3 cr) Lec 3. Prereq: 12 hours biological or agricultural sciences. At least one course in production agriculture and one course in natural resources is strongly suggested. Offered odd-numbered calendar years. The roles of woody plants in sustainable agricultural systems of temperate regions. Emphasis on the ecological and economic benefits of trees and shrubs in the agricultural landscape. Topics include: habitat diversity and biological control; shelterbelts structure, function, benefits and design; intercropping systems; silvopastoral systems; riparian systems; and production of timber and specialty crops. Comparison of temperate agroforestry systems to those of tropical areas.

NRES 418/818. Introduction to Remote Sensing (GEOG* 418/ 818) (4 cr) Lec 3, lab 2. Prereq: 9 hrs in courses in the earth or natural resource sciences including GEOG 150 and 152 or 155; or permission. Introduction to remote sensing of the earth from aerial and satellite platforms. Aerial photography, multispectral scanning, thermal imaging and microwave remote sensing techniques. Physical foundations of remote sensing using electromagnetic energy, energy-matter interactions, techniques employed in data acquisition and methods of image analysis. Weekly laboratory provides practical experience in visual and digital interpretation of aerial photography, satellite imagery, thermal and radar imagery. Applications in geographic, agricultural, environmental and natural resources analyses.

NRES 419/819. Chemistry of Natural Waters (GEOL* 418/818, WATS 418) (3 cr II) Lec 3. Prereq: Two semesters of college chemistry, or CHEM 109 and 110, 113 and 114, or CHEM 111; or permission. Principles of water chemistry and their use in precipitation, surface water, and groundwater studies. Groundwater applications used to determine the time and source of groundwater recharge, estimate groundwater residence time, identify aquifer mineralogy, examine the degree of mixing between waters of various sources and evaluate what types of biological and chemical processes have occurred during the water's journey through the aquifer system.

NRES 419L/819L. Chemistry of Natural Waters Laboratory (GEOL* 418L/818L, WATS 418L) (1 cr II) Prereq: Two semesters college chemistry or permission. Parallel: GEOL 418/818, NRES 419/819, WATS 418. Offered even numbered calendar years or as needed. Basic laboratory techniques used to perform water analysis including various wet chemical techniques, instrument use (AA, IC, UV-

Visible) and computer modeling. Techniques for sample collection and preservation, parameter estimation and chemical analysis.

NRES 420/820. Applications of Remote Sensing in Agriculture and Natural Resources (AGRO, GEOG, GEOL* 419/ 819) (4 cr) Lec 3, lab 2. Prereq: GEOG/NRES 418/818 or permission. Aerial photography, multispectral scanning, thermal imaging and microwave remote sensing techniques. Physical foundations of remote sensing using electromagnetic energy, energy-matter interactions, techniques employed in data acquisition and methods of image analysis. Weekly laboratory provides practical experience in visual and digital interpretation of aerial photography, satellite imagery, thermal and radar imagery. Applications in geographic, agricultural, environmental and natural resources analyses.

[IS] **NRES 423/823. Integrated Resources Management 1 (3 cr II) Lec 3.** Prereq: Senior standing, natural resources or related major; or permission. Integrated and multiple-use management. Economic, political, social, and physical impacts on natural resources management priorities.

NRES 424/824. Forest Ecology (4 cr I) Lec 3. Field/lab 3. Prereq: BIOS 320 or permission. Includes a weekend field trip to forested sites in Nebraska. Ecology of North American forests, emphasis on woodland and savanna vegetation in the Great Plains and identification of native trees and shrubs.

NRES 435/835. Agroecology (AGRO*, HORT 435/835) (3 cr II) Lec 3. Prereq: For AGRO/HORT/NRES 435: Senior standing or permission. For AGRO/HORT/NRES 835: 12 hrs biological or agricultural sciences or permission. Team projects for developing communication skills and leadership skills. Integration of principles of ecology, plant and animal sciences, crop protection, and rural landscape planning and management for sustainable agriculture. Includes natural and cultivated ecosystems, population and community ecology, nutrient cycling, pest management, hydrologic cycles, cropping and grazing systems, landscape ecology, biodiversity and socioeconomic evaluation of systems.

NRES 442/842. Environmental Geophysics I (GEOL* 442/842) (4 cr) Lec 3, lab 3. Prereq: MATH 107; PHYS 211; GEOL 101 or 106; or equivalent or permission. Introduction to the principles of seismic, ground-penetrating radar, and bore-hole geophysical methods and their application to groundwater, engineering, environmental, and archaeological investigations.

NRES 443/843. Environmental Geophysics II (GEOL* 443/843) (4 cr) Lec 3, lab 3. Prereq: MATH 107; PHYS 211; GEOL 101 or 106; or equivalent or permission. Introduction to principles of magnetic, electromagnetic, resistivity, and gravity methods and their application to ground water, engineering, environmental and archaeological investigations.

NRES 448/848. Advanced Topics in Wildlife Damage Management (2 cr II) Lec 2. Prereq: NRES 348. Participation in a three day professional conference is strongly encouraged. Economic, global, and public policy issues relative to situations in which wildlife damage personal property or natural resources, threaten human health and safety, or are a nuisance. Demonstration and discussion of technological advances in fertility control, damage resistance, toxicology, behavioral modification, and biological management.

NRES 450/850. Biology of Wildlife Populations (BIOS* 450/ 850) (4 cr II) Lec 3, lab 3. Prereq: BIOS 320 or permission. Principles of population dynamics. Management strategies (for consumptive and nonconsumptive fish and wildlife species) presented utilizing principles developed.

NRES 451/851. Soil Environmental Chemistry (3 cr II, offered even-numbered calendar years) Lec 3. Prereq: CHEM 250 or equivalent or graduate standing; or permission. Theory, mechanisms and processes related to chemical behavior in soil-water environments. Application of computer simulation models for predicting contaminant fate in soil. Basic chemical and biological principles of remediating contaminated soil and water.

NRES 452/852. Climate and Society (AGRO, GEOG, METR* 450/850) (3 cr) Prereq: METR 200 or 351 or equivalent, or permission. Offered spring semester of even-numbered calendar years. Impact of climate and extreme climatic events on society and societal responses to those events. Global in scope and interdisciplinary.

NRES 454/854. Population and Community Ecology (BIOS* 454/854) (4 cr) Lec 3, lab 4. Prereq: BIOS 302 or 320 or equivalent. May also be offered at Cedar Point Biological Station. Nature and characteristics of populations and communities. Interactions within and between populations and community structure and dynamics. Examples from plants and animals.

NRES 455/855. Soil Chemistry and Mineralogy (AGRO* 455/ 855; SOIL 455) (3 cr I) Lec 3. Prereq: AGRO/SOIL 153, CHEM 116 or 221 or equivalent. Chemical and mineralogical properties of soil components with emphasis on the inorganic colloidal fraction. Structures of soil minerals as a means of understanding properties, such as ion exchange and equilibria; release and supply of nutrient and toxic materials; and soil acidity and alkalinity.

NRES 456/856. Mathematical Models in Biology (BIOS* 456/ 856) (3 cr) Lec 3. Prereq: Junior or senior standing in biological sciences, MATH 106 or 107 or permission. Biological systems, from molecules to ecosystems, are analyzed using mathematical techniques. The strengths and weaknesses of mathematical techniques. The strengths and weaknesses of mathematical approaches to biological questions are emphasized. Topics: 1) brief review of college level math, 2) introduction to modeling, 3) oscillating systems in biology, 4) randomness in biology, 5) review of historically important and currently popular models in biology...delete?.

NRES 457/857. Soil Chemical Measurements (SOIL 457, AGRO* 457/857) (2-3 cr I) Lec 2, lab 4-6. Prereq: AGRO 153, CHEM 116 or 221 or equivalent or permission. Permission required to register for 2 cr. Students registered for 3 cr will design, carry out, and report on an independent study project conducted during the semester. Offered even-numbered calendar years. Theory and practice of soil chemical analyses commonly encountered in research and industrial settings. Wet analyses of inorganic fraction of soil and operation of instrumentation necessary to quantify results of those analyses.

NRES 458/858. Soil Physical Determinations 1 (SOIL 458, AGRO* 458/858) (2 cr I) Lab 3, plus 3 hrs arr. Prereq: SOIL/ AGRO/GEOG/WATS 361; PHYS 141 or equivalent; MATH 102 or 103. Graduate students in NRES/AGRO 458/ 848 or SOIL 458 are expected to carry out an independent project and give an oral report. Survey of measurement techniques and principles used in characterizing the physical properties of soils. Includes analysis of experimental design and sources of experimental error. Techniques included: particle size analysis, soil water content, pore size analysis, field sampling techniques, soil strength, and saturated hydraulic conductivity.

NRES 459/859. Limnology (BIOS* 459/859, WATS 459) (4 cr II) Lec 3, lab 4. Prereq: 12 hrs biological sciences, including introductory ecology; 2 sems chemistry. May also be offered at Cedar

Point Biological Station. Physical, chemical, and biological processes that occur in fresh water; organisms occurring in fresh water and their ecology; biological productivity of water and its causative factors; eutrophication and its effects.

NRES 460/860. Soil Microbiology (AGRO* 460/860, BIOS 447/ 847, SOIL 460) (3 cr II) Lec 3.

Prereq: One semester microbiology; one semester biochemistry or organic chemistry. Soil from a microbe's perspective—growth, activity and survival strategies; principles governing methods to study microorganisms and biochemical processes in soil; mechanisms controlling organic matter cycling and stabilization with reference to C, N, S and P; microbial interactions with plants and animals; and agronomic and environmental applications of soil micro-organisms.

NRES 461/861. Soil Physics (AGRO*, GEOL 461/861; SOIL, WATS 461) (3 cr I) Lec 3. Prereq:

AGRO/SOIL 153; PHYS 141 or equivalent, one semester of calculus. Recommended: Parallel AGRO/NRES/SOIL 458. Principles of soil physics. Movement of water, air, heat, and solutes in soils. Water retention and movement, including infiltration and field water regime. Movement of chemicals in soils.

[IS] **NRES 463/863. Fisheries Science** (4 cr I) Lec 3, lab 3. *May also be offered at Cedar Point Biological Station.* Fisheries biology emphasizing the determination and evaluation of vital statistics for the management of fish populations. Basis of specific management techniques.

NRES 464/864. Fisheries Biology (BIOS 464/864) (3 cr) Lec 3. Prereq: BIOS/NRES 489/889 or equivalent. Biology of fishes. Factors that affect fishes in the natural environment. Techniques used in the analysis and management of fish populations.

NRES 465/865. Soil Geomorphology and Paleopedology(GEOL* 465/865) (3 cr) Lec 2, lab 3.

Prereq: GEOL 450/850 and NRES 477/877; or permission. Two field trips required. Soils and paleosols as evidence in reconstruction landscape evolution and paleoenvironments. Role of paleosols in stratigraphy.

NRES 467/867. Global Climate Change (METR* 467/867) (3 cr) Lec 3. Prereq: Junior standing; MATH 106; 5 hrs physics; METR/GEOG 251, 252, 350 and 453/853; or permission. Offered fall semester of even-numbered calendar years. Elements of climate systems, El Niño/La Niña cycle and monsoons, natural variability of climate on interannual and interdecadal scales. Paleoclimate, and future climate, developed climate change scenarios and climate change impacts on natural resources and the environment.

NRES 468/868. Wetlands (BIOS 458, WATS* 468) (4 cr II) Lec 4. Prereq: 12 hrs biological sciences; BIOS 320; CHEM 109 and 110. Offered even-numbered calendar years. Physical, chemical and biological processes that occur in wetlands; the hydrology and soils of wetland systems; organisms occurring in wetlands and their ecology wetland creation, delineation, management and ecotoxicology.

NRES 469/869. Bio-atmospheric Instrumentation (AGRO, GEOG, MSYM, METR* 469/869; HORT 407/807) (3 cr I) Lec 2/lab 1. Prereq: Junior standing; MATH 106; 4 hrs physics; physical or biological science major. Offered fall semester of odd-numbered calendar years. Discussion and practical 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.

NRES 475/875. Water Quality Strategy (AGRO*, CIVE, CRPL, GEOL, MSYM, POLS, SOCI 475/875; SOIL, WATS 475) (3 cr II) Lec 3. Prereq: Senior standing or permission. Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.

NRES 476/876. Mammalogy (BIOS* 476/876) (3 cr) Prereq: 12 hrs biological sciences including BIOS 386, or 12 hrs natural resources including NRES 311; or permission. May also be offered at Cedar Point Biological Station. Survey of animals of the world, with emphasis of mammals of Nebraska and the Great Plains.

NRES 477/877. Great Plains Field Pedology [IS] (AGRO* 477/ 877, GEOG 467/867, SOIL 477) (4 cr II) Lec 3. Lab. Prereq: AGRO/SOIL 153 or permission. Spatial relationship of soil properties on various parts of landscape typical of the Plains, causal factors, and predictions of such relationships on other landscapes. Grouping these properties into classes, naming the classes, and the taxonomy that results from this grouping. Application of a taxonomy to a real situation through making a field soil survey in a region representative of the Plains border, predicting land use response of various mapped units as it affects the ecosystem, and evaluating the effectiveness of the taxonomic system used in the region surveyed.

NRES 488/888. Groundwater Geology (GEOL* 488/888) (3 cr) Prereq: GEOL 101; MATH 107 or equivalent. Occurrence, movement, and development of water in the geologic environment.

NRES 489/889. Ichthyology (BIOS* 489/889) (4 cr I) Lec 3, lab 4. Prereq: 12 hrs biological sciences. May also be offered at Cedar Point Biological Station. Fishes, their taxonomy, physiology, behavior, and ecology. Dynamics of fish stocks and factors regulating their production.

NRES 491/891. Seminar in Natural Resource Sciences (1 cr, max 2 cr I, II) Presentations of special non-thesis topics, and/or research plans, and/or thesis research results.

NRES 495. Grasslands Seminar (AGRO* 495, ENTO 495, HORT 495, PATH 495, RNGE 495, SOIL 495).

NRES 496/896. Independent Study (1-5 cr, max 5 I, II, III) Ind. Prereq: 12 hrs natural resource sciences or closely-related fields, and permission. Individual or group projects in research, literature review, or extension of course work.

NRES 497/897. Career Experiences in Natural Resource Sciences (1-6 cr, max 6, I, II, III) Prereq: Sophomore standing; School of Natural Resources (SNR) majors; permission and advanced approval of a plan of work. Internships are coordinated by School of Natural Resources faculty and administered through the UNL Student Employment and Internship Center. Off-campus work experiences sponsored by natural resource agencies, companies, and organizations. Students collaborate in the development of a plan of work that will identify student responsibilities, including a final written report.

NRES 499H. Honors Thesis (3-6 cr I, II, III) Prereq: Admission to the University Honors Program and permission, AGRI 299H recommended. Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.

Rangeland Ecosystems (RNGE)

RNGE 201. Preparation for an Agronomic Career (AGRO*, SOIL 201) (2 cr II) Lec 2. Prereq: Sophomore standing; major in agronomy, range science, or soil science, or permission. Group activities to help formulate ideas about careers. Develop skills and obtain information bases that help to be more effective students and be better prepared for post-college life. Emphasis on plant and soil sciences.

RNGE 240. Forage Crop and Range Management [IS] (AGRO* 240) (4 cr I, II) Lec 3, lab 2. Prereq: AGRO 101 or BIOS 109 or equivalent. Principles basic to the establishment, management, and utilization of forage crops, pastures and ranges. Plant identification and selection, seeding, fertilization, plant community manipulation, forage/range quality and utilization, and range management. The role of forages and ranges in developing a sustainable agriculture.

RNGE 242. North American Range Plants (AGRO*, SOIL 242) (1 cr I, II, max 4) Prereq: Permission, AGRO 240 recommended. Develops skills for identification and description of 200 important range plants of North America. The characteristics of these plants evaluated in terms of management implications.

RNGE 299. Research Problems and Career Experience (AGRO*, SOIL 299) (1-5 cr I, II, III) Prereq: Permission and advance approval of plan of work. *P/N only. Written report usually required.* Student participation in agronomic applications and in agronomy-related areas of agribusiness; agronomic research in lab, greenhouse, or field; participation in farming practices other than those in which the student has had previous experience; or preparation of teaching materials.

RNGE 340. Range Management and Improvement (AGRO* 340) (3 cr II) Lec 2, lab 3. Prereq: AGRO 240 or permission. Analyzing the principles of range management within the ecosystem framework with emphasis on range improvement practices, including grazing systems; plant control using biological, chemical, mechanical factors; prescribed burning; range seeding; range fertilization and the integration of range with other forage resources.

RNGE 401. Senior Seminar (AGRO*, SOIL 401) (1 cr II) Disc 1. Prereq: 80 credit hours. *An oral presentation will be made.* Experience in library research related to agronomic topics and in collating that information in outline form suitable for making oral presentations.

RNGE 440. The Range Ecosystem (AGRO* 440/840) (3 cr II) Lec 3. Prereq: 12 hrs biological science, including BIOS 320 or 325. Characteristics of range ecosystems, interrelationships of ecological factors and processes, and their application in the management of rangeland.

RNGE 441. Forage and Range Physiology (AGRO*, HORT 441/ 841) (2 cr II) Lec 4. Prereq: AGRO 403/803. *AGRO 403/803 (first eight weeks) and AGRO 441/881 (second eight weeks) constitute a one-semester course in forage and range physiology.* Principles of crop physiology studied in relation to the growth, development and survival of perennial plants. Emphasis on the application of physiological principles to forage systems and to the improvement of forage plants.

RNGE 442. Range Plants (AGRO* 442/842) (3 cr I) Lec 2, lab 3. Prereq: 12 hrs agronomy or biological sciences. Comprehensive study of range plants that are important to range management and production. Distribution, utilization, classification, identification (including identification by

vegetative parts), and recognition of grasses, legumes, poisonous plants, and troublesome range weeds with emphasis on grasses.

RNGE 444. Rangeland Analysis (AGRO* 444/844) (3 cr I) Lec 2, lab 3. Prereq: 12 hrs biological sciences and AGRO 340, or permission; AGRO 440/840 recommended. Criteria by which rangelands are analyzed. Vegetation sampling techniques, measurement and evaluation of vegetation by animal performance, and measurement of important environmental factors. Evaluations of range sites, condition, trend, utilization, key species, stocking rates, improvement practices, wildlife value, recreational value and watershed value.

RNGE 445. Livestock Management on Range and Pasture 1 [IS](AGRO* 445/845, ASCI 451/851) (3 cr I) Lec 2. Prereq: ASCI 250 and AGRO 240 or 340; AECN 201 recommended. All students required to participate in a one-week field trip in central or western Nebraska prior to beginning of fall semester. Therefore, students must notify instructor at time of early registration. (Dates are given in class schedule.) Analyzing the plant and animal resources and economic aspects of pasture. Management of pasture and range for continued high production emphasized.

RNGE 496. Independent Study (AGRO* 496/896, SOIL 496) (1-6 cr I, II, III). Prereq: 12 hrs agronomy or closely related fields and permission. Individual and group projects in research, literature review, extension of course work under supervision and evaluation of a departmental faculty member.

RNGE 499H.Honors Thesis (AGRO*, SOIL 499H) (3-6 cr I, II, III) Prereq: Admission to the University Honors Program and permission, AGRI 299H recommended. Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.

Environmental Soil Science (SOIL)

SOIL 153. Soil Resources [ES] (AGRO* 153) (4 cr I, II) Lec 1, act 4. Prereq: High school chemistry or one semester of college chemistry. Characteristics of soils in relation to their appropriate uses and protection. Principles and practices using cooperative exercises including discussion, assessment, planning, problem-solving, writing, and presentation involving all aspects of soils.

SOIL 201. Preparation for an Agronomic Career (AGRO*, RNGE 201) (2 cr II) Lec 2. Prereq: Sophomore standing; major in agronomy, range science, or soil science, or permission. Group activities to help formulate ideas about careers. Develop skills and obtain information bases that help to be more effective students and be better prepared for post-college life. Emphasis on plant and soil sciences.

SOIL 269. Principles of Soil Management (AGRO* 269) (3 cr I) Lec 3. Prereq: AGRO 153. Principles of soil management under dryland and irrigated conditions. Relationships of soil and climate resources to soil erosion, movement and storage of soil water, soil organic matter, and irrigation practice. Special problem topics such as acidity, alkalinity, drainage and soil testing.

SOIL 279. Soil Evaluation (AGRO 279) (1 cr I, II, max 3) Soil profile characteristics and evaluation of these characteristics in terms of soil genesis, classification and use.

SOIL 299. Research Problems and Career Experience (AGRO*, RNGE 299) (1-5 cr I, II, III) P/N only. Written report usually required. Student participation in agronomic applications and in agronomy-

related areas of agribusiness; agronomic research in lab, greenhouse, or field; participation in farming practices other than those in which the student has had previous experience; or preparation of teaching materials.

SOIL 354. Soil Conservation and Watershed Management [IS] (MSYM*, WATS 354) (3 cr I) Lec 2, lab 3. Prereq: AGRO/SOIL 153 and MATH 109 or equivalent. Watershed hydrology, soil erosion, erosion control, water management and land surveying and mapping. Includes rain-fall-runoff relationships; determination of watershed characteristics; terraces, waterways, vegetative filters, and residue management; ponds, wetlands, non-point source pollution control, and water conservation; profile and topographic surveying.

SOIL 361. Soils, Environment and Water Quality (AGRO*, GEOL, WATS 361) (3 cr II) Lec 3. Prereq: PHYS 141 or equivalent, one year chemistry, one semester biology and one of the following: AGRO 153 or GEOL 101 or CHEM 116 or 221. Selected soil properties that influence environmental and water quality. Waste site selection criteria, cleanup and remedial action, as well as federal regulations. Particular contaminants discussed vary but can include radioactive materials, pesticides, oil, sewage, nitrates, as well as other organic and inorganic materials. Identifying processes and role soil plays in modifying waste. Effects of particle soil properties on contaminant movement and attenuation.

SOIL 366. Soil Nutrient Relationships [IS] (AGRO* 366) (4 cr II) Lec 3, lab 3. Prereq: AGRO 153. Use of fertilizers as plant nutrient sources to produce healthy and nutritious plants, improve profit, insure enterprise sustainability, fulfill legal requirements, and protect soil and water quality. Addresses issues from production agriculture, natural resource utilization and preservation, and ornamental plant culture.

SOIL 401. Senior Seminar (AGRO*, RNGE 401) (1 cr II) Disc 1. Prereq: 80 credit hours. *An oral presentation will be made.* Experience in library research related to agronomic topics and in collating that information in outline form suitable for making oral presentations.

SOIL 455. Soil Chemistry and Mineralogy (AGRO*, NRES 455/855) (3 cr I) Lec 3. Prereq: AGRO 153, CHEM 116 or 221 or equivalent. Chemical and mineralogical properties of soil components with emphasis on the inorganic colloidal fraction. Structures of soil minerals as a means of understanding properties, such as ion exchange and equilibria; release and supply of nutrient and toxic materials; and soil acidity and alkalinity.

SOIL 457. Soil Chemical Measurements (AGRO*, NRES 457/ 857) (2-3 cr I) Lec 2, lab 4-6. Permission required to register for 2 cr. Prereq: AGRO 153, CHEM 116 or 221 or equivalent or permission. *Permission required to register for 2 cr. Students registered for 3 cr will design, carry out, and report on an independent study project conducted during the semester. Offered even-numbered calendar years.* Theory and practice of soil chemical analyses commonly encountered in research and industrial settings. Wet analyses of inorganic fraction of soil and operation of instrumentation necessary to quantify results of those analyses.

SOIL 458. Soil Physical Determinations (AGRO*, NRES 458/ 858) (2 cr I) Lab 3, plus 3 hrs to be arranged. Prereq: SOIL/ AGRO/GEOL/WATS 361; PHYS 141 or equivalent; MATH 102 or 103. *Graduate students in NRES/AGRO 458/ 848 or SOIL 458 are expected to carry out an independent project and give an oral report.* Survey of measurement techniques and principles used in characterizing the physical properties of soils. Includes analysis of experimental design and sources of

experimental error. Techniques included: particle size analysis, soil water content, pore size analysis, field sampling techniques, soil strength, and saturated hydraulic conductivity.

SOIL 460. Soil Microbiology (AGRO*, NRES 460/860, BIOS 447/847) (3 cr II) Lec 3. Prereq: One semester microbiology; one semester biochemistry or organic chemistry. Soil from a microbe's perspective—growth, activity and survival strategies; principles governing methods to study microorganisms and biochemical processes in soil; mechanisms controlling organic matter cycling and stabilization with reference to C, N, S and P; microbial interactions with plants and animals; and agronomic and environmental applications of soil micro-organisms.

SOIL 461. Soil Physics (AGRO, GEOL, NRES* 461/861; WATS 461) (3 cr I) Lec 3. Prereq: AGRO/SOIL 153, PHYS 141 or equivalent, one semester of calculus. Recommended: Parallel AGRO/NRES/SOIL 458. Principles of soil physics. Movement of water, air, heat, and solutes in soils. Water retention and movement, including infiltration and field water regime. Movement of chemicals in soils.

SOIL 475. Water Quality Strategy 1 (AGRO*, CIVE, CRPL, GEOL, MSYM, NRES, POLS, SOCI 475/875; WATS 475) (3 cr II) Lec 3. Prereq: Senior standing or permission. Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.

[IS] **SOIL 477. Great Plains Field Pedology** (AGRO, NRES* 477/877, GEOG 467/867) (4 cr II) Lec 3. Lab. Prereq: AGRO/SOIL 153 or permission. Spatial relationship of soil properties on various parts of landscape typical of the Plains, causal factors, and predictions of such relationships on other landscapes. Grouping these properties into classes, naming the classes, and the taxonomy that results from this grouping. Application of a taxonomy to a real situation through making a field soil survey in a region representative of the Plains border, predicting land use response of various mapped units as it affects the ecosystem, and evaluating the effectiveness of the taxonomic system used in the region surveyed.

SOIL 496. Independent Study (AGRO*, RNGE 496/896) (1-6 cr I, II, III) Individual or group projects in research, literature review, or extension of course work.

SOIL 498. Senior Project 1 (AGRO* 498) (1 or 3 cr I, II) Prereq: Senior standing. A two-semester sequence. Students should select one credit hour the first semester and three credits the second semester. The first semester will be used for planning, topic selection, and identifying a project adviser. The second semester will be used to carry out the research project, prepare a written report, and possibly an oral presentation. Carry out and report on a research project.

SOIL 499H. Honors Thesis (AGRO*, RNGE 499H) (3-6 cr I, II, III) Prereq: Admission to the University Honors Program and permission, AGRI 299H recommended. Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.

Water Science (WATS)

WATS 281. Hydrogeography [ES] (GEOG*, NRES 281) (3 cr I) Prereq: GEOG 150 or permission. Survey of the water resource in its geographical context, both world-wide and regionally. Basic principles of the hydrologic cycle, snow hydrology, rivers and river systems, lakes, plus other water topics. Reference made to man/water interactions.

WATS 299. Career Experiences (1-5 cr, I, II, III) Prereq: Permission and advanced approval of plan or work. P/N only. Student participation in water science applications. May include participation in water resource management, water measurement, water quality monitoring, water supply, water administration; research in laboratories, green houses and fields; or preparation of educational materials.

WATS 354. Soil Conservation and Watershed Management [IS] (MSYM*, SOIL 354) (3 cr I) Lec 2, lab 3. Prereq: AGRO/SOIL 153 and MATH 109 or equivalent. Watershed hydrology, soil erosion, erosion control, water management and land surveying and mapping. Includes rain-fall-runoff relationships; determination of watershed characteristics; terraces, waterways, vegetative filters, and residue management; ponds, wetlands, non-point source pollution control, and water conservation; profile and topographic surveying.

WATS 361. Soils, Environment and Water Quality (AGRO, GEOL, SOIL* 361) (3 cr II) Lec 3. Prereq: PHYS 141 or equivalent, one year chemistry, one semester biology and one of the following: AGRO 153 or GEOL 101 or CHEM 116 or 221. Selected soil properties that influence environmental and water quality. Waste site selection criteria, cleanup and remedial action, as well as federal regulations. Particular contaminants discussed vary but can include radioactive materials, pesticides, oil, sewage, nitrates, as well as other organic and inorganic materials. Identifying processes and role soil plays in modifying waste. Effects of particle soil properties on contaminant movement and attenuation.

WATS 408. Microclimate: The Biological Environment (AGRO, GEOG, HORT, METR, NRES* 408/808) (3 cr) Prereq: Junior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering; or permission. 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.

WATS 418. Chemistry of Natural Waters (GEOL* 418/818, NRES 419/819) (3 cr II) Lec 3. Prereq: Two semesters of college chemistry, or CHEM 109 and 110, 113 and 114, or CHEM 111; or permission. Principles of water chemistry and their use in precipitation, surface water, and groundwater studies. Groundwater applications used to determine the time and source of groundwater recharge, estimate groundwater residence time, identify aquifer mineralogy, examine the degree of mixing between waters of various sources and evaluate what types of biological and chemical processes have occurred during the water's journey through the aquifer system.

WATS 418L. Chemistry of Natural Waters Laboratory (GEOL* 418L/818L, NRES 419L/819L) (1 cr II) Prereq: 2 semesters of college chemistry or permission. Parallel: GEOL 418/818, NRES 419/819,

WATS 418. *Offered even numbered calendar years or as needed.* Basic laboratory techniques used to perform water analysis including various wet chemical techniques, instrument use (AA, IC, UV-Visible) and computer modeling. Techniques for sample collection and preservation, parameter estimation and chemical analysis.

WATS 452. Irrigation Systems Management (HORT, MSYM* 452/852) (3 cr I) Lec 2, lab 2. Prereq: MSYM 109 or general physics; AGRO/SOIL 153 recommended. Irrigation management and the selection, evaluation, and improvement of irrigation systems. Includes soil-water measurement, crop water use, irrigation scheduling, irrigation efficiency, measurement of water flow, irrigation systems, groundwater and wells, pumping systems, applying chemicals with irrigation systems, and environmental and water resource considerations. Two laboratory sections are available; one which emphasizes agricultural applications and one which emphasizes horticultural applications.

WATS 459. Limnology (BIOS, NRES* 459/859) (4 cr II) Lec 3, lab 4. Prereq: 12 hrs biological sciences, including introductory ecology; 2 sems chemistry. Physical, chemical, and biological processes that occur in fresh water; organisms occurring in fresh water and their ecology; biological productivity of water and its causative factors; eutrophication and its effects.

WATS 461. Soil Physics (AGRO, GEOL, NRES* 461/861; SOIL 461) (3 cr I) Lec 3. Prereq: AGRO/SOIL 153, PHYS 141 or equivalent, one semester of calculus. Recommended: Parallel AGRO/NRES/SOIL 458. Principles of soil physics. Movement of water, air, heat, and solutes in soils. Water retention and movement, including infiltration and field water regime. Movement of chemicals in soils.

WATS 468. Wetlands (BIOS 458, NRES* 468/868) (4 cr II) Lec 4. Prereq: 12 hrs biological sciences; BIOS 320; CHEM 109 and 110. *Offered even-numbered calendar years.* Physical, chemical and biological processes that occur in wetlands; the hydrology and soils of wetland systems; organisms occurring in wetlands and their ecology wetland creation, delineation, management and ecotoxicology.

WATS 475. Water Quality Strategy (AGRO*, CIVE, CRPL, GEOL, MSYM, NRES, POLS, SOCI 475/875; SOIL 475) (3 cr II) Lec 3. Prereq: Senior standing or permission. Holistic approach to the selection and analysis of planning strategies for protecting water quality from non-point sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.

WATS 496. Principles and Problems in Water Science (1-5 cr, I, II, III) Prereq: 15 hours in water science or closely related areas. Individual or group projects in research, literature review, or extension of course work under the supervision and evaluation of a water science faculty member.

WATS 498A. Senior Project I (2 cr, I, II) Prereq: Senior standing. WATS 498A is the first course of a two-semester sequence of courses consisting of WATS 498A and WATS 498B. Work as individual or as a team member to develop solutions to water resource problems. Problem involves multidisciplinary features. Requires independent research, proposal preparation and presentation.

WATS 498B. Senior Project II [IS] (2 cr, I, II) Prereq: WATS 498A. WATS 498B is the second course of a two-semester sequence of courses consisting of WATS 498A and WATS 498B. Continuation of WATS 498A. Carry out proposal and present findings orally and in writing.

WATS 499H. Honors Thesis (3-6 cr, I, II, III) Prereq: Admission to the University Honors Program and permission, AGRI 299H recommended. Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.

Appendix 4.5

Degree Objectives and Expected Competencies

Bachelor of Sciences in Natural Resource (BSNR) Majors College of Agricultural Sciences and Natural Resources

DEGREE OBJECTIVES

The broad objectives for persons getting a B.S. degree in Natural Resource Sciences are to: 1. learn and use the facts and concepts central to a specific field of study and future career options; 2. acquire the skills necessary to collect, analyze, summarize, synthesize and interpret data relevant to their field of study; 3. develop the ability to work independently and in teams to propose solutions to natural resources questions using systems thinking or analysis; 4. communicate information effectively to a variety of audiences.

EXPECTED COMPETENCIES

Natural Resource Specific Skills

Describe and explain the basic characteristics of natural resource systems which include the atmosphere, hydrosphere, geosphere and biosphere.

Describe the physical and biological interactions among the various natural resource systems.

Describe the impact of humans as stewards, managers and components of natural resources systems.

Communication Skills

Give an organized and professional oral presentation that uses appropriate visual aids on natural resources topics.

Write to effectively communicate research results and opinions in a manner appropriate to an audience.

Problem Solving Skills

Organize and conduct research using a systematic approach.

Locate and use various data sources that are available for natural resource science, policy, management, and/or economics.

Collect data using appropriate laboratory and field techniques.

Use the following quantitative methods to evaluate applied problems in natural resources.

- A. construct graphical and tabular summaries of quantitative data.
- B. use mathematical concepts to represent the dynamics of physical, biological, and socioeconomic processes.
- C. construct a simple dynamic model that incorporates key pools, fluxes and feedback mechanisms to represent a biological or physical system.

D. conduct simple statistical analysis of data.

LEARNING OBJECTIVES GRID
General Assessment Grid: CASNR Natural Resources B.S. Candidates
(To be completed by capstone course instructor)

Student Name _____ **Date** _____

Faculty Evaluator _____

| The student's apparent competencies in the following skills are: | Adequate | Inadequate | Can't Evaluate |
|---|----------|------------|----------------|
| <u>Natural Resource Specific Skills</u> <ul style="list-style-type: none"> · Describe and explain the basic characteristics of natural resource systems which include the atmosphere, hydrosphere, geosphere and biosphere · Describe the physical and biological interactions among the various natural resource systems · Describe the impact of humans as stewards, managers and components of natural resources systems | | | |
| <u>Communication Skills</u> <ul style="list-style-type: none"> · Give an organized and professional oral presentation that uses appropriate visual aids on natural resources topics · Write to effectively communicate research results and opinions in a manner appropriate to an audience | | | |
| <u>General Problem Solving Skills</u> <ul style="list-style-type: none"> · Organize and conduct research using a systems approach · Locate and use various data sources that are available for natural resource science, policy, management and/or economics · Collect data using appropriate laboratory and field techniques | | | |
| <u>Quantitative Specific Problem Solving Skills</u> <ul style="list-style-type: none"> · Construct graphical and tabular summaries of quantitative data · Use mathematical concepts to represent the dynamics of physical, biological and socio-economic data · Construct a simple dynamic model that incorporates key pools, fluxes and feedback mechanisms to represent a biological or physical system · Conduct simple statistical analysis of data | | | |

Comments:

GENERAL ASSESSMENT RUBRICS:

Adequate--Evidence that the student is aware of and demonstrates these skills in the capstone course if the content of the course calls for them.

Inadequate--Evidence that the student is either unaware of or does not demonstrate these skills in the capstone course if the content of the course(s) call for them.

Can't Evaluate--The content of the course does not call for the use of such skills.

Appendix 4.6

FISHERIES AND WILDLIFE MAJOR - LEARNING OBJECTIVES GRID

Survey for graduating seniors

Date _____

Graduation semester _____

Return to your professor or Susan Vosler (102 Plant Industry Bldg)

Graduating seniors - please help us continue to improve the Fisheries and Wildlife major. Your feedback is critical. Here's a list compiled by the faculty of what we think you should know and some of the skills you should have graduating from this program. How well have we done? Obviously, we hoped you learned something in our classes, but internships, field trips, club activities, etc are also part of your education. For each of the following areas please rank the level of your knowledge / skill. Remember, we're not grading you – we're asking you to grade the program on how well it's taught you.

Assessment Scale (1 to 5)

1 = very poor (“I’ve never heard of it; I couldn’t do this if my life depended on it”)

2 = poor (minimal if any experience or ability with this topic)

3 = basic (some experience and ability with the topic, but still relatively weak)

4 = good (we’ve done our job; a skill or knowledge that you are able to use)

5 = very good (you feel this is one of your strengths, something you would emphasize in a job interview)

General Natural Resources Skills

Describe and explain the basic characteristics of natural resource systems, which include climate, hydrology, geology and biology.

1 2 3 4 5 (mean response Spring 2003 = 3.5)

Describe the impact of humans as stewards, managers and components of natural resource systems.

1 2 3 4 5 (mean = 4.5)

Use standard mapping systems (township/range, latitude/longitude, UTM, etc) to locate and orient natural resources features.

1 2 3 4 5 (mean = 3.6)

Use GIS (geographic information systems)

1 2 3 4 5 (mean = 4.1)

Give an organized and professional oral presentation that uses appropriate visual aids.

1 2 3 4 5 (mean = 4.8)

Write in a way that effectively communicates research results and opinions to an audience.

1 2 3 4 5 (mean = 4.3)

Problem Solving Skills

Locate and use various data sources pertaining to natural resource science, policy, management and/or economics.

1 2 3 4 5 (mean = 4.1)

Collect data using appropriate laboratory and field techniques.

1 2 3 4 5 (mean = 4.4)

Conduct simple statistical analyses of data.

1 2 3 4 5 (mean = 3.7)

Construct graphical and tabular summaries of quantitative data.

1 2 3 4 5 (mean = 4.0)

Use mathematical concepts to represent the dynamics of physical, biological or socio-economic data.

1 2 3 4 5 (mean = 3.3)

Construct a simple dynamics model that incorporates key pools, fluxes and feedback mechanisms to represent a biological or physical system.

1 2 3 4 5 (mean = 3.3)

Biological and Ecological Skills

Relate the distribution of flora and fauna to patterns of soil fertility, moisture availability and climate variation across a landscape (such as a watershed) or a region (such as the Great Plains).

1 2 3 4 5 (mean = 3.5)

Identify common flora and fauna of Nebraska.

1 2 3 4 5 (mean = 3.9)

Use appropriate resources to identify (with scientific names) flora and/or fauna in at least two specialized groups (grassland plants, woody plants, invertebrates, reptiles/amphibians, birds, mammals, fish, other).

1 2 3 4 5 (mean = 4.4)

Use simple but appropriate mathematical models to represent exponential growth, age-structured populations, and population growth constrained by a carrying capacity.

1 2 3 4 5 (mean = 3.6)

Describe habitat requirements for both game and non-game species and predict how land use can impact habitat either positively or negatively.

1 2 3 4 5 (mean = 3.9)

Use appropriate techniques to sample wildlife populations and analyze / summarize the results.

1 2 3 4 5 (mean = 4.0)

Management Skills

Reconcile production and consumption (i.e. harvesting) to achieve sustainable yield of a renewable natural resource in game management, fisheries or forestry.

1 2 3 4 5 (mean = 3.6)

Know the basic requirements of the National Environmental Planning Act (NEPA) and how to incorporate them into a natural resources planning process.

1 2 3 4 5 (mean = 3.9)

Differentiate the mission and management approaches of the major federal natural resources agencies (Forest Service, Fish and Wildlife Service, Park Service, Bureau of Land Management).

1 2 3 4 5 (mean = 4.0)

Recommend appropriate management techniques to achieve a habitat management or wildlife population control objective.

1 2 3 4 5 (mean = 4.1)

Professionalism

L. Professionalism is hard to define, but you know it when you see it. Aspects of professionalism would include a conscientious and sincere work ethic, timely and reliable work habits, the ability to maintain productive working relationships with diverse colleagues (even the ones you really don't care for), and a respectful and pleasant attitude for the public you interact with.

1 2 3 4 5 (mean = 4.8)

Appendix 4.7 Undergraduate Scholarships available for students in Natural Resources majors

| Scholarship | Dollars available | Major/Degree | Student Rank |
|--------------------------------|--------------------------|---------------------------------------|---------------------|
| Recruiting | 600 per student | CASNR | Entering Freshman |
| Donald E. and Doris L. Taylor | ~1,500 * | Environmental Studies | |
| Marlin Perkins | variable | Environmental Studies (CASNR and A&S) | |
| Izaak Walton (various sources) | ~4,000 | Fisheries & Wildlife | |
| Randall Schilling | ~600 | Fisheries & Wildlife | |
| Howard Wigers | ~1,200 | Fisheries & Wildlife | |
| Ronald M. Case | 750 | Fisheries & Wildlife | |
| Wildwood Fund | | Fisheries & Wildlife | Entering Freshman |
| Omaha Sportsman | | Fisheries & Wildlife | Entering Freshman |
| Herman & Alice Kohrs | 8,000 | BSNR | Sophomore or higher |
| William McGeachin | 6,200 | BSNR | |
| Water Quality | 100 | Water Science | |
| Joseph O. Young | variable | Rangeland Ecosystems | all ranks |
| Total | | | |

* one award

Appendix 4.8 Graduate Courses of Instruction.

A number of graduate courses are offered to advanced undergraduates (see Appendix 4.4) were identified with 4xx/8xx designations in the Undergraduate Course Instruction list and are identified below with a # preceding the course number. Cross listed courses marked with an * indicate the course home unit. In addition to the courses listed below, BIOM 801 (Statistical Methods in Research) and BIOM 802 (Experimental Design) may be used as part of the course work constituting a major in **Natural Resource Sciences**

General Natural Resource Sciences courses

#813. Environmental Leadership: A Historical and Ethical Perspective.

#891. Seminar in Natural Resource Sciences

#896. Independent Study

#897. Career Experiences in Natural Resources

899. Masters Thesis (6-10 cr)

996. Research other than Thesis. (1-6 cr I, II, III) Prereq; Permission. Supervised non-dissertation research and independent study.

999. Doctoral Dissertation (1-24 cr)

Atmospheric Resource Sciences

#808. Microclimate: The Biological Environment

#852. Climate and Society

#867. Global Climate Change

#869. Bio-Atmospheric Instrumentation

906. Crop Growth and Yield Modeling (AGRO 906) (3 cr II) Lec 2, lab2. Prereq AMET 808 or equivalent. Experience in programming in a high-level computer language. *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.

907. Agricultural Climatology (AGRO; HORT 907; METR 952) (3 cr II) Lec 2, lab 2. Prereq AMET 808; BIOM *801 or equivalent or permission. *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.

908. Solar Radiation Interactions at the Earth's Surface (AGRO; METR; HORT 908) (3 cr II) Prereq MATH 208; AMET 808 or equivalent or permission. *Offered spring semester of even-numbered calendar years.* 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.

954. Turbulent Transfer in the Atmospheric Surface Layer (BSEN 954) (3 cr) *Offered spring semester of odd-numbered calendar years.* 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. Instrumentation and data-logging requirements in atmospheric turbulence research.

Biological Resource Sciences

#802. Aquatic Insects

#802L. Identification of Aquatic Insects

#803. Fundamentals of Crop Physiology

805. Medical and Veterinary Entomology

805L. Medical and Veterinary Entomology Lab

#806 (proposed). Plant Ecophysiology: Theory and Practice

NRES 807. Plant-Water Relations (AGRO* 807, BIOS 817) (3 cr I) Lec 3. Prereq: BIOS 325 or equivalent, MATH 106 recommended, or permission. *Quantitative study of water relations in the soil-plant-atmosphere system. Basic physical processes, which describe the movement of water in the soil and atmosphere, and the physiological processes, which describe water movement inside the*

plant, studied in detail. Stomatal physiology and the effects of internal water deficits on photosynthesis, respiration, nitrogen metabolism, cell division and cell enlargement. Results from integrative models used to study the relative importance of environmental versus physiological factors for several plant-environment systems.

#809. Horticulture Crop Physiology

810. Landscape Ecology (HORT* 812) (3 cr II) Lec 3, lab. Prereq: 12 hrs biological sciences or related field including BIOS 320, or permission. Spatial arrangements of ecosystems, the interaction among component ecosystems through the flow of energy, materials and organisms, and alteration of this structure through natural and anthropogenic forces.

811. Plant Tissue Culture (BIOS, HORT* 811) (4 cr II) Lec 2, lab 4. Prereq: BIOS 109, 325 (includes CHEM 109, 110, BIOC 221), or equivalents, or permission. Survey of techniques used in plant cell, tissue and organ culture, including current research. Laboratory emphasizes practical manipulation of plant cells, tissues, and organs, including examples from woody and herbaceous plant species.

#817. Agroforestry Systems in Sustainable Agriculture

#823. Integrated Resource Management

#824. Forest Ecology

#835. Agroecology

#848. Advanced Topics in Wildlife Damage Management

849. Woody Plant Growth and Development (HORT*, BIOS 849) (3 cr I) Lec 2. Prereq: BIOC 221 or CHEM 251; BIOS 325 or permission. Offered fall semester of even-numbered calendar years. Plant growth and development specifically of woody plants as viewed from an applied whole-plant physiological level. Includes plant growth regulators, structure and secondary growth characteristics of woody plants, juvenility, senescence, abscission and dormancy.

#850. Biology of Wildlife Populations

862. Conservation Biology (3 cr) Prereq: 12 hours of biological sciences, including BIOS 220 or AGRO 315 or equivalent. Typically offered second semester. Current issues in conservation biology. Theoretical principles from the areas of ecology and genetics to effectively preserve and manage biological diversity and small populations.

#863. Fisheries Science

#864. Fisheries Biology

#876. Mammalogy

#889. Ichthyology

909. Crop Responses to Environment (AGRO, HORT* 909) (3 cr I) Prereq: 20 hrs plant sciences including plant physiology. Offered odd-numbered calendar years. Physiological and developmental aspects of hardiness and growth of crop plants as affected by light, temperature, wind and water. Design, function and limitations of controlled environment facilities in plant research.

915. Horticultural Crop Improvement and Breeding (AGRO, HORT* 915) (3 cr II) Prereq 18 hrs plant sciences including AGRO 315 and 815. Offered even-numbered calendar years. Application of the principles of genetics and plant breeding to the improvement of vegetables, fruits and ornamental plants.

943. Advanced Avian Physiology (ASCI* 943) (3 cr I) Lec 3. Prereq: One semester of physiology or ornithology, or permission. Anatomical and physiological of the major body systems of birds; discussions cover both domesticated and other species and their adaptations. Comparison with mammalian species is included, especially to illustrate divergent evolution of structure and function. Behavior is related to adaptations of both anatomy and physiology, and environmental influences are emphasized. Selected techniques (anesthesia, some surgical procedures, artificial insemination, embryo manipulations) are incorporated as laboratory sessions as needed.

950. Seminar in Horticulture and Forestry (HORT* 950) (1 cr per sem, max 6) Prereq: Permission. *Expected of all horticulture graduate students and all agronomy Ph.D. students; optional for MS students.* Presentation of thesis or non-thesis in agronomy, horticulture or related subjects.

Earth and Soil Resource Sciences

#842. Environmental Geophysics I

#843. Environmental Geophysics II

#851. Soil Environmental Chemistry

#855. Soil Chemistry and Mineralogy

#857. Soil Chemistry

#858. Soil Physical Determinations

#860. Soil Microbiology

#861. Soil Physics

#877. Great Plains Field Pedology

920. Pesticide Dissipation in Soils and Plants (ENTO* 920) (4 cr I) Lec 3, lab 3. Prereq; CHEM 251 or equivalent; AGRO 855 and 860 or equivalents recommended. *Offered odd-numbered calendar years.* An in-depth study of the fate and interactions of pesticides in the soil-plant environments and instruction in related analytical methodology. Pesticide behavior in soils will be emphasized.

958. Theoretical Aspects of Physical Chemistry of Soils. (AGRO* 958) (3 cr II) Lec 3, Prereq; MATH 208, AGRO 855, CHEM 871 or 882 or permission. *Offered even-numbered calendar years.* Topics in physical chemistry which have a special significance in the field of soil chemistry. Includes problems and outside readings in this area of soil chemistry.

961. Advanced Soil Physics (3 cr II) Lec 3. Prereq; MATH 208 and PHYS/ASTR 212 or equivalents, or permission. *Offered odd-numbered calendar years.* Physics of soils and porous media, with emphasis on the physics and mathematics of the movement of water, air, and heat through soils.

966. Soil Fertility (AGRO* 966) (3 cr I) Lec 3. Prereq; BIOM 801, AGRO 855, 857 and MATH 106. Conditions and transformations involved in the transfer of a mineral nutrient ion from the soil into the plant. Evaluation of a nutrient supply to plants.

977. Soil Genesis and Classification (GEOG* 967) (3 cr II) Lec 2, rec 1. Prereq; AGRO 153, 877 and permission. A detailed study of procedures used to classify soils, the concepts behind the systems in use, and the genesis of the soils in the major categories of each system.

996A. Research in Soils (2-5 cr I, II, III) Prereq; 12 hrs agronomy or closely related sciences and permission.

Hydrologic Resource Sciences

#815. Water Resources Seminar

#819. Chemistry of Natural Waters

#819L. Chemistry of Natural Waters Laboratory

853. Hydrology (CIVE 853) Prereq: MATH 106. *Credit in CIVE 353/853 will not count towards a major in civil engineering.* Introduction to the principles of hydrology, with emphasis on optimization and simulation techniques for evaluating alternatives in water resources developments related to water supply, flood control, hydroelectric power, drainage, water quality, water distribution, irrigation and water measurements.

#859. Limnology

866. Advanced Limnology (BIOS* 860) (3 cr I) Lec 3. Prereq: NRES 459/859 or equivalent. In-depth consideration of selected areas of limnology including stream limnology, primary production, secondary production, nutrient cycling and eutrophication.

#868. Wetlands

#875. Water Quality Strategy

#887. Hydrogeology

887. Hydrogeology (GEOL* 889) (3 cr) Prereq: GEOL 488, MATH 208. Principles of flow through porous media with emphasis on basic classical solutions, flow-net analysis, and elementary modern numerical solutions that aid in the analysis and development of groundwater supplies.

#888. Groundwater Geology

917 Environmental Isotope Hydrology (GEOL* 917) (3 cr, offered odd-numbered calendar years) Lec 3, Prereq: NRES 419/819 or equivalent, or permission of the instructor. The theory and use of stable, radiogenic and radioactive isotopes in hydrologic studies. Abundance and variation of the stable isotopes of oxygen, hydrogen, carbon, sulphur, chlorine, nitrogen and strontium. Application of isotopes to determine water origin, movement, geochemical history, recharge age and residence time, and to delineate contaminant sources and solute migration.

Remote Sensing & GIS

#812. Introduction to GIS

#818. Introduction to Remote Sensing

922. Seminar in GIS (3 cr). Prereq; GEOG 812 and 822; or equivalent or permission. Third in a sequence of courses on Geographic Information Systems (GIS). It is designed for students interested in advanced topics in computer oriented geographical data analyses. The major objectives of the course are structures toward a detailed investigation of current theory and practices relating to various aspects of a GIS. The course is oriented toward current problems facing the designers and users of GIS. Students will be expected to read current literature relating to a specific topic each week and the class will consist of in-depth discussion of selected topics. When appropriate, demonstrations of modern computer hardware/software used in GIS will be done.

Undergraduate Student Recruitment and Retention Plan

Background. The School of Natural Resources' (SNR) current undergraduate student recruitment and retention effort is led by the Teaching Coordinator and members of the undergraduate curriculum committee through CASNR's Recruitment, Retention and Placement committee, with occasional participation by other undergraduate teaching faculty. A relatively small group of faculty cover on- and off-campus recruitment events and respond to student inquiries. Efforts are primarily reactive.

During the past few years, several SNR majors have experienced a significant decline in enrollment. Faculty cite several reasons for this trend including loss of key faculty, increased academic rigor, isolated instances of inadequate advising, unit name change and changes in course numbers among others. Given this decline in enrollment, a more organized and aggressive approach to student recruitment and retention is being implemented with the hiring of a recruitment coordinator. Additionally, SNR should accelerate efforts to develop undergraduate service courses that play to faculty strengths and meet student needs, thereby generating more student credit hours.

Recruitment and Retention Plan. SNR's undergraduate recruitment plan begins with an aggressive campaign to find prospective students in one of two ways:

- (1) identification of a target pool of promising and well-prepared students (e.g., PSAT lists, community colleges, general studies or undeclared majors, siblings and friends of current or former students),
- (2) expression of an interest by the student in SNR programs at University, College or School-sponsored events or as a result of personal contact by recruitment coordinator or others.

Following the initial contact, timely personal responses to all inquiries will occur including occasional communication from SNR's recruitment partners (e.g., current students, local alumni, extension educators) until the prospective student is admitted, enrolls and commits to an SNR major or indicates he/she is no longer interested. The recruitment coordinator will facilitate ease of faculty participation (e.g., organize recruitment activities, prepare materials, implement appropriate follow-up) in consultation with the Teaching Coordinator and members of the undergraduate curriculum committee. A data management system will expedite the tracking of student contacts from first inquiry through enrollment and beyond.

Communications. *See the communication section in the graduate plan for additional recommendations applicable to undergraduate recruitment.*

- Develop a communications campaign using CASNR's recruitment calendar to schedule SNR responses to prospective students. This calendar adheres to time frames for the college decision-making process.
- Use consistent theme and design elements throughout communications campaign. The continuity and the redundancy is effective in establishing an identity that prospective students will associate with SNR.
- Personalize communications. Using students' names in correspondence adds power to the message and increases the likelihood that it will be read.

- Establish faculty/student relationship in the early stages of recruitment, prior to admittance and enrollment. Responsiveness of faculty to student inquiries is of considerable importance to a student's decision to apply.
- Adopt a correspondence sequence for admitted students that includes a personal letter from the School, a congratulatory letter from a successful alumni, and a "student life" related letter from a current SNR student leader.
- Publicize ease of internal transfers in communication pieces.
- Aggressively market SNR minors to increase student credit hours. A minor in NR compliments most traditional agriculture majors and would enhance students' marketability.
- Partner with Admissions staff and CASNR recruitment director to promote SNR programs. Invite Admissions staff to meet with undergraduate teaching faculty to learn about SNR majors.
- Develop student guide for each major similar to Environmental Studies guide.

Data Collection. At present, there is little quantifiable data on the impact of the School's participation in recruitment events (e.g., FFA, Big Red Day) or other recruitment activities which may result in students' enrollment in SNR undergraduate majors. In order to select strategies that offer the best return on investment, sustained research into the experience of the individual student (i.e., why current students chose SNR, how they learned about the programs, how they describe their undergraduate experience, which students are not retained and why) is warranted. Over a 3-5 year period, the recruitment coordinator will gather data about students' pre-admittance contact with SNR, plus factors that influenced their decision to enroll, and adjust recruitment strategies accordingly.

In addition to collecting information from current students, the recruitment coordinator will:

- Facilitate the collection of data from alumni and employers, and from students admitted to UNL who have indicated SNR as their program choice, but who do not matriculate.
- Standardize databases for tracking prospective and current students and recent graduates (AY 2003-2004).
- Centralize data collection (AY 2004-2005).
- Expand existing exit surveys to include all majors; standardize, but provide space for questions that are major specific.
- Develop a database of career information on recent graduates for use in recruitment materials and to assist seniors in their job search.

Scholarships and Financial Aid. Most college students rely on financial assistance at some time during their college career. Even a small stipend can mean the difference in a student's choice to enroll and/or remain in college. The School could consider the following measures to increase student numbers:

- Increase publicity for scholarships, recipients and donors.

- Change the timetable for awarding scholarships from end of spring semester to January or February.
- Contact donors to see if some scholarships could be modified to better meet the needs of prospective and current SNR students.
- Pursue new and/or expanded endowments from alumni and others to strengthen the School's financial aid packages.

Student Retention and Success. *There is more to a good party than sending out the invitations.*

Attracting students is only the first step in increasing SNR's enrollment. Faculty must also help students persist and succeed by helping them fit into their new environment. Factors that generally indicate success are student 'fit' with (1) the institutional culture, (2) the academic environment, and (3) the faculty. A number of factors impact students' capacity to fit with the culture of the university including: academic preparation, work commitments, feelings of isolation and alienation, financial and social support. Student capacity to fit within the academic environment is impacted by factors such as quality of teaching, level of enthusiasm among faculty and staff, and inclusiveness of the classroom community. At the academic level, students who have rewarding contacts with faculty members are the ones most likely to complete their degrees. Therefore, faculty efforts to establish and maintain a positive connection with students will likely payoff in student retention. Here are some other suggestions for reducing attrition and fostering student success.

- Develop a productive adviser-advisee relationship. *Commitment to advising is high in SNR, but there are some reported inconsistencies at the undergraduate level.*

Suggested actions:

- Stay in touch with advisees in the first six weeks of each semester.
- Go beyond routine course scheduling to help students achieve their academic and career goals.
- Create list serves within majors to enhance internal communication; provide monthly updates of activities, deadlines, etc.
- Encourage participation in student clubs.
- Maintain connections with majors through occasional newsletters, email.
- Integrate transfer students into SNR by encouraging participation in student clubs and by facilitating connections with other students.

- Use CASNR resources:

- Annual *Advising Workshops* are held in September. Topic for 2003 is “Advising Transfer Students”. CASNR also offers specialized workshops for academic units for groups of 5 or more.
- CASNR Cares* is a pilot program created to help students persist and succeed. The purpose of the program is to (1) identify CASNR students who may need assistance during their educational experience; and (2) work with the student to develop an action plan for meeting their academic goals. Students may be identified by faculty, other students, parents, and roommates. The CASNR Student Development Director, Sue Voss, is the contact for this program. Situations handled during the 2002-2003 AY include illness, deaths, poor academic performance, injuries and financial problems.

If a student withdraws

With assistance from the CASNR Student Development Director, the recruiter will determine the nature of the students' decision to withdraw. The recruiter will help faculty track withdrawals by administering exit surveys and provide assistance for potential return, if appropriate.

- Develop mechanisms for the regular and accurate collection and reporting of data on student success/failure and on attrition/retention. Such data will enable:
 - Monitoring of SNR's performance on success and retention, and
 - Interventions in courses where failure and attrition rates are high.
- Develop and maintain a profile of the successful SNR student. Fashion recruitment activities to attract students who fit this profile.

Recruitment and Retention Partners. Partnerships with SNR alumni and current students could enhance the recruitment effort. These constituents bear credibility with prospective students and could favorably impact enrollment decisions.

Alumni

- Develop an alumni network of recruiters. Initially, focus on alumni who have strong ties to the School. Select those who are active in their community. They can assist in regional recruitment efforts (i.e., help identify potential recruits, make personal contact with students in their community who have indicated an interest in SNR programs).
- Encourage alumni to participate in an "adopt-a-school" program in Nebraska to promote SNR programs.
- Continue to develop information on the SNR website targeted at keeping alumni connected to current students, other alumni, faculty and staff.
 - Send announcement informing alumni about the new website and what it has to offer (e.g., profiles of alumni, faculty and current students, opportunities for supporting SNR's recruitment effort and for providing financial support). In addition to news and information about alumni and the School, this webpage should include a listing of opportunities for alumni involvement in School activities as well as scholarship information for those who might be considering pursuing an advanced degree in the SNR.
- Facilitate interaction between club members and alumni to (1) help educate upperclass students about career options, (2) provide an avenue for showcasing undergraduates to potential employers, and (3) strengthen relations between the School and alumni.

Current Students

- Involve Undergraduate Clubs in Recruitment. Since club members who are satisfied with their educational experience in SNR can be effective recruiters, elicit their help in both formal and informal recruitment activities. Club members are likely active in other campus organizations which places them in a position to reach a large number of students who have yet to decide on a major.
- Consider a small stipend for current students who assist with organized recruitment activities.

Graduate Student Enrollment Management Plan

Background. The School of Natural Resources' (SNR) current graduate student recruitment effort is the responsibility of the graduate committee in cooperation with the faculty. Oversight for specific objectives is provided by the Teaching Coordinator and/or the Graduate Committee. The recruitment effort consists primarily of a communication campaign. Components include a website, brochure, fact sheets, and mailings to selected baccalaureate graduates. Information packets are provided as follow-up to inquiries. A recruiter will soon be hired to coordinate these and other efforts.

In the past few years, most areas in SNR have experienced steady or declining enrollment. Faculty cite several reasons for this trend, including visibility, identity issues with formation of SNRS, lack of competitive funding, and immigration issues among others. To increase graduate student numbers, the School should develop a more focused and coordinated approach to student recruitment emphasizing the strengths of the School, (e.g., the interdisciplinary nature of programs, faculty reputation, major new grant activities involving SNR faculty, new initiatives such as the Fish and Wildlife Cooperative Unit) and exploring a regional outreach effort.

Information about students' college decision-making process can be helpful in developing an effective recruitment campaign. Although few studies have addressed the factors influencing students' decision to apply and enroll in graduate school, those that have been completed have arrived at similar conclusions. Generally, location and climate factors and educational costs ranked less important overall than department and institutional reputation and advice of professors, friends, and relatives. Cost and location were of significantly greater interest to master's students. Repeatedly, the top factors in students' decision to apply are

- match between degree program and specific interest (Masters and PhD),
- reputation of the department and/or its faculty (Masters and PhD),
- work of individual faculty member (PhD),
- responsiveness of the department or faculty to inquiries (Masters and PhD).

A programs' printed materials and on-line resources are typically identified as important sources of information about the institution and specific programs.

Increase Visibility. *Share your excitement about SNR's programs!*

If SNR is to maintain or increase the size of the applicant pool, we must increase the visibility of faculty and their interests through a variety of means, but with emphasis on personal contact. Given the recent modest level of success in securing a healthy cohort of high caliber students to SNR's graduate programs, engaging all faculty in some way in the recruitment effort seems reasonable. This strategy should be based on the individual talents of faculty so their comfort level with this new activity is evident.

Most faculty are continually presented with opportunities to market the school, but often do not realize it because they haven't viewed routine activities as opportunities for recruitment (e.g., collaborating on projects with colleagues at UNL, other institutions or local agencies, participation at professional meetings, participation in workshops and grant project meetings, international activities). With recruitment materials prepared expressly for these interactions, each faculty member can be effective and with minimal effort.

Below are specific recommendations to help SNR reach prospective students:

- Establish goal (target number of Master's and PhD's entering and completing programs) by which to measure progress.
- Strengthen relationships with colleagues nationally/internationally for the purpose of marketing the programs offered in SNR. Tell your colleagues about the exciting programs SNR is offering and encourage them to recommend the program to their top students.
- Solicit names of potential students from faculty affiliated with top NR and related programs.
- Identify top 20 schools in NR and/or specific areas of specialization, and distribute recruitment materials to those schools via a personal contact.
- Contact the School's constituents and/or alumni to help us identify potential graduate students.
- Participate (recruiter and/or faculty) in Graduate School Day events around the country which are designed for graduate student recruitment.
- Sponsor Graduate Student Recruitment Day for current upperclass UNL and SNR students and local and regional alumni.
- Recruit actively at professional meetings. Faculty should expand this effort. Promote SNR graduate programs at regional, national and international meetings. Identify a select number of professional meetings each year and provide resources for recruiting at these meetings. Select meetings where there is a venue for recruiting graduate students. This is a minimal cost effort with potential for maximum benefit.
- Target regional professional meetings (students from the region are more inclined to consider Nebraska a viable location for their graduate studies)
- Subscribe to GRE Search service. This service will enable us to target prospects in a variety of ways, (e.g., by preferred region of study, by graduate and undergraduate majors, by self-reported GPA, by planned date of enrollment, by state, country, world region, etc.)
Send recruitment packets to those selected majors generated by the search who meet SNR admissions standards.
- Explore the potential benefits of using the top 3 commercial graduate student recruitment web sites. Correct inaccurate information about SNR currently found on some of these sites.
- Feature a graduate specialization at SNR-sponsored seminars especially those with outside guests in attendance. Introduce faculty in that area and include an exhibit, fact sheets and other materials that effectively market the opportunities for graduate study. Added benefit: faculty become familiar with colleagues' work which will enable them to better represent the School at recruitment events.
- Prepare informational packets and have these available at SNR colloquia, seminars, lectures for participants who might be interested in graduate study in the School.

- Work closely with faculty in selected fields of study on campus to ensure they have the latest information regarding SNR's graduate program offerings.
- Identify undergraduate and graduate majors at UNL from which the School would welcome top students to study in SNR. Target these populations, advertising strengths and interests that would likely match students' interests through a focused campaign of personal contacts, print and electronic media.
- Target top SNR undergraduates as well as high caliber Master's students to continue study in SNR's programs. Effective mentoring and undergraduate research opportunities within SNR can contribute to a larger pool of students to recruit into graduate programs.
- Target top SNR graduates, 5-15 years out, whose current positions may require continuing education at the masters level.
- Build on the positive image that previous students have of the School. Graduates can be the School's best recruiters. Mobilize these alumni to help with graduate recruitment
- Include current students in recruitment activities.
- Create more effective linkages with agencies for the purpose of identifying potential graduate students. Target groups from which the School would likely encounter some success recruiting graduate students, (e.g., Department of Natural Resources, Game and Parks, U S Geological Survey, NRD, consulting firms, high school teachers.
- Consider expanding beyond the traditional target audiences. Provide graduate opportunities for nontraditional students through part-time status, night classes, off-campus courses, web based courses or other distance learning programming
- Offer non-thesis/professional degree option in some areas.
- Complete additional specializations in the Ph.D. program that help to emphasize particular program strengths.
- Review general entrance requirements for SNR graduate programs permitting specializations to make requirements specific to their areas. SNR entrance requirements may need to be modified to recruit students into some specializations.

Communications

- Develop a communication campaign using consistent theme and design elements throughout (e.g., print, exhibits, computer presentations, give-aways, videos).
- Participate in university and college recruitment events on and off campus. Target packets will be developed for various audiences.
- Update graduate program brochure and specialization fact sheets.
- Update graduate student handbook.

- Develop simple, portable exhibit for use at events and meetings.
- Develop electronic presentation master marketing the SNR to which individual program or specialization slides can easily be added.
- Develop a few choice slides that SNR faculty and staff can include in Powerpoint presentations that highlight or articulate the School's vision, mission, and objectives.
- Develop an "SNR template" for Powerpoint slides that help to provide visibility of SNR to UNL and non-UNL audiences.
- Articulate career opportunities to prospective students in communication campaign based on employers' current and projected needs.
- Update faculty business cards, include SNR's new web address.
- Call students' attention to the School's web page in recruitment materials.
- Retain or improve departmental responsiveness from 1st inquiry through graduation and beyond.
- Offer training to SNR's front-line staff on how best to meet the prospective students' needs since the prospects first contact is often with individuals in this group.
- Advertise successes (e.g., CALMIT website recognizes graduates and their current position in the field). A listing such as Don Rundquist's featuring current positions of former graduate students serves as an effective recruitment tool. Consider a similar listing on SNR's website.
- Add these features to the School's website:
 - Information about factors to consider when selecting a graduate program
 - Benefits of a graduate education including lifetime financial rewards
 - Information about sources of funding and costs of attendance including cost of living
 - A "Did you Know" element—new each time the page is refreshed—that highlights distinctive features of individual graduate programs
 - On NU Graduate Studies website, change direct link which now goes to SNR graduate fact sheet to new SNR graduate student information page (keep current information but make format more compelling).

Funding. *Implement new strategies to strengthen SNR's competitive position in attracting excellent graduate students, including more attractive remuneration.*

- Monitor the financial aid awards offered by our competitors locally and nationally.
- Survey other departments at UNL on graduate assistantship stipend levels, as well those of other universities that have strong natural resources programs. **Know your competition!**
- Increase graduate research and teaching assistantship stipends to become or remain competitive.

- Establish a specific goal for offering more competitive funding and increasing numbers of assistantships, (i.e., increase the average fellowship and assistantship award 20 percent by AY 2004-2005, increase the number of graduate fellowships and assistantships 10 percent by AY 2004-2005).

To successfully compete nationally for top students, SNR must build a cohort or pool of graduate students. According to UNL's Life Sciences Interdisciplinary Graduate Recruitment Program (LSIGRP), the major reason given by prospective graduate students for not choosing UNL after their campus visit is that (all else being equal) other schools have an identifiable cohort of graduate students. With only 3 open assistantships in SNR, it is difficult to build such a cohort.

- *The current stipend of \$13,500-\$14,500 is not competitive nationally and is below some UNL departments. Increase GTA stipends to a competitive level in order to attract and retain the best graduate students by combining open lines with other funding sources to reach the current minimum UNL Life Sciences Interdisciplinary Program stipend of \$18,000.*
- Work to secure funding available from graduate studies office and private funding sources, (e.g., Othmer funds, PEOs, NSF).
- Establish a "topping off" award for recruiting our most talented applicants—\$5,000 per award.
- Explore financial incentives beyond the basic stipend to facilitate/promote student recruitment and retention. Are there creative ways/incentives beyond providing funding that might appeal to prospective students?
- Publicize available financial aid awards and **cost-of-living** information in program materials and on website.

LSIGRP

The School's connection with this group is the Ecology and Evolutionary Biology program area. To use this group to our advantage, SNR should

- Appoint a SNR faculty member to the admissions committee
- Encourage SNR faculty affiliated with the EEB group to see that their entry point on the web listed in the LSIGRP brochure is informative and dynamic and part of the SNR site.
- Take advantage of the LSIGRP's national and regional meetings recruitment effort (just beginning) by developing recruitment packets for distribution.

Data Collection. *We need to know more than grades, GRE scores and numbers of graduates produced. Are SNR graduates satisfied with their educational experience, do they find good jobs and do they become leaders in their fields? A satisfied and successful alum is the ultimate recruitment tool.*

Satisfaction and Retention of Students

- Conduct surveys to determine level of satisfaction and perceptions of current students, (i.e., why they chose SNR, how they learned about SNR graduate programs, to what extent the program is meeting their needs, quality of classroom instruction).
- Analyze survey results and incorporate into recruitment/retention effort.

- Conduct exit interviews of all SNR graduate students to document their experiences at UNL, including both the successes and failures of our program). To begin the process, interviews should be conducted with graduates from the past two years via telephone or mail surveys.

Post Education Satisfaction and Success

- Expand and update database of recent graduates. Include placement information and satisfaction measures
- Update demographics of graduates, (i.e., Do SNR graduates get good jobs, do they become leaders in their field?).
- Conduct employer satisfaction surveys every 5 years.

CHAPTER 5 - RESEARCH PROGRAMS

Executive Summary

Faculty, staff and students of the School of Natural Resources (SNR) conduct research focused on a host of issues critically important to the state, region and nation. Research in SNR is carried out by individual investigators working independently, by groups of investigators working in collaboration (“research clusters”) and through formally organized research Centers. SNR research is supported financially by internal and/or external funding. In 2002, SNRS faculty and staff submitted 100 proposals for \$14,912,751 in combined internal and external funding and were awarded \$4,083,470 in funding for 40 projects. *On an annual basis, total grant dollars generated per FTE have fluctuated from about \$225,000 (in FY 1998) to over \$300,000 (in FY2002). The integration of SNRS, CSD, and the Water Center to form the School of Natural Resources (SNR), and the development of Hardin Hall, promise to generate synergism that will continue to increase the scope, quality and impact of research.*

SNR will seek, over the next five years, to continually increase externally-funded grants, engage more faculty in research, increase publications per research faculty FTE, and develop new research areas (e.g., human dimensions). In order to achieve its research potential, however, SNR will need to address several challenges. The School’s future research posture will depend, first and foremost, on SNR’s ability to retain and enhance existing faculty and staff positions. Second, because the IANR fiscal situation is unlikely to improve significantly within the next several years, funding for graduate assistants, managerial-professional staff, post-doctoral associates and other staff required to support research will need to come largely from external sources (i.e., grants and contracts) and reallocation.

Likewise, acquisition, replacement and maintenance of equipment and laboratory facilities, travel and field work, and related expenses will, increasingly, have to be borne by external monies. The School will need to (1) encourage development of new research by providing faculty incentives and rewards for success, (2) seek to ensure that IANR/ARD policies on research issues such as overhead return are serving the best interests of enhancing research, and (3) identify better means to assist faculty in administering and managing grants and contracts through the Natural Resources Business Center.

In order to have maximum impact, the results of SNR research must be disseminated to a broad audience using both traditional media (refereed publications, maps, brochures, books and reports) and computer-based technologies. The integration of SNRS and CSD should enhance outreach and delivery of data and information to SNR clients. The School will seek to develop stronger linkages with the UNL Cooperative Extension Division and with Extension Educators throughout Nebraska. School research faculty will also be encouraged to employ new methods for distributing information on the nature and results of SNR research activities with special emphasis on delivery of research results through the Internet.

CHAPTER 5 - RESEARCH PROGRAMS

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CHAPTER 5 - RESEARCH PROGRAMS

5.1 Introduction

Faculty, staff, and students of the School of Natural Resources (SNR) conduct research focused on a host of issues critically important to the state, region and nation. These investigations include both basic and applied research, as well as research related to the teaching, extension/outreach and survey missions of the School. This chapter summarizes SNR research strengths and achievements, and outlines the institutional infrastructure established by SNR to support research. Future goals and opportunities for enhancing SNR research are also discussed.¹

5.1.1 Research Vision and Goals

The School of Natural Resources is Nebraska's premier provider of research in the natural resource sciences. Research conducted by School faculty, staff and students is intended both to advance scientific knowledge across the breadth of the natural resources sciences (including geology, soils, water, forests and grasslands, climate, wildlife and fisheries, geospatial information sciences, and the human dimensions of natural resource use and management) and to assist the public, government and the private sector in addressing issues of special importance to the state, region, nation, and the global community. The School strives to contribute substantially to the betterment of Nebraska's economy and the welfare of its populace by fostering stewardship, conservation and management of natural resources.

School faculty, staff and students are committed to:

- achieving state, regional, national and international recognition for research in natural resources;
- maintaining superior disciplinary research programs while, at the same time, strongly encouraging integrated and interdisciplinary approaches to research using an ecosystem science paradigm;
- empowering faculty, staff and students to achieve their fullest professional potential by providing first class research facilities and other support;
- using state-of-the-art technologies (e.g. flux towers, GIS, remote sensing, statistical methods and modeling) in concert with strong laboratory and field-based approaches to provide cutting-edge research;
- *building collaborations and partnerships with federal, state and local government and with non-governmental organizations (NGOs); and,*

¹Note that, as a result of the very recent integration of SNRS, CSD, and WC, the emphasis in this chapter is on research conducted through the former SNRS. Research activities of CSD are generally covered in Chapter 7.

ensuring that research results are delivered in the most useful manner for School clientele using both traditional print media as well as electronic publication and tools such as the Internet.

5.1.2 Research Faculty and Program Areas

Currently, 74 faculty hold salaried or equivalent rank positions within SNR. Of these, 44 have full (100%) or partial (10-90%) research appointments (See Appendix 2.1). Collectively, these faculty constitute 25.32 FTE research positions. Nine (8.55 FTE) are supported mostly or entirely on soft funds (i.e., grants and contracts). Broken down by program areas, but recognizing that many people work in several areas, it is evident that the largest concentrations are in climate and bio-atmospheric sciences and water, while the smallest are in forestry, wildlife, and human dimensions (Table 5.1).

Salaried faculty and equivalent rank research personnel are complemented by 45 managerial-professional, technical and clerical staff (37.67 research FTE) who conduct research and/or provide research support (See Appendix 2.2). The majority (29.25) of these positions are supported by soft funds. Most staff are assigned to one primary area of research specialization (Table 5.1). Note that these numbers do not include support staff who are part of the Natural Resources Business Center (see next section).

Research conducted by SNR salaried faculty and staff is enhanced by contributions of, and collaborations with, 53 UNL faculty who hold courtesy appointments and 27 others who hold adjunct appointments in the School. The latter represent many external organizations with which SNR faculty work, including several universities, the Nebraska Game and Parks Commission, Nebraska Department of Natural Resources, National Park Service, USDA National Agroforestry Center, National Center for Atmospheric Research, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration and others (also see section 5.2.6)

5.1.3 Research Administration

The School has established several means of support for School faculty and staff engaged in research.

Research Coordinator

The Research Coordinator is appointed by the Director to provide leadership for enhancing and facilitating research. The Research Coordinator is nominally a 25% FTE non-administrative appointment. Dr. James W. Merchant has served as Research Coordinator since February 2002. Dr. Patrick J. Shea served as Research Coordinator from 2000-2001. Among other duties, the Research Coordinator serves as Chair of the SNR Research Committee, is responsible for the SNR Seminar series, organizes the annual

SNR Research Colloquium, and represents the School in other activities requested by the Director.

SNR Research Committee

In July 2002, SNR established a Research Committee to foster and facilitate basic and applied research. The Committee (1) advises the SNR Director on matters pertaining to research, and (2) assists the SNR Research Coordinator in identifying and implementing actions designed to enhance the physical and institutional infrastructure (e.g., field facilities, laboratories and centers) required to support research. The Committee is charged with (1) identifying needs and requirements for enhancing SNR infrastructure to support research, (2) proposing measures to increase the quality and volume of SNR research, (3) seeking ways to assist faculty and staff in acquiring external funding, (4) working to establish recognition of SNR research capabilities and special expertise within funding agencies and among SNR clientele, and (5) carrying out special assignments as requested by the Director.

The Committee is chaired by the SNR Research Coordinator. Membership is comprised of (1) two persons appointed by the SNR Director to represent two of the SNR centers [Great Plains Regional Center of the National Institute for Global Environmental Change (GPRC-NIGEC), Center for Advanced Land Management Information Technologies (CALMIT), National Drought Mitigation Center, and High Plains Regional Climate Center], and (2) three other SNR faculty holding research appointments to reflect the diverse research interests of the School, and one representative of the SNRS managerial/professional research staff, all four elected. Committee members are appointed or elected for staggered three-year terms.

Business Support - Natural Resources Business Center

The Natural Resources Business Center (NRBC) was created to coordinate and improve support for SNRS, CSD, Water Center, and other affiliated units (e.g., Nebraska Forest Service). NRBC staff assist SNR research faculty in hiring (e.g., research staff, post-doctoral research associates, graduate

research assistants), budgeting, accounting, travel, purchasing, proposal preparation, and related matters. NRBC staff specialize in each of these areas.

The NRBC Grants Specialist is responsible for the coordination of the grants and contract process. The Grants Specialist assists faculty with the preparation of budgets and submission of forms necessary for federal, state and internal grant proposals, maintains a database of grants submitted and awarded, monitors grant expenditures to insure compliance with federal guidelines (e.g., A-21 and A-133) particularly for matching funds, maintains documentation for these matching funds, assists faculty with project extensions, and works closely with the NRBC staff and UNL Office of Sponsored Programs throughout the duration of the grant.

5.1.4 Research Enhancement Activities

Research Colloquium

On October 21, 2002 SNR sponsored the first annual SNR Research Colloquium. The principal objective of this day-long event was to provide an opportunity for SNR faculty, staff and students to share their research-related accomplishments and on-going activities with one another, with SNR clients and with colleagues in other UNL units. Over 80 faculty, staff and students attended. The program included 14 oral presentations, 28 poster presentations, summary reports on activities of the 6 SNR Research Centers, and remarks from UNL Vice Chancellor for Research Prem Paul. Abstracts of all presentations were published in a printed volume (attached) and Powerpoint slides were made available on a web site prepared for the Colloquium - <http://calmaps.unl.edu/snrscoq> . The second annual SNR Research Colloquium is scheduled for October 20, 2003.

Seminar/Visiting Scientists Program

The School hosts a weekly seminar series during the academic year. Speakers include faculty, staff and students from within SNR as well as guests from other academic institutions, from public agencies and non-governmental organizations (Table 5.2) In addition to the weekly seminar, special seminars are offered from time-to-time. These may be co-sponsored with other units or by SNR focus groups. For example, on October 24, 2002 SNR hosted a special seminar by Keith Hobson (Canadian Wildlife Service) entitled *Using Stable Isotopes to Track Migratory Wildlife*, and on April 7, 2003 SNR hosted Dr. Yul Roh (Oak Ridge National Laboratory) speaking on *Environmental Mineralogy: Reactive Iron Barriers and Biomineralization*.

To augment the seminar series, in 2002 SNR established a Visiting Scientists Program. Under the Visiting Scientists Program, SNR brings 2-4 scientists per year to Lincoln for periods of 3-4 days each. The principal objectives are to provide opportunities for faculty, staff and students (1) to interact with, and learn from, experts in areas of broad interest within SNR and (2) to develop new or improved research collaborations. Each visiting scientist is asked to give at least one public seminar on some aspect of his/her research as part of the SNR seminar series. In addition, visiting scientists are expected to lecture in at least one class, and meet with interested students and faculty in small discussion groups (and perhaps with university administrators, if appropriate). In 2002-2003, SNR visiting scientists included Thomas Loveland and Jess Brown

(USGS EROS Data Center), *James Nichols (USGS Patuxent Wildlife Research Center)*, and George Hess and Heather Cheshire (North Carolina State University).

Professional Conferences Hosted and Sponsored

One of the ways in which SNR is working to increase the visibility and stature of its research, as well as interaction with colleagues and clients, is by hosting and sponsoring professional conferences (Table 5.3). Some of these (e.g., the Nebraska Well Drillers Convention and the Nebraska GIS Symposium) are held regularly (annually or biannually) and draw attendance primarily from within the state. The School is also, however, engaged in sponsoring national meetings. In 2002, for example, SNR hosted the annual symposium of the *International Association for Landscape Ecology - United States Regional Association* which brought over 325 scientists to Lincoln (see www.calmit.unl.edu/usiale2002). In May 2003 SNR co-sponsored the biennial *Nebraska GIS Symposium*, and, in June 2003 SNR (CSD) was host for the annual meeting of the *Association of American State Geologists* (see csd.unl.edu/aasg). In October 2003, SNR will host the annual *Great Plains Limnology Conference*. And, the School is currently discussing hosting the *Natural Areas Association* (<http://www.naturalarea.org/>) national conference in 2005 or 2006.

5.1.5 Internal and Externally-funded Research Support

Most SNR research is supported financially by internal and/or external funding. Since SNRS, CSD and the Water Center have, heretofore, operated so differently (see Section 5.3 below), most of the content of this section, unless otherwise indicated, reflects only data for SNRS.

Internal funding sources include grants and awards from SNRS, IANR/ARD and other sources at UNL. When SNRS was formed in 1997, ARD provided the School with \$75,600 to support an Interdisciplinary Research Program. This program is administered by SNR and invites faculty with interdisciplinary research ideas to apply for funds. Faculty have found this resource useful for building research teams and establishing collaborative partners. Generally, the allocations may be as much as \$10,000 for one year, with the possibility of a second year of funding contingent upon satisfactory progress. Project areas include, but are not limited to, forestry, buffer strips, ecology, wheat ecosystems, soils, climate, remote sensing. Over 16 projects have been funded through SNR interdisciplinary grants.

External sources include funds allocated from McIntyre-Stennis as well as contracts and competitive awards granted by state and federal agencies, NGOs and foundations. School research is supported by a mix of large grants (usually awarded to research clusters or centers - see Table 5.4 and Section 5.2) and many smaller grants and contracts. From 1998-2001, external funding generated by SNRS faculty and staff (by fiscal year) increased from \$1.9 million to approximately \$5.0 million in research grants and contracts (Table.5.5). During this same period CSD external funding for research decreased from about \$2.2 million to \$1.3 million, no doubt reflecting, in part, changes in faculty appointments as approximately 6 CSD faculty moved all or part of their research appointments to SNRS over this time period. According to NRBC, in calendar year 2002, SNRS faculty and staff submitted 100 proposals for \$14,912,751 in combined internal and external funding and were awarded \$4,083,470 in funding for 40 projects. Thus, 40% of proposals were funded for about 27% of the funding requested.

Indirect costs (“overhead”) returned to SNR may also, at the discretion of the Director, be used to support research. UNL policy states that two-thirds of indirect costs on grants are retained by the Office of the Vice Chancellor for Research. Of the remainder, one-third is retained by IANR and the rest is returned to the unit(s) in which the principal investigator(s) is appointed. SNRS policy is to pass approximately 60% of the amount received by the School to the PI. Note that overhead return to units lags by one year from the date on which it was collected.

The total overhead generated by SNRS research faculty has increased from approximately \$343,000 in FY 1997-1998 to \$596,000 in FY 2002-2003 (Table 5.6). Overhead funds returned to SNRS by the Office of the Vice Chancellor for Research and IANR/ARD (i.e., not retained in those offices) have increased from approximately \$28,000 in FY 1997-98 to \$132,000 in FY 2002-2003 (Table 5.6). Note that CSD has, heretofore, operated under somewhat different policy. Additional details are provided in Section 5.3 (below).

The School also supports research by providing graduate research assistantships to faculty engaged in research. During the past five years, approximately \$85,000/year has been committed to such support.

5.2 Research Emphases and Infrastructure

Research in SNR is carried out (1) by individual investigators working independently, (2) by groups of investigators working in collaboration (“research clusters”) and (3) through formally organized research “centers”. Faculty, staff and students may, at any given time, may participate in research under any or all of these institutional structures.

5.2.1 Current Research Strengths

In 2002, the SNR Research Committee identified a number of research areas in which SNR faculty have particular strength and have achieved national and international recognition. Such recognition is reflected in awards of external funding and publications. These areas of strength include:

- *Aquatic ecology and limnology of inland waters*
- *Avian and ungulate ecology and management*
- *Bio-atmospheric interactions and agricultural meteorology*
- *Carbon balance in natural and managed ecosystems*
- *Characterization of vegetation and water via remote sensing*
- *Drought assessment, mitigation and planning*
- *Ecology and management of shelterbelts and woodlands*
- *Fisheries ecology and management*
- *Geographic Information Systems (GIS) in natural resources management*
- *Regional climatology, monitoring and modeling weather*
- *Soils geomorphology, genesis, remediation and restoration*

- *Surface and groundwater hydrology, geochemistry and modeling*
- *Wildlife damage assessment and management.*

5.2.2 Individual Research Initiatives

SNR research is founded on the leadership, innovation and publications of the faculty. Recent research foci, initiatives and productivity of individual faculty are summarized in the abbreviated vitae in Chapter 9. SNR faculty, to varying degrees, work independently, in interdisciplinary groups (“research clusters”) and through the SNR Centers to achieve their research goals. Although SNR generally seeks to encourage multidisciplinary team-oriented research, the School also rewards and recognizes those contributions that arise from the work of one or a few individuals.

5.2.3 Interdisciplinary Research Clusters

School research is also conducted through interdisciplinary research clusters involving several faculty, staff, and students collaborating closely to address a major research problem. By combining talents and facilities in an organized, concerted and well-coordinated manner, research clusters seek to make major inroads in answering complex natural resources questions, while, at the same time, achieving regional, national or international stature for SNR research. Research clusters led by SNR faculty often include faculty members from other UNL units, and occasionally from outside the university. In 2003, SNR research clusters included groups focused on carbon sequestration, lake classification and surface water quality, agroforestry and shelterbelt dynamics, drought risk assessment, biocomplexity of the Sand Hills, and environmental remediation of soils (see Appendix 5.1).

School research clusters are somewhat fluid, each cluster commonly having a lifespan of 2–5 years tied to the nature of the problem(s) being addressed and, often, to the duration of supportive grants. Usually research clusters arise when faculty and staff collaborate in development of major proposals that are

subsequently funded. Research clusters that are addressing problems of sufficient magnitude and longevity may evolve into research centers.

5.2.4 SNR Research Centers

SNR is currently the administrative home for six research centers – Great Plains Regional Center of the National Institute for Global Environmental Change (GPRC-NIGEC), Center for Advanced Land Management Information Technologies (CALMIT), National Drought Mitigation Center (NDMC), and High Plains Regional Climate Center (HPRCC), Water Center and Great Plains Cooperative Ecosystem Studies Unit (GP-CESU). These centers serve as foci for research that cuts across many disciplines and units. Some centers include significant participation from faculty, students and organizations external to SNR and UNL. The centers are briefly described in Appendix 5.2. Additional details are included in the 2002 SNR Research Colloquium Program and on the center web sites (see Appendix 5.2).

Research centers differ from research clusters in several regards. Centers generally deal with research topics that, though related, are broader in scope, and longer in duration, than those dealt with by clusters. Most centers have achieved national and international stature through 10-30+ years of sustained research achievements. As a result, the centers are recognized by UNL's Office of Research, and may be chartered by the NU Board of Regents, as cross-campus centers-of-excellence in their respective areas of research. While research clusters are led by one or two Principal Investigators, research centers have a Director, a number of full-time staff and faculty affiliates, and often many research assistants (CALMIT for example, has approximately 19 faculty and staff and 21 research assistants). Most centers also have permanent physical facilities (offices, laboratories and sometimes field facilities), and generate substantial external funding via multiple grants that may be loosely linked thematically.

5.2.5 Unique and/or Specialized Facilities and Capabilities

School research is supported by a variety of specialized laboratories equipped with instruments that provide faculty and staff with critical capabilities. Facilities for conducting research in water, soils, atmospheric sciences and remote sensing are exceptional and regionally unique (details are provided in Appendix 5.3). School faculty have first-class capabilities for making micrometeorological and gas exchange measurements at the plant and ecosystem level (e.g., eddy covariance flux towers to estimate ecosystem carbon and water balance).

SNR researchers also have access to excellent field facilities. The University of Nebraska operates more than two dozen research ranches, farms and facilities comprising tens of thousands acres arrayed across the environmental gradients of the state (<http://ard.unl.edu/facilities.html>). All are available to SNR research investigators; however, SNR scientists use a number of sites intensively (see <http://snrs.unl.edu/wedin/nefieldsites/> and Appendix 5.3).

5.2.6 Major External Collaborations and Linkages

SNR research is enhanced by close working relationships among SNR faculty and staff and other units and organizations located on the UNL campus, in Lincoln or nearby in the region. Strong collaborations exist with, respectively, the UNL Departments of Agronomy and Horticulture (soils, agroforestry and grassland ecosystems), Entomology (agroforestry), Computer Science and Engineering (drought), Geosciences (meteorology/climatology, water science and geology), School of Biological Sciences (ecological sciences) and Animal Sciences (wildlife and agroforestry). Staff of the Nebraska State Museum (NSM) and Nebraska Forest Service (NFS), both located on campus, formerly held joint or adjunct appointments in SNR and collaborate with SNR faculty on research in geological sciences (NSM), gap analysis (NSM), woodland management (NFS), wildlife ecology (NSM) and related areas. And, SNR faculty collaborate with many colleagues at institutions of higher education throughout the Midwest and in other states. For example, in the area of agroforestry, close linkages exist between faculty in SNR and at Iowa State University.

Ten School faculty participate in the UNL Ecology and Evolutionary Biology Initiative, a cross-campus endeavor established to foster research and graduate

education in basic and applied ecology, evolution, and behavior (<http://ecology.evolution.unl.edu/>). Several SNR faculty serve on the Initiative steering committee of that group. Among other things, the group funds graduate student research, sponsors an interdisciplinary seminar series by visiting scholars, has established several user facilities (including an ecosystem analysis lab and a molecular biology lab), and has submitted a number of graduate training grants to federal agency (including a successful GAANN grant from the Department of Education).

Among state agencies, SNR researchers have strong linkages with investigators at the Nebraska Game and Parks Commission (located adjacent to East Campus), the Nebraska Department of Environmental Quality, the Nebraska Department of Natural Resources and the Nebraska GIS Steering Committee (all located in downtown Lincoln). The unique regional Natural Resource Districts (NRDs), into which Nebraska is organized, are also important SNR clients and cooperators.

Among federal agencies, close research collaborations exist with the USDA National Agroforestry Center (located on the UNL East Campus), the National Park Service (a key agency in the SNR-affiliated Great Plains Cooperative Ecosystem Studies Unit, located on East Campus), the USGS Earth Resources Observation Systems [EROS] Data Center (a national center for remote sensing research located in Sioux Falls, SD), the USGS Water Resources Division office (in Lincoln), the NOAA/National Climatic Data Center, the USDA/NRCS National Soils Survey Center (located in downtown Lincoln), the USDA National Wildlife Research Center, USDA/APHIS Wildlife Services and the U.S. Fish and Wildlife Service (located in Grand Island, NE).

5.3 Research Support (1998 - 2003)

In order to gauge trends and progress in development of SNR research, one needs to examine annual statistics that reflect (1) proposals submitted, (2) proposals funded, and (3) funding generated per research faculty FTE. This section presents such information with some important caveats (see also Section 5.1.5 above). In April 2003 the School of Natural Resources (SNR) was formed by integrating the School of Natural Resource Sciences (SNRS), the Conservation and Survey Division (CSD) and the Water Center (see Chapter 1). Moreover, SNRS and CSD (and, to a lesser extent, the Water Center) have themselves been in transition these past five years as, each year, new faculty have joined, some have left for other units, and many appointments have been initiated, split or otherwise changed (i.e., annual research FTE are difficult to establish). Complicating things further, CSD and SNRS research faculty have, heretofore, reported administratively in different ways - CSD directly to the IANR Vice Chancellor and SNRS through the IANR Dean of the Agricultural Research Division (ARD). And, in developing externally-funded research, CSD faculty have usually worked directly with the Office of Sponsored Programs under the UNL Vice Chancellor for Research, while SNRS faculty have worked through ARD, with assistance from the Natural Resources Business Center (NRBC). As a consequence of these complicated and fluctuating circumstances, valid statistics on SNR research are very difficult to come by. The best available data, reported below, come from the ARD, although these represent only about 50-60% of the total research FTE now contained within the integrated SNR (see Section 5.1.2). An important priority for SNR in 2004 and subsequent years will be to establish better internal methods for tracking and reporting research activity (see Section 5.5 below).

ARD annual reports indicate that SNRS faculty have been quite productive in obtaining research funding (Table 5.7). On an annual basis, total grant dollars generated per FTE have fluctuated from about \$225,000 (in FY 1998) to over \$300,000 (in FY2002). More than half of these funds are typically generated through competitive proposals (usually from federal agencies). SNRS faculty annually submit about 3-4 proposals/FTE per year of which about half are for competitive awards. Although FY 2002 was an anomaly, SNRS has generally been improving its rank in research funding among peer units within IANR.

5.4 Indicators of Research Productivity (1998 - 2003)

Research productivity can, in part, be assessed by examining statistics on publications, theses generated and honors received by faculty. Acquisition of valid metrics to reflect productivity of SNR research faculty is beset with the same problems outlined in Section 5.3. Again, the data presented here are drawn mostly from ARD, but are believed to be generally representative of the entire integrated SNR faculty. Additional details are contained in the faculty and staff curricula vitae in Chapter 9.

According to ARD, during the past five years, refereed publications authored by SNRS faculty have generally hovered around 2-3 per FTE per year (Table 5.8). This appears somewhat below average for IANR. However, it is important to note that these statistics reflect only publications that have been given an ARD "journal series number" or are otherwise recognized by ARD. Many publications authored or co-authored by SNR faculty are not currently counted.

Theses (Masters and Ph.D. theses) supervised by SNRS faculty have, according to IANR records, ranged from about 0.5 per FTE per year to slightly over 1.0. Again, however, these figures are unrealistically low because, as noted in the chapter of teaching, at least half of the graduate students supervised by SNRS faculty are majoring in other departments (including departments affiliated with other colleges).

Although the only statistics currently available, we believe that these metrics under-represent SNR research achievements. As indicated by honors and awards received (Table 5.9), SNRS faculty are well-recognized by peers for their research accomplishments. Moreover, perusal of the vitae attached to this report give clear indications of research productivity. A major issue for SNR over the next five years will be to develop better methods of reporting, documenting and accounting for faculty and staff productivity.

5.5 Future of SNR Research (2004 - 2009)

The integration of SNRS, CSD, and the Water Center to form the School of Natural Resources (SNR) promises to generate synergism that will continue to increase the scope, quality, and impact of research. Consolidation of the natural resources sciences within SNR, along with identification of *ecosystem science* as a UNL priority program

(<http://www.unl.edu/svcaa/prioritization/jan2001/lsPage5.html>) should both serve to help natural resources research achieve, within IANR, greater parity with the agricultural sciences. While the overarching goals and vision set forth above (Section 5.1.1) will continue to guide SNR research through the next five years, this section outlines specific issues, opportunities and requirements that need to be addressed.

5.5.1 Research Enhancement Actions and Opportunities

As the lead unit for natural resources research and instruction at UNL, it goes almost without saying that SNR will seek, over the next five years, to continually increase externally-funded grants, engage more faculty in research, increase publications per research faculty FTE, and develop new research areas that are currently under-represented (e.g., human dimensions). In addition, School faculty and administration will endeavor, wherever appropriate, to increasingly use *ecosystem science* as a paradigm cutting across all SNR functions - research, teaching, extension/outreach and survey. *Ecosystem science* generally embodies the School's philosophy that natural resources issues are usually best dealt with in a holistic fashion.

The annual SNR research colloquium, initiated in 2002, and the seminar and visiting scientists programs will continue, as these have proven good ways to stimulate interaction among faculty, staff, students, external research collaborators and SNR clients. The 2003 SNR Research Colloquium is scheduled for October 20, 2003. We will also continue efforts to host regional and national conferences as useful means to showcase SNR research interests and achievements and to develop

new research relationships. For example, preliminary discussions are underway with the Natural Areas Association to host its 2005 or 2006 national symposium, an event that would bring 400-600 natural resource scientists and managers to Lincoln.

The School will seek to expand and further develop interdisciplinary collaborations within UNL through programs such as the Ecology and Evolutionary Biology Initiative (see Section 5.2.6). Externally, research partnerships with several federal agencies (most notably the National Park Service) have increased since the establishment, in 2000, of the School-affiliated Great Plains Cooperative Ecosystem Studies Unit (GP-CESU) (Appendix 5.3). The CESU serves to connect researchers at GP-CESU member universities with projects developed by CESU member agencies, expedite contracting and grants, and reduce overhead. We will continue to build on opportunities afforded by the GP-CESU to expand SNR research. To foster such opportunities, we will urge member agencies to follow the National Park Service lead and locate staff on campus as is encouraged under CESU guidelines. The development of the Hardin Center will facilitate integration of, and interactions between, CESU and SNR staff.

SNR is also a founding member of the Missouri River Basin Consortium (MRBC), an affiliation of universities and colleges designed to enhance and facilitate research and education related to the Missouri River (<http://mrbc.missouri.edu/>). This, too, will augment research.

Another most positive opportunity for SNR is that, in late 2003, Nebraska will join 37 other states in hosting a U.S. Geological Survey Biological Resources Discipline (BRD) Fish and Wildlife Cooperative Research Unit (FWCRU). The Unit will be affiliated with SNR and will be staffed by at least three new federally-funded doctoral-level scientists who will become adjunct faculty contributing to both SNR instructional and research programs. It is anticipated that the FWCRU will significantly enhance School research (including external funding) focusing on wildlife, fisheries and related areas.

And, beginning in late 2003, SNR faculty will be major players in a new Water Initiative being developed under the auspices of the UNL Vice Chancellor for Research. This Initiative will cut across all colleges, departments and other units on campus to focus expertise and funds on major water-related issues confronting the state and the region. Dr. Kyle Hoagland (former SNRS Interim Director and Water Center Director) has been asked to lead their effort along with Dr. Sheri Fritz (Department of Geosciences). Among other things, the Water Initiative will seek to develop new foci for water research, organize multidisciplinary teams of scientists to address major issues, and obtain major new funding to support research. Because SNR has many strengths directly related to water science, the Initiative promises to significantly enhance research within the School.

5.5.2 Challenges, Issues and Resource Needs

There are many reasons to be optimistic about the future of research in the School of Natural Resources. However, in order to achieve its research potential, SNR will, in the next five years, need to secure critical human and material resources. The budget crisis with which IANR is currently confronted will clearly make it difficult for the School to obtain major infusions of new state (“hard”) funding. However, SNR must attempt to, at least, retain its current budget and positions. In addition, SNR must plan for internal reallocations of faculty, staff and support funds where needed, must seek new funding from sources such as public agencies and foundations, and must look for ways to reward faculty and staff who are willing to invest significant effort in seeking such funding.

Faculty and Staff: The School’s future research posture will depend, first and foremost, on SNR’s ability to retain and enhance existing faculty and staff positions. Over the next 5 years, at least 15 faculty and 10 staff will become eligible for retirement. SNR will need to reassess all positions as they become open with a view to possible internal reallocation of such positions. Decisions should be guided by a plan, to be drafted no later than May 2004, that both fosters development of specific traditional disciplinary strengths (“program areas”) and identifies positions required to ensure that the School achieves its goals of excellence

in research, teaching and outreach based on an ecosystem science paradigm². The School has made a few initial strides in that regard. For example, the recent success of several SNR faculty, working with faculty in other units, to garner NSF funding for research on biocomplexity of the Sand Hills is a stellar case of applying the ecosystems approach (see Appendix 5.1). And, in a different vein, the SNRS faculty have identified several priority faculty positions needed in the integrative areas of ecosystems modeling, geographic information systems and the human dimensions of natural resources issues (see Chapter 3). However, much work remains to be done in addressing the manner in which the School's disciplinary strengths, and its research, teaching, outreach/extension and survey missions, can be wed to address natural resources issues using an ecosystem science approach. There must also be consensus on an institutional structure that facilitates balance between disciplinary strengths and integrative activities, based on a common understanding of ecosystem science.

As the School looks at the need to reposition and reallocate faculty, faculty will also be urged to consider opportunities to enhance their expertise through faculty development leaves ("sabbaticals"). Few SNR faculty have taken advantage of the opportunities for leaves in recent years. Such leaves serve to allow faculty to retool, to focus for a concerted period on research, and to build relationships with new collaborators and funding agencies.

Research Funding: The IANR fiscal situation is unlikely to improve significantly within the next four years; therefore, funding for graduate assistants, managerial-professional staff, post-doctoral associates and other staff required to support research will need to come largely from external sources (i.e., grants and contracts) and reallocation. Likewise, acquisition, replacement and maintenance of equipment and laboratory facilities, travel and field work, and related expenses will, increasingly, have to be borne by external monies. Many SNR research faculty have

²As a pre-requisite, SNR faculty and staff will need to reach consensus on the definition and character of ecosystem science".

been successful in acquiring external funding, but more will need to be done. The School will need to (1) encourage development of new research by providing faculty incentives and rewards for success, (2) seek to ensure that IANR/ARD policies on research issues such as overhead return are serving the best interests of enhancing research, and (3) identify better means to assist faculty in administering and managing grants and contracts through the Natural Resources Business Center (see below).

If the School is to significantly increase external funding over the next five years, more faculty will need to become involved in developing proposals. Those already successful in obtaining funds will need to be encouraged to do more³. Both are most likely to occur if SNR can identify means to reduce the burdens of grants management and maintenance of research facilities, and increase rewards for success in grantsmanship activities. Faculty successful in grantsmanship should be credited for assisting and mentoring faculty who are younger, less experienced or less successful. And, SNR must recognize that most increases in funding are likely to come through efforts of research clusters and the centers, and means to ensure their continuing success are critical, though not at the expense of individual research endeavors.

A key issue that SNR will need to review is overhead from external funding. In general, SNRS has been generous with policies on returning a portion of overhead to Principal Investigators (see Section 5.1.5); however, most faculty believe that UNL administration retains too much of the overhead generated on grants (i.e., that not enough is passed on to SNR for support of research). Moreover, faculty who were formerly part of CSD, which did not route research through ARD, will now, under SNR, see ARD taking a portion of overhead. Administrators must realize that overhead is one of the few rewards for success in grantsmanship and, as noted above, will become increasingly important to support the research mission of the School. It is demoralizing and counterproductive to research when overhead

³Although clearly many of the most successful faculty are near saturation.

return is diminished. Moreover, SNR must ensure that overhead monies returned to investigators can be carried over from one fiscal year to the next. This has been an issue in some years. Such funds, however, are critical to research operations of SNR. The centers, for example, in general have no hard-money operating budgets, and, thus, rely on overhead funds to ensure that they can retain staff, maintain equipment and provide continuity in research activities unimpeded. And, IANR restrictions on spending overhead funds (e.g., they cannot be used for professional memberships or journal subscriptions) fly in the face of what most faculty believe overhead is for (i.e., to enhance research). In order to deal with such issues, SNR administration, in conjunction with the SNR Research Committee, will, not later than December 2004, draft a comprehensive strategy for addressing issues related to faculty incentives for research development, support of research facilities and management of grants. This plan will include a new policy on distribution of overhead that is consistent across the School.

Natural Resources Business Center (NRBC): As noted above, NRBC staff assist SNR research faculty in hiring, budgeting and accounting, travel, purchasing, proposal preparation and related matters. In many respects the NRBC has been very successful in helping faculty obtain and manage research funds. However, NRBC was established by IANR before the SNR Research Committee existed, and with limited faculty input. With the recent integration of SNRS, CSD, and the Water Center, and the difficulties encountered in providing statistical data for this review (issues outlined elsewhere in this report), it has become increasingly clear that both the research faculty and NRBC would benefit from a review of research support activities and procedures. Thus, SNR will assess research-related services provided by NRBC to ensure that they best meet the needs of the School research community. The School will undertake to perform the review by December 2004.

Reporting and Accounting: As noted frequently in this chapter, SNR must deal with many issues related to improving the accuracy and efficiency of reporting and record-keeping. It is clear that SNR administrators, faculty, and NRBC staff need to clarify and better synchronize such procedures with the IANR deans. Included should be a discussion of the current format for the Annual Report of Faculty

Accomplishments (ARFA) filed by faculty each Fall. Ironically, at least one administrator finds it so difficult to extract useful statistical information from the ARFA that he has faculty prepare a separate (simpler) summary for his own use. SNR should have an annual faculty reporting procedure that facilitates both review of accomplishments and assemblage of statistical information in a convenient fashion. By May 2004, SNR will identify and implement ways to improve data collection and reporting procedures to ensure that statistical information better reflecting SNR progress and accomplishments is available for future annual and five-year reviews.

Physical Infrastructure: School researchers have been quite successful in building and equipping facilities to support research (see Appendix 5.3). Currently there appear to be no major hindrances to research stemming directly from inadequate facilities; however, the School is challenged to identify means to maintain and enhance existing laboratories and equipment in future years (see above). And, there are certainly issues regarding the location of facilities and the quality of space that need to be addressed.

Clearly, the fact that SNRS, the Water Center and CSD faculty, staff and facilities have been physically dispersed in different buildings and on different campuses over the past five years has not benefitted development or execution of research. It is remarkable what has been achieved in spite of this circumstance. By Fall 2005, virtually all School units and facilities will move to the renovated Clifford Hardin Hall on the UNL East Campus (see Chapter 3). It is expected that this relocation will greatly facilitate interaction and collaboration among faculty, staff and students. In addition, for many faculty and staff, Hardin Hall will provide improved quality (though sometimes smaller) of office and laboratory space. The research mission of SNR will be enhanced by efforts in the Center to clearly identify research centers and facilities through signage, to provide first class facilities for meeting with research clients and partners, to provide improved amenities for storage and deployment of field equipment, and to display and deliver products of SNR research. Research faculty and staff must continue to be involved in planning for the Hardin Hall renovation.

It is also important that SNR take a more active role in managing field facilities used by faculty and staff. Although field facilities are, in general, very good, there are at least two issues that need to be addressed in coming years. First, the natural resources have been under-represented in committees and decision-making involving planning and administration of IANR field stations

(<http://ard.unl.edu/facilities.html>) . SNR should seek to become an equal partner with agriculture in such efforts. The SNR administration will, by May 2004, report to faculty on progress made to give the School an active role in that arena. Second, the School owns and/or has principal management responsibilities at two locations (including several sites at ARDC [Mead], Prairie Pines). These locales serve teaching, research and outreach functions, but no coordinated, systematic assessment of the needs to improve or use the sites has been conducted. Therefore, by December 2003, SNR administration will appoint an ad hoc committee to develop a plan for managing, using and enhancing the School properties. This committee will complete its mission by January 2005.

Outreach and Delivery of Research Results: *In order to have maximum impact, the results of SNR research must be disseminated to a broad audience using both traditional media (refereed publications, maps, brochures, books and reports) and computer-based technologies. The School's audience includes a wide range of clients encompassing peers (faculty and scientists at public and private institutions), public agencies, NGOs, private firms, educators (K-16), the media, and the general populace.*

SNRS extension faculty have achieved many successes in information delivery (see Chapter 4). The recent integration of SNRS and CSD should enhance outreach and delivery of data and information to SNR clients. The CSD staff have several decades of experience in information delivery, maintain an office of the Earth Science Information Center (map and report sales, USGS maps and USDA/NRCS Soils surveys, image library, digital data distribution) and a web site that facilitates download of data and information. These services will be expanded to cover all facets of SNR. SNR administration will, not later than December 2004, develop a

plan to integrate information delivery across all units of the School, with the assistance of a new Information Services Coordinator. This effort will be carried out in close cooperation with those working to enhance the School web site. A key facet of this review will involve identification of expectations and needs of SNR clients, and assessment of their preferred delivery formats for different types of information (e.g., internet, CD-ROM, articles and books).

The School will seek to develop stronger linkages with the UNL Cooperative Extension Division and with Extension Educators throughout Nebraska. The SNR Research and Extension/Outreach Coordinators will collaborate to identify ways to inform extension specialists about SNR research and engage them in outreach efforts targeted at SNR clients, and to educate SNR faculty and staff about the services of Cooperative Extension. For example, extension educators may be invited to attend the annual SNR Research Colloquium.

School research faculty will also be encouraged to explore new methods for distributing information on the nature and results of SNR research activities. In Fall 2003, for example, the Research Coordinator will, solicit, from faculty and staff, one page "fact sheets" that describe in laymen's terms, the research being conducted in SNR (see attached sample). The fact sheets will be downloadable from the SNR web site, and will serve, among other functions, to keep SNR clients abreast of current projects and to inform prospective students of faculty research foci.

The Internet will, of course, be increasingly important for delivery of research results. All natural resources are spatially distributed over the Earth's surface, as are human beings (users of natural resources) and other organisms. As a consequence, mapping is critical to most analyses of natural resources issues, and most models require explicit or implicit consideration of the spatial dimensions of natural resources and resource use. Although traditional map products will continue to be important, SNR researchers must also increase their participation in technologies such as interactive Internet mapping. Although some strides have been taken in this regard (see, for example, <http://www.calmit.unl.edu/cohyst/>

and <http://www.calmit.unl.edu/rwb/>), much more should be done over the next five years. This will require a commitment from SNR administration to provide critical technical assistance and funding. The School will, no later than December 2004, draft a plan to enhance and facilitate delivery of research results through the Internet.

Table 5.1. Traditional Program Areas of SNR Research Faculty and Staff, July 2003

| Program Area | Number of Faculty | Total Faculty Research FTE | Number of Staff | Total Staff Research FTE |
|--|-------------------|----------------------------|-----------------|--------------------------|
| Forestry | 9 | 0.60 | 2 | 1.00 |
| Geology | 8 | 0.00 | 1 | 0.50 |
| Grassland & Agro-Ecology | 6 | 3.50 | 2 | 1.20 |
| Climate & Bio-atmospheric | 11 | 8.20 | 18 | 12.24 |
| Geospatial Information (remote sensing/GIS) | 6 | 1.45 | 12 | 11.00 |
| Soils Science | 9 | 2.65 | 4 | 2.25 |
| Water | 17 | 5.46 | 16 | 14.00 |
| Wildlife | 6 | 2.56 | 6 | 1.00 |
| Other (e.g. Human) | 2 | 0.90 | 0 | 0 |
| Other (cartography, IT) | 0 | 0 | 7 | 6.45 |
| Totals | 74 | 25.32 | 68 | 49.64 |

Table 5.2. SNR Seminars 2002-2003

- September 16 Thomas R. Loveland, U.S. Geological Survey/EROS Data Center
The Spatial and Temporal Dimensions of Contemporary U.S. Land Cover and Land Use Change
- September 23 John Schalles, Department of Biology, Creighton University
From Grits to Shrimp: Organic Carbon Pathways, Water Column Optics, and Remote Sensing in Coastal Georgia Waters
- September 30 Manda Page, School of Natural and Rural Systems Management
The University of Queensland, Australia (Visiting Scientist, SNR, UNL)
Natural Resource Management in Australia: Our History and Our Issues
- October 7 James Parham, School of Natural Resource Science, UNL

Habitat Modeling for Fish Conservation - Examples from Hawai'i and Nebraska

- October 14 Adauto Araujo, Brazilian National School of Public Health
Parque Serra do Capivara: Natural Resource Development and Public Health in One of Brazil's Newest Parks
- October 21 no lecture (SNR Fall Colloquium)
- October 28 George Hess and Heather Cheshire, Department of Forestry, North Carolina State University
Integrating GIS into a Natural Resource Undergraduate Curriculum
- November 4 Loretta Johnson, Division of Biology, Kansas State University
Fire and Grazing Regulate Belowground Processes in Tallgrass Prairie
- November 11 Anatoly Gitelson, Giorgio Dall'Olmo and Don Rundquist, CALMIT/SNR, UNL
Remote Sensing of Water Quality
- November 18 Carolyn Olson, National Leader, Soil Survey Investigations, USDA National Soil Survey Center
A Review of Research at the USDA National Soil Survey Center
- November 25 no lecture (Thanksgiving week)
- December 2 Mace Hack, Nebraska Game and Parks Commission
The Behavioral Ecology and Conservation of East Africa's Zebras
- January 15 Michael J. Hayes, Assistant Professor, National Drought Mitigation Center, SNR, UNL
Magnitude, Extent and Frequency of Drought in the Great Plains
- January 22 Mark S. Kuzila, Director, Conservation and Survey Division, UNL.
UNL's Re-constituted School of Natural Resources
- January 29 William R. Clark, Department of Animal Ecology, Iowa State University, Ames, IA
Mesopredator Population Dynamics
- February 5 Michael A. Drain, Central Nebraska Public Power and Irrigation District, Holdrege, NE
Managing Lake McConaughy During Severe Drought
- February 12 Chris Helzer, The Nature Conservancy, Aurora, NE
The Art and Science of Restoring and Managing Platte River Grasslands

February 19 Michele Schoeneberger, USDA National Agroforestry Center, Lincoln, NE

Agroforestry in the United States: Linking Sustainable Forestry and Sustainable Agriculture

February 26 James D. Nichols, USGS Patuxent Wildlife Research Center, Laurel, MD

Animal Monitoring Programs: Why, What and How

March 5 Larry Cieslik, U.S. Army Corps of Engineers, Omaha, NE

Missouri River Main Stem Reservoir Management During Drought

March 12 Donald A. Wilhite, National Drought Mitigation Center, SNR, UNL

Implementing Drought Mitigation Strategies

March 19 No seminar (UNL spring break)

March 26 Patrick J. Shea, School of Natural Resources, UNL

Environmental Remediation and Restoration of Soils

April 2 Jerry Obrist, Lincoln Water System, Lincoln, NE

Well Field Management for the Lincoln Water System

April 9 Jess Brown, USGS/EROS Data Center, Sioux Falls, SD

Integrating Satellite and Climate Data to Improve Tools for Drought

Monitoring

April 16 Dean E. Eisenhauer, Department of Biological Systems Engineering, UNL

UNL

Conservation Benefits of Riparian Buffers

April 23 Eric B. Knox, Department of Biology, Indiana University, Bloomington, IN

IN

Evolution of the Giant Senecios and Giant Lobelias On The Mountains Of Eastern Africa

April 30 Peter Gleick, Pacific Institute for Studies in Development

Environment Water and War Issues for the 21st Century

Table 5.3. Selected Conferences Sponsored by SNR

- 2003 Great Plains Limnology Conference, Lincoln, NE
- 2003 Association of American State Geologists (95th Annual Meeting),
Lincoln, NE,
<http://csd.unl.edu/aasg/>
- 2003 Nebraska Urban Pest Management Conference, Lincoln, NE,
<http://entomology.unl.edu/upm.htm> (Note: held each year)
- 2003 Nebraska GIS Symposium, Lincoln, NE,
<http://www.calmit.unl.edu/nebgis2003/>
(Note: held in even-numbered years)
- 2003 Nebraska Well Drillers 73rd Annual Convention, Lincoln, NE,
<http://csd.unl.edu/nwda/>
(Note: held each year)
- 2003 Children's Groundwater Festival, Grand Island, NE,
<http://www.groundwater.org/index.html>, (Note: held each year)
- 2002 U.S. Regional Association - International Association for Landscape
Ecology (17th Annual Symposium), Lincoln, NE,
<http://www.calmit.unl.edu/usiale2002/>
- 2002 Defending the Integrity of Ground Water: Understanding the Impacts
of Natural and Man-made Disasters, Washington, D.C.,
<http://www.ngwa.org/pdf/defending.pdf>
- 2002 MidAmerica GIS Symposium, Kansas City, MO,
<http://magicweb.kgs.ukans.edu/magic/body.html>, (Note: held in even-
numbered years)
- 2000 Drought 2000: Impacts, Policy and Technology, Des Moines, IA,
<http://www.ngwa.org/news/2000/droughpr.html>

Table 5.4. Examples of Recent Major SNR Research Awards¹ (2001–2003)

| Project Title | Funding Agency | Award |
|--|----------------|-------------|
| <i>Sand Hills Biocomplexity</i> | NSF | \$1,800,000 |
| Carbon Sequestration in Dryland and Irrigated Ecosystems | DOE | \$975,000 |
| Carbon Sequestration and Global Climate Change | DOE EPSCoR | \$840,000 |
| Great Plains Regional Center, National Institute for Global Environmental Change | DOE | \$1,246,907 |
| Earth Observation System Validation Program | NASA | \$505,000 |
| <i>America's Farm</i> | NASA | \$700,000 |
| <i>Land Cover Dynamics in Kazakhstan</i> | NASA | \$359,407 |
| <i>Remote Sensing Aircraft Program</i> | NSF | \$450,000 |
| <i>Remote Sensing Environmental Laboratory</i> | NASA | \$542,000 |
| <i>Gap Analysis Program</i> | USGS | \$550,000 |
| <i>Integrated Framework for Drought Monitoring and Mitigation</i> | NSF | \$499,438 |
| <i>Drought Risk Management System</i> | USDA and NSF | \$2,400,000 |
| <i>Engaging Communities with Applications of Climate Information</i> | NOAA | \$436,424 |
| <i>Lake Classification Strategy for Agricultural Landscapes</i> | EPA | \$1,224,706 |
| <i>Ecology and Management of Sturgeon in the Platte River</i> | NGPC | \$1,240,000 |
| | | |

| | | |
|---|-------------------|--------------------|
| <i>Managing Soil and Water Contamination Using Novel Remediative Treatment Technologies</i> | <i>EPA EPSCoR</i> | <i>\$825,489</i> |
| <i>Accelerated Bioremediation of Xenobiotics</i> | <i>NSF EPSCoR</i> | <i>\$657,591</i> |
| <i>Prairie-Forest Border Ecosystem Dynamics</i> | <i>NSF</i> | <i>\$4,200,000</i> |
| <i>Accelerating Riparian Buffer Adoption</i> | <i>USDA</i> | <i>\$225,000</i> |

¹Grants and contracts cumulatively in excess of \$250,000; some span several years.

DOE - U.S. Department of Energy

NSF - National Science Foundation

EPA - U.S. Environmental Protection Agency

NOAA - National Oceanic and Atmospheric Administration

NASA - National Aeronautics and Space Administration

NGPC - Nebraska Game and Parks Commission

USDA - U.S. Department of Agriculture

Table 5.5. Total Research Submitted and Awarded 1998-2002 - in millions of dollars (rounded)

| | 1997- 1998 | 1998- 1999 | 1999- 2000 | 2000- 2001 | 2001- 2002 |
|----------------|---------------|---------------|---------------|---------------|---------------|
| SNRS submitted | 4.509 | 7.964 | 8.655 | 8.716 | 6.124 |
| SNRS awarded | 1.947 | 2.978 | 4.061 | 3.785 | 4.495 |
| % success | 43 | 37 | 47 | 43 | 73 |
| CSD submitted | 9.108 | 4.375 | 8.207 | 11.136 | 2.217 |
| CSD awarded | 2.250 | 2.612 | 1.775 | 1.598 | 1.334 |
| % success | 25 | 60 | 22 | 14 | 60 |

Sources: IANR/ARD and NRBC

Table 5.6. SNRS Research Overhead 1998-2003 - in thousands of dollars (rounded)

| | 1997- 98 | 1998- 99 | 1999- 00 | 2000- 01 | 2001- 02 | 2002- 03 |
|--------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Overhead collected | 343 | 230 | 467 | 435 | 366 | 596 |
| Received in unit | 29 | 76 | 51 | 104 | 81 | 132 |

Note: These numbers portray overhead generated only by research grants and contracts; additional overhead was generated by extension and, in some years, teaching grants and contracts. The numbers are for SNRS only.

Sources: IANR/ARD and NRBC

Table 5.7. Trends in SNRS Research Funding 1998-2002

| | FY 1998 | FY1999 | FY2000 | FY2001 | FY2002 |
|--|---------|--------|--------|--------|--------|
| | | | | | |

| | | | | | |
|----------------------------------|---------|---------|---------|---------|---------|
| Total grant \$/FTE | 471,197 | 225,108 | 325,372 | 262,316 | 306,512 |
| Competitive grant\$/FTE | 374,897 | 167,077 | 198,178 | 217,851 | 177,083 |
| Appropriated \$/FTE ¹ | 187,558 | 152,774 | 145,473 | 160,872 | 161,865 |
| Total \$/Total appropriated \$ | 2.5 | 1.5 | 2.2 | 1.6 | 1.9 |
| Total proposals/FTE | 7.1 | 3.2 | 4.7 | 3.1 | 2.1 |
| Competitive proposals/FTE | 3.9 | 1.9 | 2.6 | 1.7 | 1.1 |
| SNRS rank in IANR | 5 | 3 | 2 | 1 | 4 |

¹Unit appropriated budget plus Regional Research and McIntyre Stennis funds.
Sources: IANR/ARD and NRBC

Table 5.8. Indicators of SNRS Faculty Research Productivity 1998-2002

| | FY 1998 | FY1999 | FY2000 | FY2001 | FY2002 |
|--|---------|--------|--------|--------|--------|
| Refereed publications/FTE ¹ | 5.1 | 2.3 | 1.9 | 2.7 | 3.0 |
| MA/PhD theses/FTE | 1.3 | 0.5 | 0.6 | 1.1 | 0.6 |

¹Publications include journal articles, books, book chapters and research bulletins.
Sources: IANR/ARD and NRBC

Table 5.9. Selected Honors, Awards and Recognitions Related to Research (1998-2003)

| Name | Year | Award | Presenter |
|----------------------|-----------|-----------------------------|--|
| Carlson, Marvin P. | 2003 | Certificate of Merit | American Association of Petroleum Geologists |
| Diffendal, Robert F. | 1998-2000 | Honorary Visiting Professor | Zhongshan University |

| | | | |
|---------------------|------|--|--|
| | | | Guangzhou, China |
| | 1998 | Guest Professor | Chengdu University of Technology, Chengdu, China |
| Goeke, James | 2001 | Maurice Kremer Groundwater Achievement Award | |
| Gitelson, Anatoly | 1998 | Israeli State Prize: for the best scientific contribution to Israeli development | USSR Academy of Sciences |
| Holz, John C. | 2001 | Environmental Council of the States Program Innovation Award in recognition of the accomplishments of the Community Lake Enhancement and Restoration Program | |
| | 1999 | North American Lake Management Society Technical Excellence Award in recognition for Outstanding Research in Lake Restoration, Protection, and Management | |
| | 1999 | Outstanding Water Resources Dissertation in the Field of Water Quality, Honorable Mention | The Universities Council on Water Resources |
| Hu, Qi Steven | 2002 | Junior Faculty Award | School of Natural Resource Sciences |
| Hygnstrom, Scott E. | 2003 | Professor of the Month (January) | UNL Mortar Board, The Black Masque Chapter |
| | 2002 | Charles E. Bessey Award | UNL Center for Great Plains Studies |
| | 1999 | Distinguished Service Award | Nebraska Cooperative Extension Association-Specialists Section |
| Jess, J. Michael | 2000 | Ditchrider Award | Four States Irrigation Council |
| | 1999 | Pioneer Award | Nebraska Water Conference Council |
| | 1998 | Award for "Leadership, Professionalism and Integrity" | Nebraska State Irrigation Association and Nebraska Water Resources Association |
| Joeckel, Robert M. | 1999 | Vice President for Academic Affairs Distinguished | Bellevue University |

| | | | |
|---------------------------|-----------------|---|--|
| | | Professorship | |
| Josiah, Scott J. | 2002 | Awarded Certified Forester designation | Society of American Foresters |
| | 2002 | Gold Award for authoring four Specialty Forest Product publications | National Association of Natural Resource Professionals (ANREP). |
| | 2002 | Dinsdale Family Faculty Award | University of Nebraska, IANR |
| | 2000 | National Innovation Merit Award | US Department of Transportation |
| Merchant, James W. | 1999 | Outstanding Contributions Award | Nebraska GIS/LIS Association |
| | 1998 | Outstanding Contributions Award | Association of American Geographers, Remote Sensing Specialty Group |
| Reinhard, Karl J. | 2001 | Fulbright Scholar, Brazil | U.S. State Department |
| Snow, Daniel D. | 2002 | Certificate of Merit | National Meeting Presentation, American Chemical Society |
| Swinehart, James B. | 2000 | Charles E. Bessey Award for best paper in natural sciences | Great Plains Research |
| Szilagyi, Josef | 2001 | Janos Bolyai Research Fellowship | Hungarian Academy of Sciences |
| Verma, Shashi B. | 2002 | Charles Bessey Professor of Natural Resource Sciences | University of Nebraska-Lincoln |
| Walter-Shea, Elizabeth A. | 2002 | Editors' Citation for Excellence in Manuscript Review | American Society of Agronomy |
| Wedin, David A. | 1999 | Junior Faculty Excellence in Research Award | Ag. Research Division, University of Nebraska |
| Wilhite, Donald A. | 2002 to present | Chair and Rapporteur, Drought Discussion Group | U.N. Secretariat for the International Strategy for Disaster Reduction, Geneva |
| | 1996 to present | Member, Editorial Board, | <i>Disaster Prevention and Management: An International Journal</i> |
| Zanner, William | 2003 | Fellow | Center for Great Plains Studies |
| | 1998 | Sigma Xi Research Award | University of Minnesota Chapter of Sigma Xi |

Appendix 5.1. SNR Research Clusters, 2002–2003

Carbon Sequestration (Shashi B. Verma and Kenneth Cassman, Principal Investigators)

The Carbon Sequestration Research Cluster focuses on ways to mitigate the increase in atmospheric carbon dioxide concentration by increasing the amount of carbon stored (sequestered) in soil. A key issue is the degree to which agriculture can contribute to this mitigation. The cluster is comprised of 16 faculty investigators representing SNR and the UNL Department of Agronomy and Horticulture, the UNL Department of Agricultural Economics, the UNL Department of Biological Systems Engineering, the UNL Department of Biochemistry and the UNO Department of Geography and Geology, and USDA ARS. The Cluster studies focus on determining the potential for carbon storage in dryland and irrigated cropping systems in the north-central U.S. and the factors that govern carbon sequestration.

Major grants from DOE and USDA fund interdisciplinary studies that will (a) quantify annual amounts of carbon sequestered using year-round measurements of CO₂ flux at the landscape-level by eddy covariance flux tower systems, (b) develop reliable, cost effective procedures for predicting annual carbon storage, (c) improve our understanding of processes controlling soil carbon storage, and (d) develop improved management practices that increase carbon sequestration while at the same time improving production efficiency, profit, and environmental quality.

Biocomplexity of the Sand Hills: Integrating Biogeophysical Processes Across Space and Time (David Wedin, David Loope, and Geoffrey Henebry Principal Investigators)

Today, the 58,000 km² Nebraska Sand Hills are stable and covered by native grassland interspersed with wetlands and lakes. The starting point for the Sand Hills Biocomplexity project was the recent observation by UNL geoscientists that many of these dunes were destabilized (lost their grass cover) and active as recently as 900 years ago. How do short- and long-term climate change interact with ecological, hydrological and bioatmospheric processes to destabilize this massive sand dune system, or, on the other hand, restabilize large areas of moving sand? What role do the numerous interdunal wetlands and lakes of the region play in stabilizing this system? An interdisciplinary team (15 faculty from SNR, Geosciences, Agronomy, and Biosystems Engineering) posed these questions to NSF in 2000 and received \$100,000 in Biocomplexity Incubation funds to develop a research program. The project has received >\$75,000 in seed money funds from UNL, as well. In May 2003 the team was awarded \$1,800,000 by NSF. The proposed research will have three main components: 1) geological and paleoecological studies will reconstruct Sand Hills climate and dynamics during the late Holocene; 2) a large-scale manipulative experiment will examine the effects of grassland destabilization on the coupled budgets of energy and water that drive both ground-water recharge and canopy-atmosphere interactions; 3) mesoscale climate modeling of the coupled climate – vegetation – hydrologic system will test whether the processes and feedbacks that we hypothesize govern the stability of the Sand Hills can account for patterns observed in both the geologic and satellite-based record.

Lake Classification and Aquatic Ecology (John Holz, Principal Investigator)

In agriculturally dominated regions, land use practices have an unusually large impact on water bodies and, therefore, land use may reduce the utility of current ecoregion-based approaches to lake classification by dampening the signals which underlie the ecoregion framework. Under a three-year EPA STAR grant,

a team of six researchers representing SNR and the UNL Department of Civil Engineering has been assembled to develop a comprehensive classification scheme for agriculturally-dominated ecosystems. The objectives of the Research Cluster are to (1) establish a protocol for aggregating lakes and reservoirs in agricultural ecosystems into appropriate classification strata and identifying reference conditions for these lake classes, (2) establish the role of remote sensing and GIS in a classification strategy, and (3) establish a dynamic technology transfer link between the proposed classification system and the end-users.

Shelterbelt Dynamics (J.R. Brandle, UNL and E.S. Takle, ISU, Principal Investigators)

The Shelterbelt Dynamics Research Cluster is a cooperative effort with Iowa State University focused on the influence of the structure of linear forests on the flow fields surrounding these forests, the influence of these flow fields on exchange processes between surfaces and the atmosphere and the resulting impacts on crop yields and economics. The group is composed of nine faculty representing two Universities, six Departments and the USDA National Agroforestry Center. The project was initiated in 1993 and has been supported by a series of grants from USDA, USFS and DOE for a total of two million dollars. It is funded through 2004 and a renewal grant has been submitted for an additional three years. The project has resulted in the development of several first generation models for flow dynamics, crop yields and windbreak economics. Current efforts focus on a) estimating barrier structure, biomass, and carbon sequestration, b) flow dynamics and exchange processes, c) successional trends of plant recruitment, d) economic impacts of these linear forests and e) issues relating to scaling point data to the landscape levels.

Agroforestry (S. Josiah and J. Brandle, Principal Investigators)

The Agroforestry Research Cluster is focused on quantifying the role of woody plants in agricultural landscapes. Its main thrusts are to quantify the ecological and economical benefits of agroforestry practices. Ten faculty representing SNR, the UNL Departments of Agronomy and Horticulture, Entomology, Biological Systems Engineering, Food Science and Nutrition and Statistics and the USDA National Agroforestry Center are active participants in this effort. Faculty have been successful in securing significant funding from a number of sources including various programs within USDA-CSREES, the USFS, USEPA, the National Arbor Day Foundation and the Northern Nut Growers Association. The effort has led to the establishment of The Integrated Farm at the Agricultural Research and Development Center located near Mead, NE and a number of cooperative agroforestry research trials on private lands, at the UNL Haskell Agricultural Laboratory at Concord, NE, the UNL East Campus Horticultural research area in Lincoln, and the National Arbor Day Foundation's Arbor Day Farm in Nebraska City.

Drought Monitoring, Risk Management, and Planning

(Donald Wilhite, Principal Investigator)

The National Drought Mitigation Center (NDMC) has been developing new tools for drought monitoring, risk assessment, and planning since its establishment in 1995. In collaboration with other faculty and departments at UNL and other institutions, the NDMC has been leading efforts to improve decision support systems for farmers, ranchers, communities, and others affected by drought in the United States and throughout the world. The NDMC receives its base funding from USDA's Cooperative State Research, Education, and Extension Service. Recent projects funded by the Digital Government Program and the Information Technology Research Program at the National Science Foundation, NOAA's Office of Global Programs, USGS's EROS Data Center, and USDA's Risk Management Agency, have provided further support for these efforts in collaboration with the High Plains Regional Climate Center, the Nebraska Research Initiative, Department of Computer Science and Engineering, Department of Agricultural Economics, and others. Deliverables from these efforts include the U.S. Drought Monitor, weekly web-based climate indices such as the Standardized Precipitation Index and the Palmer Drought Severity Index, risk management workshops, integrated climate and hydrologic data bases, remote

sensing and climate-based drought monitoring tools, and numerous scientific publications and presentations. The NDMC is also collaborating on development of a national integrated drought information system, legislation to develop a national drought policy aimed at preparedness and risk management, and creation of a network of regional drought preparedness networks through agencies of the United Nations.

Remediation of Contaminated Soil and Water (Pat Shea and Steve Comfort, Principal Investigators)

The research cluster focused on Remediation of Contaminated Soil and Water has since 1992 sought to (1) develop innovative and practical remediation technologies, (2) determine associated kinetics and reaction mechanisms, (3) develop novel techniques to predict chemical reactivity, (4) measure environmental and mammalian toxicity and (5) demonstrate remediation technologies at field sites. In addition to SNR faculty, the cluster includes participants from UNL's Departments of Civil Engineering, Physics and Astronomy, Chemistry, Agronomy and Horticulture, Biochemistry and Biological Sciences. External collaborators represent DOE Sandia National Laboratories, DOE Oak Ridge National Laboratory, DOE Pacific Northwest Laboratory, Compliance Advisory Services, H & H EcoSystems, Inc., Brice Environmental Services Corporation and the Russian Academy of Sciences. External funding of approximately \$3,000,000 has been obtained from the US Army, EPA, USDA, USGS, NSF, DOE EPSCoR, IANR ARD, SNRS, Water Center, the Nebraska Research Initiative, Nebraska Environmental Trust and Brice Environmental Services Corporation. In recent years, the cluster has:

- characterized munitions fate and transport in soils from former Nebraska Ordnance Plant.
- isolated and identified TNT-degrading bacteria in munitions-contaminated soil.
- determined grass species tolerance for TNT-contaminated soil
- demonstrated enhanced TNT degradation in rhizosphere soil.
- shown enhanced TNT degradation by treatment with activated carbon.
- developed Fenton oxidation for destruction of TNT and RDX in water and soil slurries.
- developed zerovalent iron reduction technology for destruction of munitions, chlorinated and nitrogenated pesticides, and nitrate.
- enhanced zerovalent iron through use of aluminum/iron salts and cationic surfactant.
- completed successful pilot-scale remediation of Los Alamos National Laboratory soil that was highly contaminated with RDX and HMX.
- successfully removed low concentrations of RDX from Massachusetts Military Reservation soil in treatability tests using iron with soil washing.
- shown oxidation of RDX in Pantex Plant aquifer material with potassium permanganate.
- conducted field-scale remediation of metolachlor-contaminated soil at two Nebraska sites.

Wildlife Damage Management (Scott Hygnstrom and Kurt VerCauteren; Principal Investigators)

Wildlife damage in the United States costs well over \$25 billion annually and human-wildlife conflicts are pervasive in society. We have developed a diverse program to provide research-based and timely information to reduce the negative impacts of wildlife associated with 1) damage to food, fiber, personal property, and natural resources; 2) threats to human health and safety; and 3) nuisance problems. Our research program is a collaboration among UNL-SNRS, the National Wildlife Research Center (USDA-APHIS-Wildlife Services), and scientists with the US Fish and Wildlife Service, US Forest Service, UN-Omaha, Kansas State University, and UNL-CALMIT. Funding has been provided by the USDA-CSREES-Integrated Pest Management, USDA-Wildlife Services, National Wildlife Research Center, US Fish and Wildlife Service, US Forest Service Nebraska Game and Parks Commission, National Rifle Association, Rocky Mountain Elk Foundation, Nebraska Bowhunters Association, Fontenelle Forest Association, Gifford Foundation, and others). Research areas have included the ecology of deer and elk (movements, dispersal, habitat selection, population dynamics, herd health), deer damage abatement techniques, efficacy of rodenticides, rodent biogeography, food habits of predators, distribution and prevalence of zoonotic diseases, and human dimensions in wildlife damage management.

Appendix 5.2. Interdisciplinary Research Centers

Great Plains Regional Center, National Institute for Global Environmental Change

Director: Shashi B. Verma

Web site: <http://gprcnigec.unl.edu/>

The National Institute for Global Environmental Change (NIGEC) operates under the U.S. Department of Energy (DOE) to execute, through regional centers, a program of research in global environmental change. The Great Plains Regional Center of NIGEC, established in 1992, focuses on the region encompassed by Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota and Wyoming. Because the region is characterized by strong climatic gradients, fertile carbon-storing soils, and important agricultural and grassland systems, the Center emphasizes research to (1) develop quantitative information on the role of key ecosystems as a source or sink of carbon dioxide and (2) to provide scientific tools required to assess the consequences of climate change on social, physical, and biological resources. Some current projects include:

- Carbon, Water and Land-Use in Conservation Reserve Program Lands of the Shortgrass Prairie
- Landscape-Level Trace Gas Fluxes on Grazed and Ungrazed Tallgrass Prairie
- Continuous Measurements of Soil Surface CO₂, N₂O, and CH₄ Fluxes to Estimate Ecosystem Respiration and Global Warming Potentials in Great Plains Agricultural Systems
- Understanding and Determining the Patterns of and Controls on Regional Net Ecosystem Production in the Great Plains and Midwestern Regions: A Proof of Concept
- Belowground Responses to Multiple Climate Change Factors: Interactive Effects of Warming and More Extreme Precipitation Patterns on Grassland Ecosystems
- Evaluating and Improving CROPGRO-Soybean and CERES-Maize Models for Predicting Growth and Yield Response to Climate Change Factors.

National Drought Mitigation Center

Director: Donald A. Wilhite

Web site: <http://drought.unl.edu/>

The National Drought Mitigation (NDMC) was established in 1995. The NDMC's program is directed at lessening societal vulnerability to drought through a risk-based management approach. Activities include promoting and conducting research and outreach activities 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 placed on research and outreach projects and mitigation/management strategies and programs that stress risk management measures rather than reactive, crisis management actions. Base funding for the NDMC is provided through a special grant from the CSREES/USDA. In addition, the NDMC also receives support for specific activities and special projects related to its mission. The NDMC is also involved in numerous international projects, working in partnership with the United Nations,

international and regional organizations, and foreign governments on drought management, planning, and policy issues.

High Plains Regional Climate Center

Director: Kenneth G. Hubbard

Web site: <http://www.hprcc.unl.edu/index.html>

The High Plains Regional Climate Center (HPRCC) is one of six regional U.S. climate centers. The HPRCC was established in 1987 and now includes seven participating universities: Colorado State University, Iowa State University, Kansas State University, the University of Nebraska, North Dakota State University, South Dakota State University and the University of Wyoming. The mission of the HPRCC is to increase the use and availability of climate data in the region. The long-term objectives of the HPRCC are to monitor the climate in the region, carry out applied climate studies, develop improved climate information products, and provide climate services in the region. More than 2,000 stations collect daily data on behalf of the National Weather Service and both historical and near-real time data from this network is ported into the HPRCC data archive. The HPRCC also operates a network of 169 hourly automated weather stations in the region in cooperation with the other states. Accesses to the HPRCC web resources are about 10 million per year. The HPRCC web page receives more than 700,000 visits per month while the on-line subscription based system receives more than 70,000 hits per month. Current HPRCC research is focused on: enhancement of data quality; a climate decision support system for drought; transformation functions for various RH and temperature sensors; a synchronized Applied Climate Information System to manage regional and national data sources and enhance efficiency as well as product development capabilities, and the status and state-of-the-art relative to the application of climate data by water managers and decision makers.

Center for Advanced Land Management Information Technologies

Director: Donald C. Rundquist

Web site: <http://www.calmit.unl.edu/>

The Center for Advanced Land Management Information Technologies (CALMIT), University of Nebraska-Lincoln (UNL) has, for 31 years, served as Nebraska's premier program in remote sensing and geographic information systems (GIS). In 1986 CALMIT was chartered by the Board of Regents of the University of Nebraska as a university-wide center-of-excellence in remote sensing and other geospatial information technologies. The core CALMIT staff is comprised of 19 full-time faculty and professional scientists and 17 graduate students. These staff are involved in a host of undergraduate and graduate education, K-12 education, basic and applied research and outreach activities. Current research projects focus on water quality and vegetation assessment using hyperspectral sensors, land use mapping and change analysis in Nebraska and Kazakhstan, classification of lake watersheds using GIS, biodiversity planning using gap analysis, remote sensing methods for improving meteorological forecasts, noxious weeds mapping on National Parks lands, and GIS support for emergency management.

UNL Water Center

Director: Kyle D. Hoagland (Acting Director: J. Michael Jess)

Web site: <http://watercenter.unl.edu/>

The UNL Water Center was founded in 1964 as part of Congressional legislation mandating a national network of Water Resource Research Centers. The mission of the Center is to implement, facilitate and coordinate focused water research, teaching, extension and service programs within the University of Nebraska and statewide, at the post-secondary education level and address environmental needs associated with agriculture and natural resources within the UNL Institute of Agriculture and Natural Resources (IANR). An integral part of the UNL Water Center is the Water Sciences Laboratory, founded in 1990. It is a modern analytical laboratory driven by grant-sponsored research that facilitates water quality research projects among many disciplines and NU units. The laboratory's mission is to provide technical expertise and analytical support for environmental and water related research statewide. Examples of current research conducted through the Water Center include: evaluating thermal-infrared imaging as a tool for characterizing groundwater-surface water interactions between the lakes and the shallow aquifer of the Nebraska Sand Hills, assessing scale type and microbial induced corrosion on dissolved copper in Nebraska public water supplies, assessing livestock waste lagoons impacts on groundwater pollution, using center pivot sprinklers to irrigate crops to reduce shallow groundwater nitrate contamination.

Great Plains Cooperative Ecosystem Studies Unit

Director: Kyle D. Hoagland

Web site: <http://greatplains.cesu.unl.edu/>

The Great Plains Cooperative Ecosystem Studies Unit (GPCEU) was established in 2000 as one of twelve units designated to enhance cooperative research between federal agencies and universities. SNR hosts the GPCEU. Partners include the University of North Dakota, the University of Oklahoma, the University of Minnesota, the University of South Dakota, the University of Wyoming, Colorado State University, Texas A&M University, and South Dakota State University. Langston University and Little Priest Tribal College are cooperating minority institutions. This consortium covers a broad portion of the Great Plains and offers an outstanding group of scientists in grassland ecosystem study and natural and cultural resource management for collaborative research and educational opportunities. Eight areas of strategic concern are foci for research: biological invasion and their impact on ecosystem integrity; habitat fragmentation; health of wetlands, lakes, streams, and rivers; preservation and/or restoration of native aquatic and terrestrial communities; social and cultural values of natural areas under changing population and land use; timely transfer and access of information for resource management and policy; implications of global environmental change on managed and unmanaged ecosystems; and implications of land use change on ecosystem integrity. In 2001, the first full year of operation for the GPCEU, eleven research projects totaling about \$200,000 were funded. Most funding originated with the National Park Service. In 2002, the GPCEU funded 23 new projects for about \$800,000, most funds provided by the National Park Service and the Bureau of Land Management.

Appendix 5.3. Specialized Research Facilities and Equipment

Water Sciences Laboratory: The UNL Water Sciences Laboratory (WSL) is one of a very few facilities to have the equipment and faculty and staff with expertise in both trace organics and stable isotope analysis. The laboratory recently acquired a triple quadrupole mass spectrometer and two new isotope ratio mass spectrometers. The new Quattro Micro triple quadrupole mass spectrometer is a state-of-the-art instrument for quantitative analysis and structural identification of organic compounds. New AP2003 and AP2005 isotope ratio mass spectrometers are both equipped with automated preparation systems that allow for rapid and highly precise analysis of stable isotopes of carbon, oxygen and hydrogen. The Quattro Micro system, complete with a high performance liquid chromatograph, is capable of rapid, sensitive and highly selective analysis of organic compounds using a process called liquid chromatography tandem mass spectrometry (LC/MS/MS). The AP2003 is a computer-controlled system for automated preparation and analysis of water and gas samples for carbon-13 and oxygen-18 analysis. The AP2005 is designed for automated sample preparation and analysis of deuterium (HD) in water samples. For additional details, see <http://www.ianr.unl.edu/waterscience/wsl.html>.

Groundwater Chemistry Laboratory: The Groundwater Chemistry Laboratory serves as a research and teaching facility for scientists and students with an interest in hydrogeochemistry. The laboratory is also part of the University of Nebraska Water Center's Core Facilities Program, and thus, provides analytical services at reduced cost to researchers, agencies and other local clientele to assist in evaluating groundwater and surface water quality across the Great Plains region. The lab is equipped with state of the art analytical instruments including a Varian[®] atomic absorption spectrometer equipped with a graphite furnace and vapor generation unit, a Dionex[®] ion chromatograph, and a Cary[®] UV-visible spectrometer for analyzing anions, cations, trace metals and redox couples in water samples. The lab has also established collaborative relationships with the Environmental Isotope Laboratory, University of Waterloo (Canada), Tritium Analytics at Purdue University, and several other national and international laboratories to provide researchers with a full spectrum of geochemical tools including stable, radiogenic and radioactive isotopes, CFCs, and Nobel gases. For additional information visit <http://csd.unl.edu/csd/staff/harvey/lab.html>.

Soil Geomorphology Laboratory: Specialized equipment to support soils research includes a Rigaku Mimi-Flex X-Ray Diffractometer with Jade interpretive software for the mineralogical analysis of soils and sediments and a Bartington field and laboratory magnetic susceptibility meter used for studying climate influences on soil properties, delineating hydric soils, and distinguishing geological sediments. A Giddings soil probe mounted on an extended cab pick-up truck is used for collection of near-surface soils and sediments.

Soil Remediation Research Laboratories: Two laboratories support research in soil remediation. Equipment includes two anaerobic chambers for strict oxygen control, Eh/pH stat system for redox and pH control, column transport and bioreactor systems, gas chromatographs with mass spectrometer, nitrogen-phosphorous thermionic and electron capture detectors, an ion chromatograph, high performance liquid chromatographs with radioisotope, standard UV and photodiode array detectors, a Microtox/Mutatox analyzer for environmental/mammalian toxicity assays, an accelerated solvent extractor,

scintillation counter, sample oxidizer, and Fourier transform infrared and ultraviolet/visible spectrophotometers, in addition to standard supporting laboratory equipment and materials.

Geophysical and Geological Research: Geological and geophysical research is supported by specialized facilities that include a combination auger/rotary rig that can produce continuous core or drill cuttings for geologic research and drill observation wells, a 12-channel Bison engineering seismogram and a 24-channel EG&G Geometrics Model 2401 seismograph, an extensive collection of geophones for seismic reflection and seismic refraction surveys; a total field and gradient Sintrex magnetometer for conducting magnetic surveys; an Abem Terrameter Resistivity unit for carrying out areal, 2D and 3D resistivity surveys; three borehole logging systems--one by Mineral Logging Systems and two by Century-21, for logging holes up to 1500 feet deep (tools available are caliper, natural gamma, single-point resistance, 16-inch and 64-inch normal resistivity, lateral resistivity, fluid temperature and resistivity, spontaneous potential); and a Geonics Model 34 Electromagnetic meter capability of conducting EM surveys or profiles using various transmitter-receiver coil spacings. In addition, CSD has two Geoprobe systems to obtain discrete soil samples and a conductivity sensor probe to map subsurface lithology.

Aquatic Ecology and Limnology Laboratory: The Aquatic Ecology and Limnology Laboratory serves as a research, teaching, and extension facility for faculty and students with an interest in surface water quality and aquatic ecology. The laboratory maintains a comprehensive and state of the art collection of surface water field sampling equipment and analytical instruments including:

- four Hydrolab Series 4a MiniSonde[®] Multiprobe units for instantaneous or continuous collection of dissolved oxygen, temperature, conductivity, pH, salinity, total dissolved salts, total dissolved gas, and depth measurements with internal data-logging capabilities
- three Isco Full-Size Portable Stormwater Samplers[®] for sequential or composite collection of stormwater samples based on time, flow rate, or storm conditions
- a Cary[®] UV-visible spectrophotometer with a random-access fiberoptic autosampler for analyzing nutrients in water samples
- three Turner Designs 10-AU Field/Laboratory Fluorometers[®] for continuous-flow (internal data logger) or discrete analysis of chlorophyll *a*, phycocyanin, and tracer dyes (e.g., Rhodamine WT) in water samples and the growth rates of cultured algae in response to pesticide and nutrient treatments
- a Turner Designs Self-Contained Underwater Fluorescence Apparatus (SCUFA)[®] for *in-situ* chlorophyll *a* and dye-tracing monitoring with internal data-logging capabilities

The lab has also established collaborative relationships with the Center for Advanced Land Management Information Technologies (UNL), Department of Geosciences (UNL), Department of Civil Engineering (UNL & UNO), School of Biological Sciences (UNL), Nebraska Department of Environmental Quality, and Nebraska Game and Parks Commission in support of remote-sensing, watershed classification, paleolimnological, water movement and oxygen modeling, and decision support modeling research and surface water quality monitoring.

Aquatic Mesocosm Laboratory: The Aquatic Mesocosm Laboratory is an indoor 418 m² (4500 ft²) temperature and light controlled experimental laboratory where temperature can be regulated down to 10°C and the light environment emulates the spectral quality of daylight in the photosynthetically active range. The facility houses 32 artificial recirculating streams (114 L) and 24 fiberglass tanks (1000 L) that serves research and teaching faculty and students with an interest in experimental aquatic ecology,

emphasizing whole-community responses in stream and lake systems. The lab is also equipped with a 3800 L trailer-mounted tank and a 3800 L holding tank for the transport and storage of stream and lake water for use in the mesocosms.

Agrometeorology Field Laboratory: Agrometeorological and micrometeorological research is supported by a field station located at the University of Nebraska Agricultural Research and Development Center near Ithaca, 30 miles northeast of Lincoln. A full range of meteorological sensors are available for measurement of radiation and energy balance components, as well as profiles of temperature, humidity and wind speed above and within plant canopies. Sensors are available for eddy covariance measurement of fluxes of momentum, sensible heat, water vapor, and CO₂. Radiometers to measure incident and reflected radiation in broad-band and continuous visible and near-IR spectrum are available as are instruments to measure leaf spectral reflectance and transmittance. Remote sensing field reference panels are calibrated under ambient conditions at the laboratory using a specially designed goniometer. Most of the micrometeorological and remote sensing instrumentations are portable and are often used at remote sites. In addition, the laboratory grounds serve as the permanent "home" for three fully equipped monitoring stations: (1) High Plains Regional Climate Center Automated Weather Data Network (AWDN); (2) National Atmospheric Deposition Program (NADP); and (3) USDA UV-B Monitoring Program.

Automated Weather Data Network: The High Plains Regional Climate Center, coordinating with surrounding states, has formed a network of 169 stations that collect hourly data on temperature, humidity, solar radiation, wind speed and direction, precipitation, soil temperature and soil moisture (<http://hprcc.unl.edu/awdn/>). These stations provide a unique resource for researchers who require environmental data for the Great Plains. Real-time maps (<http://www.hprcc.unl.edu/products/awdn.html>) and graphs (<http://www.hprcc.unl.edu/soilm/home.html>) are available through the web.

Remote Sensing: The Center for Advanced Land Management Information Technologies (CALMIT) operates specialized facilities for carrying out research in remote sensing. A receiving station allows reception of real-time satellite imagery from the NOAA meteorological satellites. An indoor "SpecLab" designed for collection of spectral data under controlled, experimental conditions, houses a Shimadzu UV-2501PC (UV-VIS) recording spectrophotometer and a LI-COR 3100 area meter. CALMIT, in cooperation with the UNL Department of Electrical Engineering and the UNO Aviation Institute, operates a Piper Saratoga aircraft equipped with a Kodak 420 Digital CIR Camera and an AISA Hyperspectral Imager. The AISA is programmable to 288 spectral channels. The CALMIT Field Research Facility (CFRF), located at the University of Nebraska Agricultural Research and Development Center near Mead, NE includes constructed ponds and wetlands, crop and grassland areas designed for outdoor experiments. Spectroradiometers available include a Spectron SE-590 (252 discrete channels from 368 to 1114 nm), an Ocean Optics PSD1000-C spectrometer (1100 discrete channels from 300 to 900 nm), and four Ocean Optics USD-2000 systems and a UniSpec radiometer (capable of collecting data in 256 channels ranging from 300 to 1100 nm). Two all-terrain instrument platforms provide high-clearance for making measurements such as spectral reflectance in field

settings, and a 24-foot pontoon boat has been specially modified for collection of spectral data above, at, and beneath the surface on lakes and reservoirs. In addition to equipment for monitoring radiation fluxes, the boat carries a GPS receiver, onboard computing, and portable water-quality and analysis. For additional details see <http://calmit.unl.edu/facilities.htm>.

Fisheries and Wildlife Research: Research on fisheries and wildlife populations is supported by a variety of field equipment and laboratory facilities including two 4WD All-Terrain Vehicles, several radio telemetry receivers and antennas (hand-held, boat- and vehicle-based systems), several Global Positioning Systems (DGPS and WAAS-compatible receivers), and a variety of fish nets, avian mist nets, and mammal traps. Five boats are available for fisheries research, including one specifically designed for electroshocking. Landscape population analyses and simulation modeling, are conducted in a Landscape Analysis computer lab with GIS-dedicated computers (MIPS and ESRI software). Two wet labs are available for sample processing.

Field Facilities: The University of Nebraska operates more than two dozen research ranches, farms and facilities comprising tens of thousands acres arrayed across the environmental gradients of the state (<http://ard.unl.edu/facilities.html>). All are available to SNR research investigators; however, SNR scientists use a number of sites intensively (see <http://snrs.unl.edu/wedin/nefieldsites/>). The School administers the 145-acre Prairie Pines facility near Lincoln (http://snrs.unl.edu/wedin/nefieldsites/Prairie%20Pines/prairie_pines.htm) and has extensive research sites at the 9000-acre UNL Agricultural Research and Development Center (ARDC) located near Mead, NE (about 35 miles north of Lincoln). At ARDC, SNR sites are dedicated to research in agroforestry, meteorology and climatology, remote sensing and carbon sequestration. SNRS researchers also make much use of the Gudmundsen Sandhills Laboratory and Barta Brothers Ranch. Other first-class field facilities employed by School researchers include the 90,000-acre Nebraska National Forest site (near Halsey, NE), a unique planted pine forest-grassland ecosystem operated by the U.S. Forest Service, and the Konza Prairie Long Term Ecological Research (LTER) area (near Manhattan, KS, <http://www.konza.ksu.edu/>).

CHAPTER 6 - EXTENSION AND OUTREACH PROGRAMS

Executive Summary

As part of the Land Grant mission of the University of Nebraska, the School provides timely and trustworthy research-based information and education for Nebraskans, both urban and rural, who can use it to enhance their lives, families, or communities. Through extension and outreach, the School also boosts student recruitment and retention, increases visibility, and maintains a positive image among stakeholders. An Extension/Outreach Coordinator works in concert with the Director, the Outreach Committee, and others to facilitate extension and outreach functions, including development of the School's quarterly newsletter, brochure, stakeholder list, and webpage. The School has 5.01 extension faculty FTE, which remain after the loss (as of July 25) of 1.5 extension forestry FTE during 2003 and the loss of 4.4 extension FTE total since 2001. Most extension and outreach faculty have joint appointments in research, teaching, scholarly service, or survey and, typically, have offices located together with others in their respective disciplines. Extension faculty and staff within the school participate in the Cooperative Extension Division's action teams, which are based on clientele inputs and are in alignment with state and federal extension goals. Over 90% of extension and outreach programs are interdisciplinary with others in extension or the University; about two-thirds involve outside agencies, organizations, or businesses; and $\geq 25\%$ involve collaborations with other states. Major focus areas include *Wildlife Conservation and Education; Wildlife Damage Management; Forestry, Agroforestry, and Market-Driven Conservation; Lake Water Quality Extension Program; Climate Information for Decision Makers and Resource Planners; and Nebraska Earth Systems Education Network (NESEN)*. State appropriated extension operating support has averaged about \$30,000/year and extension/outreach grant and contract income over \$750,000/year. Field facilities used in support of outreach programs include Prairie Pines, 145-acres of woodlands and grasslands near the northeast edge of Lincoln, and a 400-acre windbreak/agroforestry area at the Agricultural Research and Development Center near Mead. The Horning (eastern Nebraska) and Cedar Canyon (south central Nebraska) State Demonstration Forests and other affiliate or university sites are also used in educational programs and offer additional opportunities.

In considering how to position our unit for the future, we have identified six issue areas in natural resources that we believe important for us to address over the next five years. These are *sustainable development; sustainable land management; human health, wellness, and safety; environmental literacy; ecosystem health and biodiversity; and natural resource enterprises*. To address these issues effectively will require additional discussion and an integrated approach with multiple disciplines and participants, a task that SNR is well suited to lead or facilitate. SNR currently contributes to many aspects of these issues and, with our additional strengths from the merger, we see potential for synergy from the breadth and focus that SNR can provide.

Areas in need of immediate and ongoing attention are the challenges of completing our merger effectively and of dealing with the impacts of recent budget cuts. Over the next five years, we will integrate the strengths and resources from the merged units to enhance publication/resource access, strengthen the SNR newsletter, and build more effective outreach. We will work to minimize the impacts of cuts made to the Nebraska Forest Service, a close affiliate of the School. Of special concern is our ability to continue several extension forestry educational programs and to deal with the huge volume of inquires about tree management. We will work with partners and others to develop Prairie Pines and the Horning State Demonstration Forest for educational outreach. We see need to strengthen our extension faculty FTE in natural resources education, aquatic systems, and in other areas to be discussed following the merger. We will build closer affiliations with extension educators and will encourage hiring educators with backgrounds in ecological systems and natural resources, an increasing need in dealing with complex natural resource systems. We propose to establish at least one extension assistantship to increase graduate-level extension education and to provide other associated outreach benefits. Finally, our merger

brings opportunities from strong programs, faculty, and staff from three units. A strength is our history and spirit of working together toward common goals. As with any merger, however, we need to build relationships among faculty and staff from the merged units and to develop unique skills and teamwork. As part of this effort, we will meet at least two times per year to discuss broad issues and to enhance linkages and synergy.

CHAPTER 6 - EXTENSION AND OUTREACH PROGRAMS

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CHAPTER 6 - EXTENSION AND OUTREACH PROGRAMS

6.1 Introduction

As part of the Land Grant mission of the University of Nebraska, the School provides research-based information and education for Nebraskans, both urban and rural, who can use it to enhance their lives, families, or communities. This educational outreach is provided to some extent by all faculty and staff in the School but primarily through Cooperative Extension, the Nebraska Earth Systems Education Network (NESEN), Centers within the School, and faculty and staff with scholarly service appointments. The scholarly service area is supported by the Agricultural Research Division and represents essential services that require creativity and leadership outside the traditional research, teaching, and extension appointments. Our extension and outreach efforts are strengthened by faculty who hold courtesy appointments in the School, several of whom carry extension appointments in their home departments. The School uses an integrated and interdisciplinary approach that is well suited to engage the university's strengths with partners and stakeholders in natural resource educational programs.

Another aspect of the School's outreach function is to help boost student recruitment and retention and to enhance the visibility and image of the School among stakeholders. Methods used in this goal include our quarterly *Natural Resource Links* newsletter, the School brochure, and our Internet web page (<http://snr.unl.edu>), which was completely revised in 2003.

The term *outreach* broadly defines our linkages with clientele and other stakeholders as noted above. Cooperative *Extension* is outreach supported through the Cooperative Extension Division and focused on educational programming. *Survey* (Chapter 7) includes outreach encompassing extensive data from monitoring and inventory of Nebraska's natural resources. An overall University goal is to move outreach toward *engagement* that involves greater two-way interaction with stakeholders. Engagement is evident in our partnerships and in many multi-entity programs, and is an increasing focus of our outreach efforts.

Extension faculty within the School have joint appointments in teaching, research, and/or service, and have offices located in the same areas with other teaching, research, and service personnel throughout the School. Joint appointments and office proximity are viewed as strengths because they enhance communication and teamwork and increase the visibility and understanding of extension activities among non-extension faculty.

The Cooperative Extension Division (CED) of IANR serves Nebraskans through four extension districts located across the state. Within these districts, there are 21 multi-county Extension Programming Units (EPUs) that serve residents in all 93 counties. The Extension system in Nebraska continues to evolve to better meet changing needs. Recent efforts are moving toward decreased emphasis on EPU boundaries and increased disciplinary focus for extension educators. Under this approach, educators will be more specialized and will serve multiple counties with more in-depth educational information and programs. Although Educators may serve multi-county areas, 4-H Youth programming will have representation in most counties because surveys indicate the need for youth programming to be nearer the homes of those served.

6.1.1 Extension & Outreach Vision and Goals

The School's vision, mission, and core values, presented on page 2-8 of this document, incorporate extension/outreach as part of the overall whole. We view teaching, research, extension/outreach, survey, and service as separate but integrated components contributing to the overall function of the School. The

School's vision and mission refer to extension and outreach in specific sections and also include these functions as integrated components throughout the School.

The School addresses an enormous breadth of topics in natural resources of importance to Nebraska and beyond. Most of these topics link to cross-cutting themes that span disciplines throughout the School. Four such cross-cutting themes for the School are:

- Sustaining a strong and viable natural resource base, which is critical to maintaining the long-term viability and productivity of Nebraska's agriculture, communities, and the quality of life for its people
- Meeting the economic, social, and environmental needs of people and communities
- Anticipating change and helping people understand and adapt to it
- Linking applied information in natural resource sciences with the various stakeholders and others in the public sector who can apply it

An annual Extension/Outreach plan of issues and proposed actions (Appendix 6.1), initiated in 2002, is a one-year plan that includes goals, objectives, and specific actions that faculty and staff are taking to increase overall effectiveness. Extension/outreach, research, and teaching plans are each developed by the respective coordinators, with input from faculty and staff, and reviewed at the School's Spring Assembly in May. This annual planning process appears to be helping us move holistically as a School toward common overall goals that lead into our longer-term, five-year goals.

6.1.2 Extension & Outreach Administration and FTE

Extension/Outreach Coordinator – An extension/outreach coordinator (0.25 FTE, non-administrative appointment) within the School works with the Director, Associate Director, and the teaching and research coordinators to facilitate School administrative functions and to coordinate and enhance extension/outreach functions. An important role is to serve as an *ex officio* member of the Outreach Committee and to interface with the committee and with faculty, particularly those with extension or outreach assignments. Coordinators have met as a group with the Director, Associate Director, and Administration Team Manager approximately every three weeks and individually with the Director between the group meetings. Coordinators occasionally met by invitation with the School's Advisory Committee to provide input and discuss specific issues. School Coordinators served key roles in maintaining School administrative functions, communications, and progress during changes in leadership resulting from the cancer illness and loss of our former Director.

Ron Johnson has served as Extension/Outreach Coordinator since the coordinator positions were initiated in July 2000. Focus areas during these three years included development of extension/outreach plans for the School, which had broad input from faculty and staff; ongoing integration of extension/outreach information and perspectives into School plans and reports; coordinating plans and issues related to development of Prairie Pines (145-acre outdoor education facility); facilitating development of the *Natural Resource Links* newsletter, the School brochure, and initial web page development; and participation in a variety of extension/outreach and other administrative functions in concert with the Director.

Extension & Outreach FTE – Extension appointments within the School total 5.01 FTE (6.51 less 1.50 identified in the budget cut for Nebraska Forest Service) distributed among 15 faculty (Appendix 2.1). Three faculty have primarily Extension appointments, totaling 2.14 FTE, and, of these, two are joint appointments with research (wildlife, forestry areas) and one with teaching (wildlife). Six foresters within the Nebraska Forest Service had 0.25 FTE appointments in Extension within the School, combining their Forest Service activities with Extension educational programming, but these six

positions, including the School's 1.50 FTE in Extension forestry, were cut (as of July 25) in the 2003 budget reductions (Table 6.1). Other Extension or outreach faculty address meteorology/climatology topics (1.20 FTE), water (0.82 FTE), soil science (0.25), and other (0.60). As the merger with the Conservation and Survey Division proceeds, survey faculty will add to the School's outreach capabilities and, as they merge their positions into IANR, some are expected to transfer a portion of their appointments into Extension FTE.

Table 6.1 Extension Faculty Positions Lost to Recent Budget Cuts

| Program | Extension/Outreach FTE | Year cut |
|--|------------------------|----------|
| <i>Positions that became open and then were eliminated</i> | | |
| Environmental Education Specialist (non-tenure leading) | 1.00 | 2001 |
| Agricultural Climatology (non-tenure leading) | 0.50 | 2001 |
| Extension Aquaculture Specialist | 0.75 | 2002 |
| Water Center/ Environmental programs | 0.65 | 2002 |
| <i>Recent cuts</i> | | |
| Forestry Extension, 6 positions | 1.50 | 2003 |

The School has 11.17 FTE in Managerial/Professional or Office/Service positions related to extension or outreach (Appendix 2.2). Of these, 1.05 FTE are supported by state appropriations and the remaining 10.72 are supported by grants or contracts.

SNR Outreach Committee – The Outreach Committee is an official standing committee of SNR. Composed of at least four faculty and two staff representatives, the Committee encourages and promotes outreach functions within the School, including communications and program marketing strategies. It serves in an advisory role to the Director on determining outreach priorities, and provides oversight for the management of the School's newsletter *Natural Resource Links* and the School's website. It interacts with other SNR committees as necessary to facilitate the School's overall goals in recruitment, fund raising, visibility, and linkages with stakeholders.

6.1.3 Alignment with State and Federal Goals and Objectives

Alignment within Nebraska – Extension programs are developed and conducted in concert with the Cooperative Extension Division's 11 issue-based *Action Plans* (Table 6.2), each of which involves an interdisciplinary Action Team of extension specialists, educators, and others. The School contributes to all of these plans in various ways, but our primary focus is with the *Natural Resources and Environmental Management (NREM)* action plan and, to a lesser degree, the *Integrated Crop Management, Community and Residential Environment, Integrated Animal Systems Management, and Youth and Family Responsibility* plans. Faculty and staff may focus with one action team but typically contribute to two or three different teams. Two School faculty currently serve as *NREM* Action Team leaders, one as co-chair.

Action teams and plans will continue to evolve to meet changing needs. In 2003, extension educators began to shift toward greater disciplinary focus to better address in-depth educational needs and to do so more effectively beyond traditional county boundaries. In concert with this, the CED is shifting toward six *Focus Areas* and associated *Program Emphases* (Table 6.2). Extension administration and action team leaders currently are evaluating team structure in relation to the Focus Areas, and team organization may change or adjust accordingly.

Action team chairs normally meet each year to coordinate among teams, and action teams then meet at an extension-wide fall retreat to review progress and to plan objectives for the following year. Meetings

between department/unit leaders and team chairs have enhanced communication and coordination between action teams and departmental TRE functions. Often two or more teams work together to address issues. For example, the *NREM* and *Integrated Crop Management* teams work together on soil, water, riparian buffers, pesticides and other agricultural/natural resource issues. *NREM* works with the *Community and Residential Management* team on wildlife in backyards, acreages, or communities. *NREM*'s environment education programs usually include the *Youth and Family Responsibility* team and occasionally the *Health and Wellness Education* team (e.g., walk for health & bird observation as a family activity).

The Action Team structure facilitates coordination and alignment of objectives, and integrated programs. One success, conceived and initiated by the School, was in interdisciplinary Issues Forum that addressed *environmental and health issues in agriculture*. The forum was jointly developed by three Extension Action Teams and three NU departments. Research, teaching, and extension faculty, staff, and students participated. Various perspectives on issues were presented and discussed; a poster session and published abstracts attracted researchers and facilitated interdisciplinary communication; and student research-travel awards for the best posters were presented. Results were positive (Appendix 6.5, Title 6.5-28). A similar forum on *Global Issues in Natural Resources and Agriculture* is currently being planned.

Alignment with Federal Goals – Action Teams develop an annual report that addresses national CSREES goals and objectives, which are outlined in the Nebraska Cooperative Extension *Plan of Work*, Federal Fiscal Years 2000 to 2004 (Table 6.3). The *NREM* team contributes in various ways to all of these goals, but primarily to Goals 1 and 4 and associated objectives that relate to sustainability and environmental protection.

Table 6.2 University of Nebraska Cooperative Extension Action Plans and recently-developed (2003) Focus Areas, and Program Emphases

| Action Plans | Focus Areas | Program Emphasis |
|--|--|--|
| Building Strong Families | Building Strong Families | Family communication (parenting/relationships/communic.) Family financial management Nurturing children |
| Health Care in Transition Enhancing Food Safety in the Food Chain Preventive Health and Wellness Education | Nutrition, Health, and Food Safety | Nutrition – incl. federally-funded Nutrition Education Prog. Food safety Wellness |
| Youth and Family Responsibility | 4-H and Youth Development | Youth/adult partnerships Out-of-school and summer programs Intergenerational education Life skills Science and technology Volunteer development/management |
| Leadership Development Leadership and Public Issues Education | Community Resource Development | Entrepreneurship and business development Information technology Community development Leadership development |
| Community and Residential Environment | Community and Residential Environment | Community integrated pest management Horticulture Water and waste Healthy homes |
| Integrated Animal Systems Management Integrated Crop Management Natural Resources and Environmental Management | Food Production and Natural Resource Systems | Confined animal feeding operations/manure management Beef production systems (pasture and range) Dryland cropping systems (east and west) Irrigated cropping systems Small farms and acreages Natural resources management Water quality and quantity Business and risk management Alternative ag/natural resource enterprises |

Table 6.3 Nebraska Cooperative Extension goals from the *Plan of Work* (Fiscal Years 2000 to 2004)

-
- Goal 1: To achieve an agricultural production system that is highly competitive in the global economy.*
Goal 2. A safe, secure food and fiber system
Goal 3. A healthy, well-nourished population
Goal 4. To achieve greater harmony (balance) between agriculture and the environment. (Goal 4 includes sub-goals on water quantity and quality, soil conservation, biodiversity and biological resources, and stewardship through environmental education.)
Goal 5. To enhance economic opportunities and the quality of life among families and communities.
-

Alignment through Extension/Outreach-based Associations and Conferences – Personnel with extension and/or service appointments in the School have regularly participated and frequently provided leadership in a variety of Extension/Outreach-based associations and conferences, including: *Nebraska Cooperative Extension Association* (NCEA), *Epsilon Sigma Phi* (ESP), *Association of Natural Resources Extension Professionals* (ANREP), and the triennial *Extension Wildlife and Fisheries Specialists Conference*.

6.2. Extension Linkages

Natural resource issues are multifaceted and require integrated, interdisciplinary education and information for effective decisions. The School is committed to working effectively with others to address natural resource issues and to provide education and information that helps stakeholders make informed decisions about issues they face. Essentially all (>90%) of our extension & outreach programming involves interdisciplinary links with others within the School, extension educators, and other NU departments/units, especially departments with faculty holding courtesy appointments in SNR. About two-thirds involve outside agencies, organizations, or businesses (Appendix 6.2), and many (>25%) involve collaborations with other states.

Within the School, extension & outreach activities are integrated with those of research, teaching, service, and survey.

- Extension/outreach faculty and staff deliver educational, research-based programs, hold joint appointments, interact with research faculty, and participate regularly in student recruitment functions led primarily by teaching faculty.
- School faculty have worked closely with the Nebraska Forest Service to provide outreach programs (e.g., Forestry Short Course, Tree Care Workshops, Arborist Certification Seminars) that could not be effectively delivered without the cooperative integration.
- Our recent merger with the Conservation and Survey Division will provide additional opportunities to link survey materials and services to extension audiences, and extension materials may receive wider use through expanded contacts with survey clientele.

Our integrated approach and split appointments facilitate connections between research and extension/outreach functions. Many grants and research projects (e.g., USDA) specifically include extension/outreach components as an integral outcome of the research. Information developed through research in the School and elsewhere is delivered to Nebraskans who can put the knowledge to work. Examples include riparian buffer strips to protect water quality, tree varieties to meet functional needs (wind protection, shade, growth in specific sites), climate modeling and prediction, drought forecasting in relation to agriculture and other land use needs, bird response to specific agricultural practices, deer response to suburban and rural landscape management, methods to prevent or manage wildlife conflict

issues, and many others. Many of these projects involve landowners who cooperate with the project and provide inputs on project activities. Other examples of these integrated efforts are included in the following sections.

6.3. Major Programming Areas

Major programming areas shift somewhat each year to adjust to trends and needs. For example, West Nile Virus became a focus in 2002. They address issue-based needs and integrate topics listed within the School's overall Program Areas (brochure circle diagrams, Appendix 6.4). The following examples are curriculum-based programs with examples of recent impacts. Curriculum-based programs (CED administration definition) include educational activities that are focused, in-depth programs, singular or multi-part in nature, and are designed to achieve measurable, desired outcomes.

Each programming area lists primary personnel contributing to the program and, where applicable, extension/outreach FTE. Many of the contributors listed do not have extension/outreach appointments, so no FTE is indicated. Although primary personnel are listed, many others that are not listed also contribute in substantial and meaningful ways to these programs

6.3.1 Wildlife Conservation and Education

Description – This program addresses primarily wildlife conservation and related issues and, within the School, meshes closely with programming in wildlife damage management and forestry to provide more holistic and integrated information to address clientele needs.

Primary Personnel (Extension FTE within the School is indicated)

Ron Johnson, Extension Wildlife Specialist (0.69 FTE)

Renaie Held, Coordinator, Tern and Plover Conservation Partnership (1 FTE)

Christine Thody, Outreach Coordinator, Tern and Plover Conservation Partnership (0.5 FTE)

Jeanine Lackey, Coordinator, Bird Conservation and Education Program (1 FTE)

Christine Meyer, Information & Education Specialist (0.3 FTE in wildlife extension)

Dennis Ferraro, Extension Educator

John Dinan, Nebraska Game and Parks Commission

Mace Hack, Nebraska Game and Parks Commission

Focus – Goal: Enhance the knowledge base and quality of life for adults and youth through research and educational programs related to wildlife, people, and sustainable natural resource systems. **Audiences:** Urban and rural homeowners, acreage owners, agricultural stakeholders (farms, ranches), business or industry, natural resource professionals, communities, youth, adults, general public. **Resources:** Contracts with partners (e.g., Nebraska Game and Parks Commission) and various grants support the Tern and Plover Conservation Partnership and the Bird Conservation and Education Partnership (about \$100,000/year). Program sponsors support the Wildlife Habitat Evaluation Program, Extension Wildlife Awards Program, and the annual picnic for tern and plover program volunteers (total about \$2,500/year).

Accomplishments and Impacts

Wildlife Habitat Evaluation Program (WHEP) – a year-round educational experience that involves youth from ages 8–18, adult volunteer leaders, and biologists. Region-specific manuals for leaders and participants were developed jointly with Kansas. An annual state contest and outdoor event is held each year, and the top state team (3 -4 youth, 2 coaches) participates in the national WHEP Invitational, an outstanding educational and confidence-building event, funded by donors. **Impacts:** Participants consistently report preparation time over several weeks and learning about wildlife and conservation, teamwork, decision making, public speaking, and how to apply management to land where they live.

(Appendix 6.5, Report 6.5-16). *Partners* include the Nebraska Game and Parks Commission; Natural Resources Conservation Service; US Bureau of Reclamation/Nebraska-Kansas Area Office; Nebraska Pheasants Forever Chapters; Izaak Walton League of America Endowment; Nebraska Division, Izaak Walton League of America; and Nebraska Chapter, The Wildlife Society. Sponsors provide funding for travel to the national event, awards, and unique T-shirts for all participants.

4-H Conservation and Wildlife, Nebraska State Fair – The 4-H conservation and wildlife projects are supported by five project manuals and by volunteer adult leaders across Nebraska. Volunteer biologists help judge projects and provide educational feedback to about 250 exhibitors that are admitted to the State Fair each year (e.g., 85 hours, 2002). *Impact*: Over 2,600 Nebraska youth (2636 in 2002) and their families are engaged in hands-on learning and life skills development.

Tern and Plover Conservation Partnership – Endangered least terns and threatened piping plovers are vulnerable to predation and conflicts with mining operations when they nest on gravel mine spoil piles. This Partnership was established in 1999 to protect river birds in a way that reduces conflicts with private industry and that educates and involves local communities. *Impacts*: The partnership has (1999-2002):

- helped avoid or mitigate ≥ 24 conflicts between threatened/endangered birds and industry, potentially saving $\geq \$1,000,000$.
- developed a new technique to shift nesting from sites that cause conflict to nearby sites not currently in use, resulting in safer nesting, reduced conflicts, and an estimated \$300,000/year in savings for the industry.
- monitored reproductive success of nesting colonies and erected fencing to exclude predators.
- established an “Adopt-a-Colony” program to engage volunteers in helping with project activities and to involve local communities in endangered species management and protection issues. Volunteers (~40-75/year) report increased biological knowledge, greater interest in river decision-making, increased understanding and appreciation for the gravel mining industry, and efforts to tell others about their experiences (Appendix 6.5, Report 6.5-18).

Current Partners: Cooperative Extension, Nebraska Game and Parks Commission, Lyman- Richey Corporation, Overland Sand and Gravel Company, Western Sand and Gravel, Mallard Sand and Gravel, Arps Gravel and Concrete, Girl Scouts - Great Plains Council, US Fish and Wildlife Service, and the Nebraska Environmental Trust.

Bird Conservation and Education Partnership – This partnership with the Nebraska Game and Parks Commission was established (2001) to increase awareness of and foster support for the birds of Nebraska. Components include coordination and development of International Migratory Bird (IMBD) celebrations, an interactive *Birds of Nebraska* website (<http://www.ngpc.state.ne.us/wildlife/birds/>), bird education workshops, and development of supporting materials (e.g., *Birds to Walk By* brochure & bookmark questionnaire). *Impacts* (2002): Workshops led to 35 teachers/educators organizing educational IMBD events, with 2,657 participants (included youth and adult; rural and Native American schools). Organizers (100%) reported that their objectives were met and that participants learned about birds, habitats, and local importance (e.g., tourism/economic impacts) (Appendix 6.5, Title 6.5-17). Other Extension action teams (*Health and Wellness* and *Youth and Families*) joined in 2002 to help sponsor *Walk for the Birds* events as a family and youth activity that enhances health and wellness.

Integration of Biological Resources into Land Management (2002 examples)

- West Nile Virus (WNV): School faculty participated in an inter-agency group to plan a state response, provided leadership to initiate an IANR team, helped develop educational materials, provided response to extension/client inquiries & coordinated with other agency personnel.
- In partnership with Nebraska Wildlife Federation (2 years), extension wildlife information was included in Wildlife Week packets sent to every 4th, 5th, and 6th grade teacher in Nebraska public & private schools (4,000), every designated science/natural resource teacher in middle & high schools (1,000), and others (1,000).
- Program information is included regularly in presentations, news media (some national), and events.

Impacts: Estimated minimum savings for clientele of >\$5,300/year resulting from the rapid, coordinated, and relevant research-based information provided. Example (2002): Hispanic child bitten by snake but language difficulty and treatment uncertainty; county extension office linked nurse by phone with SNR; snake identified & problem solved.

HerpsNeb – HerpsNeb is a web site designed for quick and easy identification of Nebraska’s reptiles and amphibians and to provide related educational information (<http://snrs.unl.edu/herpneb/>, summer 2003). The site includes photos, life history information, range maps, protected status, and educational games.

Supporting materials include NebGuides (10), Extension Circulars (12), NebFacts (1), brochures (2), bird-walk guide (1), poster (1), Book chapters (4), newsletters (1), and web sites (3) (Appendix 6.3).

Interdisciplinary Teams – University Extension Action Teams (3), Wildlife Habitat Evaluation Program Team, CRP to Crops Team, Community Integrated Pest Management Team, West Nile Virus Extension & inter-agency Teams.

6.3.2 Wildlife Damage Management

Description – Wildlife damage in the United States costs well over \$25 billion annually and human-wildlife conflicts are pervasive in society. We have developed a diverse program to provide research-based and timely information to reduce the negative impacts of wildlife associated with 1) damage to food, fiber, personal property, and natural resources; 2) threats to human health and safety; and 3) nuisance problems. Our focus areas include production agriculture, natural resources and recreational environments, and residential and public areas.

Primary Personnel (Extension FTE within the School is indicated)

Scott Hygnstrom, Extension Wildlife Damage Specialist (0.70 FTE)

Dallas Virchow, Program Coordinator-Distance Education (1.0 FTE)

Dennis Ferraro, Extension Educator

Focus – Goals: to 1) increase the economic benefits related to the adoption of practices that reduce wildlife damage, 2) reduce potential human health risks and 3) reduce adverse environmental effects from wildlife. These goals are in line with the National Integrated Pest Management (IPM) Program Goals. **Audiences:** natural resource, pest management, and extension professionals; agricultural producers, landowners, homeowners, commercial managers, youth, and the general public. **Resources:** USDA-CSREES-IPM allocated funds – \$60,000 to \$96,000 per year for the UNL-IPM-Vertebrates Program. External grant funds – \$50,000 to \$90,000 per year from a variety of sources (USDA-Wildlife Services, USDA-IPM Regional Programs, US Fish and Wildlife Service, US Forest Service,

Bureau of Land Management, Nebraska Game and Parks Commission, Nebraska Department of Agriculture, National Rifle Association, National Pork Board, Rocky Mountain Elk Foundation).

Accomplishments and Impacts

The wildlife damage management program at UNL was recognized as a “center of excellence” in the 1996 CSREES review of the Department of Forestry, Fisheries and Wildlife (now part of SNR). Our programs have improved human health and promoted economic and environmental well-being at the individual, local, state, regional, national and international levels.

Prevention and Control of Wildlife Damage -- The leading reference in wildlife damage management. Two volumes, 850 pages. 11,400 copies sold. Currently under revision. Based on user surveys, we conservatively estimate that the “Handbook” saves an estimated \$220 million in resources and \$210 million in labor each year (Appendix 6.5, Report 6.5-21). Partners – USDA-APHIS-Wildlife Services and the Great Plains Agricultural Council.

Internet Center for Wildlife Damage Management -- The clearinghouse for all information on wildlife damage management on the worldwide web (<http://wildlifedamage.unl.edu>). The ICWDM receives about 1,300 hits per day and is currently listed as the #1 hit from “wildlife damage” searches on nine of the top 15 web browsers. Partners – USDA-CSREES-IPM-North Central and Western Regions, Clemson University, Cornell University, Utah State University.

13th Great Plains Wildlife Damage Control Conference – Over 225 professionals from 22 states and one province participated. They increased their knowledge considerably or somewhat (94%), will handle their clients’ problems differently (74%), and will do their job more efficiently (80%) (Appendix 6.5, Title 6.5-22).

Partners – USDA-APHIS-Wildlife Services, Nebraska Game and Parks Commission, and The Wildlife Society.

Urban Pest Management Conferences (7) – Educated over 1,000 pest management professionals from Nebraska and surrounding states since 1997. Survey respondents indicated that they would decrease pesticide use (45%), increase use of non-chemical control methods (61%), increase business profitability (42%), and experience a positive impact on their business (82%) (Appendix 6.5, Report

6.5-26). Partners – UN Cooperative Extension, Nebraska State Pest Control Association, Nebraska Department of Agriculture.

Community Wildlife Damage Management Workshops (30) – Surveys indicate that over 500 participants managed problem wildlife on 36,732 acres and potentially saved \$751,725. Partners – 30+ local UN Cooperative Extension Educators.

Municipal Animal Damage Control Workshop Series (6) – Thirty-six professionals from eight public agencies and one private contractor increased their knowledge of wildlife damage management considerably (100%), will handle wildlife damage problems differently (90%), and will do their job more efficiently (93%). Overall, they rated the workshops as excellent (95%). Partners – USDA-APHIS- Wildlife Services, Lincoln-Lancaster County Public Health Department. (Appendix 6.5, Title 6.5-25).

Student-Professional Workshop - Wildlife Diseases – Sixty-one university students and professionals from ten public institutions and one private organization increased their knowledge of wildlife diseases considerably (93%), will handle wildlife disease issues differently (83%), and will do their job more efficiently (83%). Overall, they rated the workshops as very good (85%) (Appendix 6.5, Title 6.5-24).

Partners – Nebraska Game and Parks Commission and the Nebraska Chapter of The Wildlife Society.

Youth Education – Nebraska's Changing Wildlife Populations (5): Over 2,100 youth, ages 9 to 12, increased their knowledge of the mountain man era, life style, and tools (96%) and increased their willingness to participate in wildlife-related activities (55%) (Appendix 6.5, Title 6.5-23).

Water Festivals (3): Four hundred-forty 5th grade students could correctly identify semi-aquatic mammals (93%), correctly identified animal sign (76%) and correctly identified damage (83%) (Appendix 6.5, Title 6.5-27).

Electronic Products -- Master Gardener PowerPoint Programs (23), Websites (5), Computer models (1).

Other Products -- Extension Circulars (1), NebGuides (15), NebFacts (2), Factsheets (4), Brochures (2), Newsletters (1), Book Chapters (30), Conference Presentations and/or Publications (51), Presentations (175), Youth Programs (35), Face-to-face contacts (20,800), Telephone calls (9,600).

Interdisciplinary Teams -- Turfgrass Science Team, Extension-Swine Workgroup, CRP to Crops Team, Urban Pest Management Team, Community Integrated Pest Management Team, Natural Resources and Environmental Management Action

Team, North-central Region Deer Management Team, West Nile Virus Extension Team, Nebraska Rabies Team, Wildlife Habitat Evaluation Program Team.

National Leadership -- The Wildlife Society-Wildlife Damage Management Working Group (Chair, 1996-97), National Animal Damage Control Association (Regional Representative, 1995-96; Vice President, 2001-03), Western Conservation Committee (Chair, 2000-01).

Awards -- National (12), State (14)

6.3.3 Forestry, Agroforestry, and Market-driven Conservation

Description – Providing research-based forestry and tree related information to federal and state agencies, communities, landowners and residents to improve rural and community forestry resources and their management, and to stimulate natural resource-based (tree and woody perennial) rural development statewide.

Primary Personnel (Extension FTE within the School is indicated)

Scott Josiah, State Extension Forester, SNR (0.75 FTE)

Christine Meyer, Information and Education Assistant, SNR (0.30 FTE in forestry extension, 0.4 FTE in Nebraska Forest Service, NFS)

Rod Wilke, Riparian Buffer Extension Coordinator, (0.5 FTE in SNR, & 0.50 in BSE)

Dennis Adams, Assistant State Forester, NFS (0.25 FTE with RREA funds)

Five NFS District Foresters: Steve Rasmussen, Doak Nickerson, Scott Dewald, West Central District Forester (vacant), and Steve Karloff (0.25 FTE each)

James Brandle, Professor, SNR

Mark Harrell, Forest Health Specialist, NFS

Laurie Stepanek, Forest Health Specialist Assistant, NFS

Focus – Goals: 1) improve environmental, economic and social sustainability of integrated agricultural systems through research and extension; 2) increase and enhance rural forestry, agroforestry, and community forestry skills and knowledge of a wide audience; 3) establish or enhance Nebraska’s civil sector’s institutional capacity to provide forestry/agroforestry support and programming; 4) stimulate forestry/agroforestry-based rural development and 5) improve public awareness of the value and importance of trees and forests. **Audiences:** natural resource professionals, Extension Educators, arborists, landscaping professionals, teachers, acreage owners, producers, youth, and the general public. **Resources:** USDA-RREA funds allocated to Nebraska Forest Service (approx \$25,000/year) for forest product marketing and utilization activities. USDA-CSREES grant funds (in collaboration with Dept of Biological Systems Engineering) of approx \$75,000/year (2000-2003) for riparian buffer extension, USEPA grant funds (2000-2002) of approx \$60,000/year, and USDA-SARE grant funds (with U. of Minn.) of \$50,000/year (2001-2003). Other grants to NFS from Turkey Federation, Nebr. Environmental Trust Fund, Pheasants Forever, and USFS have funded equipment acquisition for forestry extension.

Accomplishments and Impacts

Integrated research/extension projects use collaborative programs and innovative concepts such as “market-driven” or “productive conservation,” “peer-to-peer extension,” alternative woody crops, and train-the-trainer approaches to expand outreach and impact in forestry-based rural development. Effective partnerships and external funding support the efficacy, scope and impact of programs spanning community and rural forestry, and agroforestry. Impacts include:

- more informed decisions by clients about tree, forest, and agroforestry management
- increased workshop attendance due to improved database management and workshop quality
- increased landowner adoption of conservation practices,
- florist purchases of Nebraska-grown woody florals produced in agroforestry systems,
- 15 landowners established specialty forest product plantings on their lands in 2002 alone
- a state Senator and a US Representative inquired about these programs
- enhanced capacity of Extension and other agencies to provide riparian buffer technical support
- stronger linkages and opportunities for exchange between UNL and 1994 Tribal Colleges and Universities, and increasing trust between and among these institutions.
- Additional details are in *EARS reports* (Appendix 6.5, Reports 6.5-1 through 6.5-9); Note that some of these include NFS or joint NFS/SNR efforts)

Programmatic Accomplishments (by area):

Forestry extension collaborations for high-impact programming. Strong partnerships have been established statewide within Cooperative Extension, faculty from Biological Systems Engineering, SNR, UNL's Food Processing Center, Agribusiness Center (School of Business), and Agronomy and Horticulture, the Nebraska Forest Service, 6 non-profits, 4 state or federal agencies, and 4 tribal colleges in ND, SD and NE (Appendix 6.2).

Forestry and agroforestry extension/educational activities – *Annual events include:* forestry State Fair exhibits and tree ID competition, Central Region (4 states) Woodland Stewardship Conference, Tree Care Workshops series held in 6 locations statewide, Arborist Certification Seminar, and the Forestry Shortcourse. *One-time events include:* USDA-SARE-funded specialty woody crop workshop (2002) with 75 attendees from 11 states, an Alternative Crops conference in 2003 attended by 150 people, and 30 or more/year invited presentations to thousands of people at workshop, conferences and field days in Nebraska and surrounding states. Nebraska Forest Service foresters also organize and conduct many additional outreach and educational events in their districts. A *Forestry Image and Presentation Archive* containing several thousand high quality forestry images and PowerPoint presentations was established to help NFS and extension faculty and staff expedite their presentation and publication development.

Public awareness programs on trees and forests – Many articles for newspapers, regional and national (e.g., USA Today) newsletters, magazines and e-journals, press releases, radio appearances on various aspects of forestry in Nebraska. Developed and distributed three riparian buffer and one champion tree display, viewed by over 1,000 people at 30 events/year region wide. Revived Champion Tree Program, developed Register of 100 state and 4 National champions. Launched Heritage Tree Program in 2003. Created Nebraska Tree Care Advisor Program, training Master Gardeners in tree care, who then provide tree care information to the public. With Nebraska Nut Growers Association, establishing a Nut Processing and Marketing Coop. to link small producers and markets. Currently forming a Nebraska Woodland Owner Association, and a Specialty Woody Crop Growers Association.

Riparian buffer extension programming – With Biological Systems Engineering, managed two major riparian buffer extension/research projects funded by USEPA and USDA CSREES in eastern Nebraska. Developed an effective farmer-to-farmer buffer extension model that generated a 67% adoption rate of buffers of those contacted. Utilize a market-driven extension approach which integrates the use of woody plants that produce commercial products in buffer systems. Research on landowner psychology (attitudes and motivations) of agroforestry adoption has generated demographic, attitudinal and behavioral predictor variables now being integrated into riparian buffer extension strategies.

Market Based Conservation Programming – Nine long-term field demonstrations/trials in two states established since 1998 focus on creating conservation plantings in agroforestry systems to provide both economic and environmental benefits. They provide completely new information on the production of commercial products in agroforestry systems, determine performance of integrated cropping systems, and may accelerate producer adoption of these systems. Conducted four state/regional market assessments on small fruits, woody florals (2) and hybrid hazelnuts. Web-based financial analysis and market information system models are under development, for release in late 2003. This knowledge and

information has been rapidly extended to rural landowners and acreage owners via extension channels statewide.

Enhance Capacity of 1994 Native American Tribal Colleges – Dr. Josiah serves as Forestry Panel Chair for the USDA IFAFS-funded Natural Resources Education Project involving four 1862 Universities in IA, NE, SD and ND, and four 1994 Tribal Colleges in ND, SD, and NE. Work with project and Tribal College personnel to build capacity to deliver forestry-related educational programs, and to assist in forestry projects at Tribal Colleges and Reservations.

Products: (includes SNR and NFS) – This does not include products of the Nebraska Statewide Arboretum, also an affiliate with SNR, but without a specific extension mandate or funding. Electronic products: 72 PowerPoint Programs, 6 Websites, 3 Computer models, 1 Video, Web-based Image and Presentation Archive. Extension Circulars (6), NebGuides (7), NebFacts (1), Factsheets (3), Brochures (3), Book Chapters (2), Extension related peer-reviewed publications (3), Proceedings papers (12), Training Manuals (2), Books (2), Other publications (10), and many newsletter and newspaper articles. Four of the “other” publications are distributed nationally and internationally by USDA National Agroforestry Center and National Arbor Day Foundation, have received national awards by ANREP, and are among their most popular publications.

Interdisciplinary teams – UNL NREM Action Team, UNL Alternative Crops Team, Tree Care Workshop Training Team, NRI proposal evaluation team, Specialty Forest Products Development

National Leadership – Board Member, Association For Temperate Agroforestry, Midwest Region Advisory Council Representative, Association For Temperate Agroforestry

Awards – National (6), UNL/IANR (2), Local/Regional (2)

6.3.4 Lake Water Quality Extension Program

Description. Since its inception in 1999, the Lake Water Quality Extension Program has grown substantially and is now the main contact and source of information for lake water quality issues in Nebraska. Programming includes both adult and youth audiences. Promising lake management techniques are experimentally tested and research results are transferred to stakeholders in the form of management recommendations.

Primary Personnel (Extension FTE within the School is indicated)

John C. Holz, Water Quality Specialist (0.35 FTE)

Tadd M. Barrow, Water Resources Program Assistant (0.70 FTE)

Focus – Goal: Improve the quality of water in Nebraska’s lakes and reservoirs through education, management technique research and development, and technical expertise. **Audiences:** Nebraska Department of Environmental Quality, Nebraska Game and Parks Commission, Natural Resource Districts, University of Nebraska faculty and staff, University of Nebraska county extension personnel, city administrators, public power and irrigation districts, private consultants, lake owners, lake users, lake managers, and Nebraska’s youth. **Resources:** The combined efforts and funds of UNL’s Cooperative Extension and Agricultural Research Division, the Nebraska Department of Environmental Quality (NDEQ), and the Nebraska Game and Parks Commission (NGPC) help support the Lake Water Quality Extension Program at UNL. Additional funds have been obtained from NDEQ (\$293,816) and NGPC (\$261,451) in support of our research, development activities, and educational programs. A three-year grant (\$2.9 million) from the Nebraska Environmental Trust Fund established the Community Lake Enhancement and Restoration (CLEAR) Program in cooperation with personnel from NGPC and NDEQ.

Accomplishments and Impacts

Youth and Adult Education – Since 1999, cooperative extension personnel, lake owners, lake users, and lake managers (e.g., NDEQ, NGPC, NRD’s, consultants) have been educated on water quality issues through workshops, extension publications, presentations, field demonstrations of management

techniques, and on-site and phone assessments of water quality concerns. Youth education activities include classroom education, developing student water quality monitoring programs, and workshops (e.g., Groundwater and Earth Wellness Festivals).

Impacts (2002 only)

- 177 visits to lakes to assess water quality.
- Water quality recommendations were made by disseminating 52 copies of *LakeScapes*, 21 copies of the “Controlling Pond Algae with Barley Straw” NebFact, writing 32 formal water quality reports and management plans for lake owners, giving water quality advice over the phone 154 times, and developing two formal issue solution plans for lake owners/managers which addressed specific water quality problems.
- Our database of lake owners and lake associations has been expanded from 171 to 196 names.
- 23 lake owners/users were surveyed to determine the most common water quality issue at their lake.
- Current water quality management research is disseminated to lake managers by involvement on 5 state/regional/national technical advisory committees.
- 380 lake owners and users were educated on water quality issues through presentations.
- A NebFact was developed to provide lake owners a guide to the services provided by Nebraska environmental consulting firms.
- 120 jr/sr high students were taught basic lake ecology, the use of lake sampling equipment, lab techniques, and data interpretation through a combination of classroom education and field trips.

Technique Research and Development – Since 1999, the goal of this area has been to experimentally test promising lake management techniques and transfer the research results to stakeholders in the form of management recommendations. Past and current efforts have addressed the use of barley straw and aluminum sulfate to control algae, the role of phosphorus in determining water quality, shoreline stabilization methodology, macrophyte management, and lake aeration.

Impacts (2002 only)

- Studies aimed at improving management in NGPC lakes by developing innovative aeration techniques that will benefit water quality *and* provide additional fish habitat were conducted at Lake Ogallala and Two Rivers Trout Lake.
- Tests and field demonstrations of the effectiveness of bottom barriers as a macrophyte control strategy were conducted at Tilden’s community pond and Crystal Cove (So. Sioux City).
- Interest in our barley straw research and NebFact remains high and our program is now a recognized international source of information on this management technique.
- As a result of our research efforts, NGPC now consults our program on nearly all of their aeration projects and are considering the use and evaluation of alum and bottom barriers in sandpit lakes and barley straw in trout hatchery ponds.

Volunteer Water Quality Monitoring Program – Since 2000, volunteers are trained to measure water clarity and collect water samples that are shipped to our lab for analysis. The volunteers are supplied with the results of the analysis and general recommendations to improve water quality. The volunteer program is a valuable tool for characterizing water quality issues and problems in Nebraska, establishing a baseline water quality data set for Nebraska’s lakes, providing a program evaluation tool to measure the impacts of water quality extension efforts, and promoting interest and involvement in sound lake management practices.

Impacts (2002 only).

- 24 volunteers were trained to monitor lake water quality; participation in this program increased by 31% in 2002; 16 lake sampling kits that enable lake users to monitor water clarity and collect water samples for algae and nutrient analyses conducted by our lab were distributed.

Community Lake Enhancement Restoration (CLEAR) Program – Since 2001, this unique program consists of a four member team of lake resource experts from UNL’s Lake Water Quality Extension Program, NDEQ, and NGPC. The purpose of the CLEAR team is to provide technical assistance to Nebraska communities for high-use lake improvement and restoration projects (e.g., city park lakes). The

CLEAR program also provides community funding for these lake projects. The Lake Water Quality Extension Program has two members on the CLEAR team whose roles are to provide technical expertise on lake restoration methodology, establish an adult and youth education program in conjunction with the restoration project, and evaluate the impacts of the education and restoration activities. The CLEAR team receives its funding from the Nebraska Environmental Trust Fund (NETF) that combines \$2.9 million from the NETF with \$1.2 million from NDEQ (Section 319 funds) over three years for community lake restoration projects. The CLEAR team is responsible for assisting communities develop sound restoration/education projects and granting these funds to eligible projects.

Impacts (2002 only).

The CLEAR team assisted four communities in the development of lake restoration work plans, funded three community lake projects totaling \$800,000 and established student monitoring and education programs at three communities. These projects will dramatically improve water quality, increase lake use, and community-wide educational activities related to the lake project.

6.3.5 Climate Information for Decision Makers and Resource Planners

Description – This climate program uses computer and internet resources to collect, archive, analyze, and disseminate climate data and information to weather-affected audiences. A strong interdisciplinary component has been developed to understand and develop interfaces between climate and other sectors: e.g., water resources, agriculture, and economics.

Efforts to collect, archive, and disseminate data from the state and surrounding region date to 1973 when the University took over the State Climate Resource Office. A special automated weather data network for energy and water balance assessments was begun in 1981. This network has grown to 159 stations. Early efforts to disseminate weather and climate information in a timely manner started in the 1980's with the University's AGNET system but have since evolved into modern IT systems. During the span of this program, significant efforts have been made to coordinate the public release of advisories by the crop, disease, insect, soil, water, and weather specialists. Various federal partners work with the University and fund Centers that deal with drought issues and climate services on state, regional, and federal levels.

Primary Personnel (Extension, Outreach, and/or Scholarly Service FTE within the School is indicated)
Kenneth F. Dewey, Climatologist, High Plains Regional Climate Center (HPRCC) (0.40 FTE starting 2003)

Allen L. Dutcher, State Climatologist

Brian Fuchs, Regional Climatologist

Michael J. Hayes, Climate Impacts Specialist, National Drought Mitigation Center (NDMC)

Steven "Qi" Hu, Climatologist (0.35 FTE)

Kenneth G. Hubbard, Director, HPRCC (0.2 FTE)

Mark Svoboda, Climatologist, NDMC

Donald A. Wilhite, Director, NDMC

Focus – Goal: to make decision-makers and managers aware of climate resources and climate risks by focusing historical, real-time, and prediction scenarios. **Audiences:** Agricultural extension personnel are an important targeted audience. In this regard, the program focuses on educating the educator so that product delivery can cascade down to the county and community levels. Other major users of the program are agricultural producers and consultants, the media, state/federal/local government personnel, litigation officers, lending institutions, water managers, and emergency personnel. The program also serves the Governor of Nebraska and the state's Climate Assessment Response Committee on drought monitoring, flood, and policy issues. **Resources:** Funding for the program includes state and CES support for salaries and basic operating costs. Grants and contracts from federal sources largely fund staff support and the operating costs for monitoring, archiving, analyzing, and disseminating data and

information. Frequent federal funding has been received from the USDA agencies and the US Dept. of Commerce. Local support for weather stations has come from the Nebraska Natural Resource Districts.

Accomplishments and Impacts

The Climate Extension and Education Annual Workshop focuses on educating extension educators and providing a forum to update the extension clientele (consultants, managers, etc.) on the recently developed climate products and current/future climate scenarios. Approximately 30 educators and consultants participated and were in turn able to serve as first responders at the community level.

Crop Watch is a weekly newsletter (Appendix 6.5, Title 6.5-10) that updates extension personnel weekly on any changes in the status of weather. Citizens receive expert advice on complex problems from the perspective of multiple disciplines.

Climate Center Programs. Both the National Drought Mitigation Center (NDMC) and the High Plains Regional Climate Center (HPRCC) conduct active outreach programs in concert with their federal and state partners (see <http://www.drought.unl.edu/> and <http://www.hprcc.unl.edu/> for details). The Applied Climate Information System (ACIS) is a tool developed by regional climate centers and implemented in Nebraska. Many of the charts and maps vary in time scales of days to years and are updated daily with maps and charts revised on a daily basis. The web sites and on-line systems are home for numerous products that can change as often as the weather. In addition, surveys of decision makers and managers have shown that on-line self help materials and tutorials are needed for first time users so they can better learn the basics of applying information to specific problems in various sectors (example at <http://www.hprcc.unl.edu/clearinghouse/>). We direct much of this program toward the Internet to keep products up-to-date and widely accessible. **Impacts-** In 2002, there were nearly 9 million accesses to the HPRCC internet products and over 10 million to the NDMC web page. These numbers are growing and reflect the wide-spread impact of this program on the public and private sectors. In addition, the weekly “Drought Monitor” appears in major newspapers and TV reports across the country (<http://drought.unl.edu/dm/monitor.html>). The new climate maps for precipitation have served the drought monitor and have been adopted for use by all RCCs and by the National Climatic Data Center (<http://www.hprcc.unl.edu/products/current.html>). Major sponsors include the Farm Credit Services of America, USDA’s Risk Management Agency, National Oceanic and Atmospheric Administration, and the United Farm Management Services. On-Line Weather and Climate Resources are available for decision makers, managers, and others (Appendix 6.5, Report 6.5-11).

Other Products include 11 NebGuides and 5 NebFacts currently active in this program (Appendix 6.3). In addition over 9 million accesses are made to the on-line products offered by this program.

6.3.6 Nebraska Earth Systems Education Network (NESEN)

Description: NESEN promotes mutually beneficial interactions between educators and professional scientists and uses multiple strategies to enhance and expand Earth-science education in Nebraska.

Primary Personnel (No Extension FTE within the School)

David Gosselin, Director

Mark Mesarch, outreach specialist

Kylee Anderson, logistical coordinator

Focus – Goal: improve collaboration and exchange of information between K-12 educators and the expertise and resources at the University of Nebraska-Lincoln (UNL), as well as at other professional Earth Science organizations. **Objectives:** 1) promote and enhance K-12 earth science education in Nebraska; 2) improve teacher knowledge and understanding so that students become better informed about the complexities of environmental and natural resources; and 3) enhance the transfer of earth-science information to the K-12 teaching community. **Audience:** K-12 Educators **Resources:** NESEN has been primarily supported through grants from NASA, NSF, DOE, UNL Drought Mitigation Center

and the American Geological Institute, exceeding \$665,000 since inception in 1993. Overhead return funds to the NESEN director have been used to support daily operational activities.

Accomplishments and Impacts

Process-oriented Environmental Change Education Workshops – In collaboration with Dr. S. Meyer, University of Wisconsin-Green Bay, five workshops have provided professional development for 69 teachers which translates into approximately 7,100 students per year potentially impacted. Surveys clearly indicated that the workshop organization and goals met teacher expectations.

Membership – Since its inception, NESEN has grown to over 530 members.

Membership includes teachers from 29 other states, Belgium, Nigeria, and Greece.

Environmental/Global Change Survey – This study provided fundamental information and recommendations related to the development of educational outreach materials and programs for the National Institute of Global and Environmental Change.

Professional Development Workshops for Earth System Science in the Community (EarthComm) – Because of recognition of NESEN as a leader in Earth Science education, UNL served as a pilot site for the development of professional development workshops to train teachers to use Earth System Science in the Community (EarthComm). Forty-one teachers were trained over this two-year program.

Integrated Research and Education Project – Nine earth systems research/education teams consisting of a scientist, pre-service educator, and classroom teacher worked together during the summer of 2000. This project has provided data that will be used to help improve communication between the scientific and educational communities.

Workshops – Over the past 8 years, NESEN has coordinated over 50 workshops for in-service K-12 Earth Science teachers. Workshops have ranged from an hour to five days. These include teaching 2-day workshops as part of the NESEN summer workshop series. Over 500 teachers have participated. NESEN also helps coordinate the recruitment of presenters for the annual meeting of the Nebraska Association of Teachers of Science.

NESEN Website – The NESEN World Wide Web site has been continually updated and redesigned to improve and enhance navigation since its inception in 1995. Unique visitors in 2002 increased to an estimated 40,000 per month. Estimated webpage hits are at 500,000 per month. The NESEN website has been reviewed and approved for classroom use by the Board of reviewing editors for Science

NetLinks, which is a comprehensive website created by the American Association for the Advancement of Science. Our site and components within it are currently being reviewed for inclusion into the Digital Library for Earth Science Education.

Data Visualization – The Universal Data Visualizer (UDV) has been developed to enhance the use of data in the classroom, including capability for leaf optical property measurements. The current UDV for net radiation data has been used in NRES 404/808 Microclimate: The Biological Environment, and presented at the 2001 Nebraska Association of Teachers of Science (NATS). UDVs for water chemistry and ground levels have also been produced.

Publications – Seven peer-reviewed publications to national and international audiences.

NATS Catalyst Award – In October 1999, Dr. Gosselin received the Catalyst Award from the Nebraska Association of Teachers of Science for leadership, dedication and service to science education.

6.4 Extension and Outreach Support

6.4.1 Extension State Operating Support

State appropriated operating funding for extension (Table 6.4) has varied among recent fiscal years in part because of personnel changes and occasional allocations for specific needs such as equipment.

6.4.2 Grants and Contracts

Grants and contracts contribute much additional support for extension programming as indicated by the overhead generated (Table 6.4). Grants and contracts come from a variety of state and federal sources, including USDA, USDI, Nebraska Game and Parks Commission, Natural Resources Districts, Nebraska Department of Environmental Quality, Nebraska Environmental Trust, NASA, NSF, DOE, US Department of Commerce, US Bureau of Land Management, US Forest Service, US Fish and Wildlife Service, and others. Total income has averaged over \$750,000 / year.

Table 6.4 State Appropriated Operating Support for Extension (Excluding Water Center) and Extension Grant Overhead Income

| Fiscal year | Operating support | Extension grant overhead |
|-------------|-------------------|--------------------------|
| 1997-1998 | 45,950 | 97,055 |
| 1998-1999 | 66,496 | 125,624 |
| 1999-2000 | 19,798 | 79,602 |
| 2000-2001 | 30,909 | 149,392 |
| 2001-2002 | 52,293 | 150,344 |
| 2002-2003 | 27,667 | 116,618 |

6.4.3 RREA

As a Land Grant University, UNL receives funding through the Renewable Resources Extension Act (RREA). The purpose of this act is to provide forest and rangeland owners and managers with information they need to produce wood products, forages and livestock, fish and wildlife populations, and outdoor recreation opportunities in a sustainable manner. Funds are appropriated annually by Congress and allocated to the States by the USDA-CSREES under an established formula. Although annual RREA funding is authorized at \$30 million per year for five years (FY 2002-07), appropriations have been much less (\$4.5 million appropriated nationally in 2002).

UNL Cooperative Extension was allocated \$49,266 in FY 2002, which was an increase over the previous five years. The FY03 allocation is expected to be \$51,796, which again reflects an increase. Currently, \$20,000 and \$29,266 of the RREA funds are directed toward personnel in range and the Nebraska Forest Service, respectively. Given the breadth of topical areas covered by RREA, other uses are certainly possible, and there have been efforts in the past to broaden the use of RREA funds at UNL as occurs in some other states. Given the relatively low funding level for Nebraska, however, spreading RREA funds over many programs or shifting the use of funding from long-term program support to short-term project support risks diluting the impacts of current programming. Current national-level RREA strategic planning may bring larger allocations for RREA in the future. We look forward to the potential for increased appropriations or other mechanisms that would allow the School additional RREA programming opportunities.

6.4.4 Stakeholder Financial Support

Project partners or sponsors provide contributions to support specific program components; totaling about \$2,500/year.

6.5 SNR Visibility and Outreach

6.5.1 Brochure

The School developed a full-color brochure to provide an overview of the School for all stakeholders, but with a focus on facilitating student recruitment. The four-fold brochure, developed with broad faculty and staff input, briefly describes the School's overall mission and associated teaching, research, extension, and survey programs. It lists centers within the school and affiliated units, and has a diagram to illustrate program areas and our commitment to teamwork and linkages among areas. This brochure is currently in revision to reflect the recent merger with the Conservation and Survey Division and Water Center as well as other updates (Appendix 6.4).

6.5.2 SNR Quarterly Newsletter

To provide greater visibility for the School and a communication link with stakeholders, we developed a quarterly three-color newsletter with the first issue published in fall 2001 (Appendix 6.6). *Natural Resource Links* is displayed on the SNR web site and distributed (hard copy) to about 1,800 stakeholders, including 850 alumni, 600 outside stakeholders (state & federal legislators, agency heads, heads of other university NR units in U.S., etc.), 100 to extension educators, 200 to SNR, and 100 to East Campus administration (includes unit heads). This newsletter costs about 13K/year for printing, distribution, and student or free-lance writer assistance with story development. We use moderate paper and layout with a goal to appeal but to minimize costs, a concern of ours and of tax-paying citizens. Charles Flowerday serves as editor and the Outreach Committee and Extension/Outreach Coordinator provide oversight.

The title and masthead match the School's integrated and global approach to natural resources; an abbreviated mission statement is included in the credits section. Content has included articles on virtually every program area – one goal is to reflect the breadth of School programs. Brief sections present natural resource facts and season-appropriate tips (e.g., severe weather, planting trees, backyard birds). A series initiated in 2003 features partnerships with others (e.g., Nebraska Game & Parks Commission) that increase efficiency and synergy toward common goals. Current issues include feature stories about individuals who have contributed to the School through endowments, scholarships, property, or in other ways; and these issues include an insert card that describes opportunities to make contributions. Student and student club features will be added in fall 2003 and distribution will increase to include parents and high school science teachers.

6.5.3 SNR Web Site

The SNR website was completely redesigned in 2002-2003 by members of the Outreach Committee and an ad-hoc website design team composed of faculty, staff and graduate students. Its primary purpose is to aid in the recruitment of undergraduate and graduate students to SNR programs. Secondary, but nevertheless important, purposes include enhancing internal communication within SNR and externally within UNL, serving as an additional tool for fund raising, and presenting SNR programs and information to stakeholders.

6.5.4 Visibility Through Contacts

To enhance School visibility and student recruitment, we initiated a strategy to include recruitment messages in extension publications and through other contacts. For example, letters of congratulations with a recruitment message were sent to all 2002 State Fair Forestry and Conservation & Wildlife youth participants. Where appropriate, we incorporate School/career information into subject-matter programs where parents or potential students are present.

6.6 Field Facilities

6.6.1 Prairie Pines

Prairie Pines is 145-acres of woodlands and grasslands near the northeast edge of Lincoln, donated to the University Foundation (leased to IANR and the School) and protected by a Conservation Easement through the Lower Platte South Natural Resources District. The property has a primary residence, an older farmhouse (recently renovated for rental), and a barn and outbuildings. The land cover is about 30 acres of grasslands, 10 acres of native prairie, 20 acres of woodlands (>200 species of woody plants; a Statewide Arboretum site), and a riparian area. An Automated Weather Data Network station was established on the property in 2001.

Our vision is to develop this property into a natural resources education and research center. It is currently used by several UNL classes (e.g., soils, forestry, bird banding & other wildlife) and program events (e.g., Biology Career Workshop). It would be well suited for summer classes for teachers, programs for acreage owners, homeowners, and others.

A Prairie Pines Endowment Fund established by the donors provides a portion of the funding needed for property care and maintenance. When the property was donated, IANR agreed by contract to hire a caretaker for the property when the donor could no longer handle those duties. The donors, a couple now in their 80s, transferred management and care responsibilities to the university in January 2002. University funds have been insufficient to hire a caretaker or to develop organized programming. We have initiated discussions with stakeholders with interest and, potentially, resources (e.g., Nebraska Game

and Parks Commission, Lower Platte South Natural Resources District, others) to plan and fund Prairie Pines for mutual outreach goals.

6.6.2 Shelterbelt Research Facility at the Agricultural Research and Development Center (ARDC), Mead

In the early 1960's, UNL acquired the former Mead Ordinance Plant from the DOD. Consisting of approximately 9,500 acres, this facility has been developed to serve as the primary site for field-based research involving 90 faculty and 150 graduate students from nine departments in IANR.

The windbreak/agroforestry area (400 acres) was established in the 1960s for study of crop response to wind and wind protection under actual farm conditions. Six windbreak systems were established, each about 40 acres (4 acres of trees and 36 of cropland). In the last 10 years, these systems have been modified to more closely mimic a typical farm operation. Most management decisions are made as if this is a commercially operating farm and all farm operations and yield measurements are made with full-size equipment.

Since establishment, the site has generated many fundamental findings on shelterbelt impacts on crop performance and yields, micrometeorological conditions, wildlife and agroecological influences, and farm and shelterbelt economics. It has provided an opportunity for interdisciplinary research with faculty from agricultural meteorology, wildlife, entomology, agronomy and horticulture. In collaboration with Iowa State University, these plantings are providing fundamental data on how the three dimensional structure and density affects windflow, data essential for the development of the Shelterbelt Agroforestry Modeling System. SAMS will be used to model the growth of a windbreak; determine its structure; model wind speed, microclimate and growth of a "virtual" crop in the protected area; and calculate expected financial returns. More recently, SAMS has produced important performance and yield information on the production of specialty woody crops in alleycropping systems, data which have stimulated widespread adoption of commercially profitable agroforestry systems in eastern Nebraska.

6.6.3 Affiliate Sites

Horning State Demonstration Forest – Managed by the Nebraska Forest Service, this demonstration forest is a 240-acre former farm located in Plattsmouth, NE, near the Missouri river between Omaha to the north and Nebraska City to the south. It is planted to a large variety of tree species in research and demonstration plantings, along with some native forest stands. It is an excellent facility to conduct forestry educational field programs for woodland, farm and acreage owners. It can be used to demonstrate a wide range of management options for a variety of objectives including timber production, wildlife management, invasives management, and production of specialty forest products. The Nebraska Forest Service has in the past held very popular Forestry Field Day events at the site, attracting thousands of people. Use of the site has been minimal for several years, but several major events are scheduled there in 2003.

Cedar Canyon State Demonstration Forest – Managed by the Nebraska Forest Service, this demonstration forest/ranch is a former ranch located in central Nebraska just southeast of North Platte. It is rough canyon topography, typical of much of the land in south central Nebraska. It has been used often over the past several years to demonstrate the integration of forestry and rangeland management, specifically management of Eastern Redcedar in rangelands. Several stands of Eastern Red Cedar have been used for pruning and thinning studies and demonstrations. The Demonstration Forest remains an important and unique demonstration area serving landowners in the heart of the state.

6.7 The Next Five Years

6.7.1 Vision

We see the School as a leading, timely, and trustworthy source for research-based natural resource information for use by Nebraska's citizenry, rural and urban. People look to the university for relevant education and information that helps in their efforts to improve themselves, their families, and communities. We strive to listen to stakeholders and to adjust accordingly to meet changing needs. Issues that involve natural resources and the environment are becoming more frequent and complex but few extension personnel are formally trained in these subjects. Moreover, natural resource professionals need an ongoing link with new findings. The School will provide opportunities for learning and educational options for a better future. We focus on integrated and interdisciplinary approaches that engage the university's strengths with partners and stakeholders. We are developing strengths in ecosystem science and links that interface with natural resource issues. We envision outreach programs that incorporate appropriate student learning, teaching, research, service, survey, and extension functions statewide.

6.7.2 Proposed Issues and Programmatic Directions

In considering how to position our unit for the future, we have identified six issue areas in natural resources that we believe important for us to address (listed below). The School brings considerable expertise and some ongoing programs to each of these areas and will gain additional strengths from the merger. To effectively address these broad issues will require multiple disciplines and participants from other agencies and organizations. SNR is well suited, however, to engage other entities and to lead or facilitate an integrated response to these growing clientele needs. As our merger proceeds, these issue areas will be further refined through discussions among faculty, staff, and our external advisory group. They are in alignment with CED Action Plans and Focus Areas (Table 6.2, page 6-8), primarily *Food Production and Natural Resource Systems*, *Community and Residential Environment*, and *4-H and Youth Development*.

- Sustainable Development – urban expansion and development issues for families, businesses, or communities; residential, industrial, or commercial: where to build a house or subdivision, landslides, transportation systems, maintaining green space and habitats within urban environments and associated benefits to people and business economy, threatened and endangered species or other wildlife concerns, water service and waste water issues, trash and waste management, where to develop to avoid critical ecosystems (e.g., native prairie, critical watersheds, etc.), contamination of water sources or ecosystems, dealing with the agriculture/urban interface.
- Sustainable Land Management – sustainable food production systems, beneficial ecosystem functions (natural enemies of crop pests; shelter from wind), climate and weather influences, acreage management, backyard/urban land management, fire-scaping in the Niobrara Valley, Pine Ridge, and Wildcat Hills, soil degradation.
- Human Health, Wellness, and Safety – water quality and quantity; disease issues (e.g., West Nile virus, chronic wasting disease, rabies, hantavirus); abatement of pollution and contaminants; climatological issues - severe weather, floods, drought, heat or cold stress; outdoor activities, families, exercise, and health; benefits of green spaces.
- Environmental Literacy – Will future generations know enough to make informed decisions about natural resources? Examples (mostly from NREM Action Plan): relationships between individual actions and impacts on local and global environments, critical thinking and effective decision making skills based on natural resource stewardship, foster a stewardship ethic and an understanding of the natural heritage of Nebraska, meaning and importance of native ecosystems

- and biological diversity, overabundant and declining species, water quality and quantity, air quality, soil conservation, and associated interrelationships, understanding of natural resource issues and ability to incorporate sound concepts into land and water management.
- Ecosystem Health and Biodiversity – global decline in biological diversity; climate change and variability; species and ecosystems in Nebraska. Survey of Nebraska’s biological diversity and integrated plans for the future. Integrating species habitats and beneficial functions into human modified landscapes. Overabundant and damaging species and associated human dimension issues. Invasive species (plants, fish, wildlife) impacts on native biota and ecosystems.
 - Natural Resource Enterprises – Alternative income sources: specialty woody products, fee access; tourism associated with bird watching, historic or champion trees, or tornado viewing. Prevention of economic losses to pest organisms. Community pride associated with unique natural resources.

6.7.3 Institutional Infrastructure

A. Develop positive outcomes and synergy from the merger of SNRS, CSD, and the Water Center:

Total publication/resource access – The Outreach Committee and others will develop mechanisms to effectively bring all SNR publications and materials into greater visibility and availability to potential users. Examples include combined web access to publications and other materials, communication to extension educators about the availability of expanded resources, and exploring ways for better links between survey and extension clientele and resources.

Newsletters – The newsletter editor and others will merge *Natural Resource Links* (SNRS, Section 6.5.2, page 6-22) and *Resource Notes* (CSD) into a slightly larger (12 pages) quarterly newsletter to serve the entire merged unit’s clientele. We will refine the mailing lists to ensure that our key stakeholders know of the School’s activities and contributions. Our initial goal of providing the newsletter electronically seems unlikely to meet stakeholder needs so, for now, we plan to continue sending hard copies to stakeholders and to post it on our SNR web site. The *Water Current*, a monthly Water Center newsletter supported by outside funds, might also be merged with the other newsletters or retained as a separate quarterly newsletter for water-related stakeholders. These options will be discussed and evaluated by the Outreach Committee and faculty.

We will develop mechanisms for stakeholder feedback on the newsletter, delayed during the merger, including a simple questionnaire insert each fall and inputs from an outside advisory committee. We will continue to evaluate content, costs, and associated goals for visibility, student recruitment, and contributions to University Foundation funds for the School.

Websites – We will merge the SNRS, CSD, and Water Center websites into one for SNR. The SNR website will continue to focus primarily on undergraduate and graduate students but will also meet the differing needs of the additional clientele. We will ensure, for example, that the merged SNR website provides clear and easy access to the additional information, resources, and materials currently available through the CSD website.

Evaluation – As CSD faculty and staff shift to evaluation under the IANR teaching, research, and extension deans, the School Director and Promotion and Tenure Committee must ensure that job expectations and evaluations are appropriate and in alignment with assigned duties.

B. Outreach integration: We will build relationships among faculty and staff in the merged unit to enhance program familiarity, extension and outreach functions, and unique skills so that teamwork and synergy develop from integration of School programs. Unit administrators and faculty must ensure that performance measures and incentives encourage teamwork and integration as well as individual

accomplishments. Faculty and staff with Extension or outreach assignments will work together to address program issues and plans through the Outreach Committee, to provide outreach-related inputs to the Hardin Center renovation, and to strengthen extension/outreach effectiveness. The merger with the Conservation and Survey Division and the Water Center brings additional outreach capabilities to the School, including the wide array of survey materials, maps, and other resources available for clientele.

All extension and outreach personnel within the School will meet at least two times/year to examine broad issues affecting natural resources and the School, to enhance School-wide linkages across the diversity of disciplines, and to create new synergies for more effective natural resources extension and outreach. These synergies will enhance educational programming and will provide mechanisms to combine strengths into clusters that will generate more competitive grant proposals. Such proposals may focus primarily on extension or outreach or may be integrated with specific research programs.

C. Nebraska Forest Service relationships: The budget cuts to the Nebraska Forest Service, a close affiliate of the School, will have strong impacts on our forestry programs. We will assess SNR programs and best options in relation to final outcomes of the cuts and changes in the NFS. In particular, we are concerned about the elimination of extension forestry FTE (6 positions, 0.25 extension FTE each, as of July 7, 2003) and the impact on our educational programs and our ability to deal with the huge volume of inquiries about tree management.

D. Cooperative Fish and Wildlife Research Unit: An extension/outreach goal is to include stakeholder needs in the research prioritization process and in extending research findings to potential users. To do this, we will ensure that natural resource needs identified by extension audiences and stakeholders are included in discussions that set the research priorities for this Unit.

E. Wildlife Damage Cooperative Research Unit: We will continue to pursue establishment of a Coop Unit with the USDA-APHIS-Wildlife Services-National Wildlife Research Center. The function of this Unit would be to identify and prioritize research needs regarding human-wildlife conflicts in Nebraska, the Great Plains, and Midwest region, and then to lead research and other efforts to resolve these issues. This Unit would include 2-3 faculty-level positions and would bring in about \$250,000 to SNR.

6.7.4 Physical Infrastructure

A. Hardin Hall Renovation: *Plans for renovation of Hardin Hall to house the School are currently being re-scaled to fit a limited budget. No additional funds appear forthcoming. Our vision for Extension & Outreach aspects of the building follow but these may change as discussions progress.*

Extension/Outreach Center – The entry area of Hardin Hall, originally designed as a hotel and conference center, is ideal as a welcoming interface with the public.

We envision an “Extension/Outreach Center” that would provide:

- easy access to free and for-sale publications, maps, and other materials;*
- a comfortable area to view instructional videos*
- a kiosk to provide building/personnel information;*

- a small conference room where visitors could meet with school faculty and staff;
- displays that highlight our academic majors and commitment to interdisciplinary teamwork;
- a small area with phone and Internet connections for use by reporters;
- a reception & office area to handle questions, sales (e.g., maps, books), and convenient access to faculty and staff who frequently interact with visitors.

Although much of this welcoming interface concept would be available for visitor-controlled access and use, it incorporates a receptionist/office area where visitors would be welcomed and provided the help or information they need. We expect that many East Campus visitors may stop first at Hardin Hall because of its location and accessibility (short-term parking stalls in front). The welcoming interface would bring visibility to the School and information to facilitate visits to other portions of East Campus.

We also envision an arrangement of extension and outreach facilities that enhance faculty and staff effectiveness. This would include work areas that accommodate development of extension/outreach materials (posters, sorting space, slide/audiovisual programs, computer scanning, etc) and, typically, faculty offices within their respective discipline areas. As the merger proceeds and as Hardin Hall plans develop, we will explore ways in which work space can be effectively used and shared among similar functions throughout the new School unit.

B. Develop Prairie Pines as a field station and natural resources education center: Prairie Pines (Section 6.6.1, page 6-23) offers outstanding opportunities for student and outreach education. We will continue to use it for class projects, field trips, and occasional outreach events. To become effective, however, it will require sufficient resources to manage and maintain the land and facilities (caretaker), and to further develop the site for educational uses, ideally including a building and restroom facilities for meetings and educational events. Our current goals are to: 1) rent the renovated farmhouse to supplement income and increase security, 2) build a stronger School-wide vision for Prairie Pines, incorporating teaching, research, extension, and survey functions as appropriate (the Outreach Committee will provide oversight), 3) work collaboratively with other stakeholders, particularly those who can contribute financial or personnel resources, to propose an overall plan and action steps for Prairie Pines (the plan will require clarification of some restrictive wording in the Conservation Easement), and 4) develop a GIS system with data on the built infrastructure and on natural resources status and trends (particularly woody plants/cultivars, songbirds, deer, and soils). Goal four will be accomplished in part through class projects and volunteers (e.g., Audubon birding group) but will require a dedicated technician to complete. Our longer-term goal is to develop Prairie Pines as a visible and effective center for natural resources education and research.

C. Develop Horning State Demonstration Forest as a landowner teaching tool: Horning State Demonstration Forest has great potential to become a major forest management teaching tool for forest landowners because of its proximity to Omaha, Lincoln, and Nebraska City; its legacy of tree planting

since the 1960s; and its extensive tree species and provenance trials. This diversity of tree plantings, successional forest, and native forest area create a fine outdoor teaching “laboratory” for training forest landowners in forest management, forest ecology, and forest products. Over the next five years, Extension Forestry and Nebraska Forest Service staff will work collaboratively to enhance this demonstration forest through a variety of forest management practices, will hold outdoor workshops and field days, and will seek external funding to improve the infrastructure and maintenance of this facility. The Outreach Committee will provide oversight for School-wide discussions of outreach through this and other School facilities.

6.7.5 Personnel

Although current budgets are limited, each of the three units entering the merger bring perspectives on priorities for extension or outreach positions. We list below positions that have been identified prior to the merger as important to future directions. These fit with our proposed issues and programmatic directions (Section 6.7.2, page 6-24) and with CED’s Focus Areas (Table 6.2). All will require further School-wide discussion, however, to ensure that all viewpoints are included and that proposed position descriptions best fit overall priority needs.

A *Natural Resources Education Specialist* faculty position was approved by the School of Natural Resource Sciences (prior to the merger) and submitted to administration, but then lost through budget cuts. The purpose was to provide leadership for comprehensive natural resources education for youth and adults throughout Nebraska. Included were goals to develop partnerships and collaborative programming and to implement Prairie Pines as a natural resources education center. An *Extension Specialist for Aquatic Systems* faculty position is needed to focus on pond/reservoir management and aquaculture and to integrate biological outreach components into water initiative programs. Managerial/Professional or support position needs include a *Lands Caretaker* for Prairie Pines and other land holdings (required by contract for Prairie Pines) and an *Education Program Manager* for Prairie Pines and other outdoor education sites.

We recognize that the current budget outlook requires strong justification for new positions. We also recognize that effective extension/outreach, visibility, and stakeholder support are critical to the future of the School. School faculty and staff will work with IANR administration and outside stakeholders to find mechanisms for meeting these personnel needs. An effort to engage partners in development of Prairie Pines, for example, includes discussions with other IANR units and with outside agencies about the potential to share funding responsibilities and educational uses.

C. Extension Educator Affiliates: Extension Educators may affiliate with a campus department to build closer associations with unit faculty and strengths in the departmental focus. Because of the strong agricultural base in Nebraska and associated extension educational needs, most extension educators have backgrounds from units such as animal science and agronomy, and they tend to affiliate with such units. Many educators deal with natural resource issues such as water quality and quantity, reduction of non-point source pollution (topsoil or pesticide runoff), nutrient management (e.g., from livestock feedlots), and field buffer strips. These efforts reduce the negative impacts of production systems. Few deal with biological resource conservation issues (e.g., biodiversity), which are becoming increasingly visible and important nationally and globally.

Over the next five years, we propose to build stronger linkages with extension educators. The breadth of information on natural resources in the School, particularly with the new survey resources from our merger, could become increasingly beneficial to educators dealing with natural resources in agricultural production, acreages or urban areas, biological conservation, tourism, and additional areas. Many programs and linkages already exist as indicated in Section 6.3 (page 6-10), Major Programming Areas. We will 1) strive to make combined School resources and programs more visible and easily available to

educators, 2) encourage opportunities for educators to integrate more closely with the School and, where appropriate, to be housed within the School to work statewide on specific educational issues. One educator is currently a key participant in educational programs on wildlife damage management and on reptile and amphibian conservation, and 3) encourage the hiring of educators with backgrounds in ecological systems and natural resources because such education and experience are increasingly needed to deal with complex issues in natural resources.

D. Extension Assistantship: We propose to establish at least one extension assistantship similar to current teaching assistantships. Graduate teaching assistants normally assist with course responsibilities and do research leading toward a graduate degree. Similarly, graduate extension assistantship recipients would learn and assist in extension and outreach activities, develop an extension educational product, and do research leading to a graduate degree. As with a teaching assistantship, the research project could be focused on disciplinary science or could focus on extension or outreach methodology or similar scholarly topics. Extension assistantships would enhance graduate education (teaching) and research components as well as provide specific educational programming that could address critical issues or solve a problem, boost School visibility, and foster student recruitment.

6.7.6 Funding

A. Outlook: The university faces current budget shortfalls and state and federal appropriated funding is unlikely to increase in the foreseeable future. We plan to continue to maximize program efficiency through cooperative efforts and partnerships where applicable and to seek external grants to support programs. As part of this effort, we will strengthen partnerships and develop new ones – potential collaborators include state and federal agencies, growers' associations, cooperatives, citizens' groups, businesses, communities, and others. Several successful partnerships and collaborative programs currently exist within the School. In situations where partnerships can be developed, the combined resource base enhances program effectiveness. One key element is ensuring that the School and other participants receive appropriate visibility and credit for the joint effort.

B. The Renewable Resources Extension Act: RREA (described, Section 6.4.3, page 6-21) received increased funding in 2002 (900K added nationally) and an additional increase is expected in 2003 (400K nationally). Much of the increase in 2002 was used to expand the program to 1892 colleges and some territories, so the increase to Nebraska and other 1862 Land Grant colleges was modest. Ongoing efforts are underway, however, to bring significant additional appropriations to RREA. We propose that as sufficient additional funding becomes available, Cooperative Extension develop an internal grant program that would provide RREA funds for interdisciplinary projects in the conservation and management of natural resources in Nebraska. These grant opportunities might cover a range of options for program use and could include support for extension graduate assistantships.

Appendix 6.1.Extension/Outreach Issues and Proposed Actions, 2003-2004

Goals (I), Needs (A), and Proposed Actions (I)

I. Enhance SNR visibility

A. Strengthen linkages with stakeholders.

1. Merge the *Natural Resource Links* (SNRS) and *Resource Notes* (CSD) newsletters into a slightly larger (12 pages) quarterly newsletter to serve the entire merged unit. (~\$12K/year)
WHO: Editor, writers, extension/outreach coordinator, & faculty/staff for stories, tips, content.
2. Develop a more user-friendly stakeholder database so that it can easily be searched, sorted, and viewed in formats to evaluate needed updates or additions and to otherwise enhance service to stakeholders. (No Cost)
WHO: Computer and database personnel & extension/outreach coordinator.
3. Update and combine the SNRS and CSD stakeholder lists into an effective SNR database, incorporating faculty and staff inputs. (No cost)
WHO: The Outreach Committee and others will compare the SNR alumni list with other sources (e.g., alumni association, CASNR) and will request faculty and staff feedback, perhaps by email note with a web link to the list.
4. Market publicity events – invite deans, VC, elected officials to SNR social, outreach and other appropriate events (provide opportunity for them to make comments if desired). (No cost)
WHO: Event planners automatically consider VIP invitations.
5. Target specific stakeholder groups (e.g., extension educators, NRD's, parents of students, etc.), perhaps one group per year, until we establish strengthened links with all critical stakeholders.
WHO: The newsletter will feature student and student club activities and will add more parents (“Looking For a Few Good Parents” program) and high school science teachers to the mailing list, and will continue to build on last years focus with Nebraska Game and Parks Commission.
6. Develop mechanisms for stakeholder feedback – e.g., a simple questionnaire, feedback through newsletter, outside advisory committee, etc. (\$125)
WHO: Extension/outreach and other coordinators will develop a brief newsletter questionnaire insert for the fall 2003 edition
7. Complete the SNR brochure update. (1K).
WHO: Extension/outreach Coordinator with inputs from faculty and staff.
8. Complete the SNR web site redesign and assess its initial effectiveness in reaching students and other stakeholders (e.g., potential students, decision makers, inquiring public, alumni, agencies and organizations, SNR and other faculty and staff).
WHO: Outreach Committee and web site subcommittee.
9. Develop a series of messages, both “good news” (successes) and tips or how-to information, that we want to have communicated to stakeholders – post on SNR web site, use in newsletter, at meetings, conferences. (No cost)
WHO: Outreach Committee, coordinators, and faculty & staff will help with messages to be used in the SNR newsletter, meetings, on the web or in other appropriate marketing spots.

B. Better ensure recognition of extension/outreach accomplishments.

1. Assess current extension/outreach indicators and/or develop new indicators that demonstrate our strengths and successes. (No cost)
WHO: The Director and Outreach Committee will examine how we can best track indicator accomplishments and effectively position SNR.
2. Develop a process to ensure that faculty are nominated for appropriate awards and other recognition for extension/outreach. (No cost)
WHO: Director, associate directors, and coordinators will discuss mechanisms to effectively ensure recognition in all areas.

C. Build greater coordination and synergy of outreach efforts within SNR

1. Build extension/outreach action around common themes (similar to research cluster concept).
WHO: Outreach Committee and Extension/outreach Coordinator will explore strengths and will facilitate formation of clusters to mesh with public issues & SNR research and survey.

II. Enhance Resources for Extension/Outreach

A. Improve Facilities

1. Ensure that the Hardin Hall renovation accommodates the extension/outreach vision and needs.
WHO: The Outreach Committee and Extension/Outreach Coordinator will monitor renovation progress, provide inputs, and maintain close liaison with the renovation planners.
2. Propose an overall plan and action steps for Prairie Pines by December 2003, to include collaboration with multi-agency stakeholder task force, initiated last year.
WHO: SNR Director and Extension/outreach coordinator will work with SNR faculty, CASNR Dean, and partners to develop a mutual vision and action goals, including assessment of changes needed in the Conservation Easement.
3. Develop a five-year plan for enhancement of Horning State Demonstration Forest as an outdoor teaching laboratory for forest landowners.
WHO: The Extension Forester in cooperation with the Outreach Committee will work with Nebraska Forest Service personnel, who currently manage the facility.

B. Personnel

1. Secure a caretaker for Prairie Pines, about 10 hours/ week. **(Cost: ~\$5K)**
WHO: SNR Director, extension/outreach coordinator and others will continue to explore options, including internal job shifts, external part-time assistance, and building multi-agency partnerships that might share full-time caretaker costs.
2. Establish funding for B-line NR educators located within SNR, perhaps through collaboration, grants, and partnerships. **(~\$40K/year)**
WHO: Faculty or faculty clusters will explore possibilities as appropriate in development of program goals.
3. Establish an extension assistantship **(\$15K/year)**
WHO: Extension/outreach coordinator will work with Director and Outreach Committee to explore possibilities.

C. Fund Raising. Form a fund-raising committee to foster contributions to SNR development funds.

WHO: Director, Outreach Committee, and Extension/outreach Coordinator with inputs from faculty & staff.

III. Strengthen linkages between extension/outreach, teaching, and research

1. Develop extension educator interest in SNR and in potential affiliate or collaborative status – invite to SNR research colloquium.
WHO: Research Committee will invite extension educators to the fall research colloquium.
2. Develop an issues forum on global issues in natural resources & agriculture – involve, extension Action Teams, other NU departments, collaborators. **(~\$2-5K)**
WHO: If IANR Day or similar event is held that could include an issues forum, as held earlier, the SNR Director will appoint a committee to develop a proposal for a forum on this topic.
3. Host seminar series on issues of broad interest & uplink to satellite so available across state – involve extension educators, partners, collaborators. **(\$5K/year but also a research goal)** *WHO: Research Committee in developing visiting*

scientist seminar series, will plan for satellite uplinks so that extension offices, and perhaps their clientele, could also view the seminars.

4. Graduate student hands-on exposure to extension system (e.g., write NebGuide, NebFact, Extension Circular, assist/present program – related to graduate specialty area). (**Cost minor**)

***WHO:** The Outreach Committee will coordinate a sub-group to draft a brief description with examples of opportunities for graduate student involvement in extension/outreach; report to faculty; and include in graduate student learning opportunities by December 2003.*

Appendix 6.2. Active collaborations with the following entities help further extension/outreach goals

K-State Research and Extension
US Natural Resources Conservation Service
US Fish and Wildlife Service
USDA, APHIS, Wildlife Services
USDA, APHIS – National Wildlife Research Center
USDA National Agroforestry Center
US Forest Service
US Bureau of Reclamation, Nebraska/Kansas Area Office
US Bureau of Land Management
US Environmental Protection Agency (2000)
US Department of Defense
Four 1994 Tribal colleges in NE, ND and SD, and other universities (particularly UMO, ISU, KSU and UMN)

Nebraska Game and Parks Commission
Nebraska Forest Service
Nebraska Department of Agriculture
Nebraska Health and Human Services System
Nebraska Department of Education
Nebraska Department of Environmental Quality
Lower Platte South Natural Resources District
Central Platte Natural Resources District (2000)
Central Public Power Irrigation District (2000)

Nebraska Chapter, the Wildlife Society
Nebraska Division, Izaak Walton League of America
Nebraska All Bird Alliance
Nebraska Alliance for Conservation and Environment Education
Nebraska Wildlife Federation
Audubon Nebraska
Wachiska Audubon Chapter
Keep Nebraska Beautiful
Nebraska Pheasants Forever Chapters
Nebraska Sustainable Agriculture Society
Nebraska and Northern Nut Growers Associations
National Arbor Day Foundation
Nebraska Community Forestry Council
Nebraska Statewide Arboretum
Nebraska Florist Society, Nebraska Corn Growers Association, National Pork Board
Nebraska Bowhunters Association, Rocky Mountain Elk Foundation, Whitetails Unlimited

Active collaborations are expected to increase with the following entities, particularly with the additional strengths brought through our merger.

Nebraska Natural Resources Commission and Nebraska's 23 Natural Resources Districts

Appendix 6.3. SNR Extension and Outreach Resources for the Public

Publications (selected) - Publications listed below include *NebGuides* (numbers beginning with G), *NebFacts* (NF), or *Extension Circulars* (EC). Most are available on the Internet and, in print form, most are 8.5 x 11 inch format. *NebGuides* are 2-4 page, peer-reviewed publications that address specific topics or issue areas and most have a how-to approach. *NebFacts* are similar to *NebGuides* but are intended to address short-term information with a more rapid response; *NebFacts* are not printed in bulk but rather are provided to extension offices to print or copy on demand. *Extension Circulars* are generally longer (e.g., 6-50 pages or more), often in color, and usually provided as a for-sale only item, but some (e.g., windbreak series) are grant supported and provided without cost. *Extension Circulars* may be developed, reviewed, and used regionally or nationally and some are designated as *North Central Regional* (NCR) publications. Publications listed below are by subject area. Additional publications in these areas may be produced by other units (e.g., many water-related publications) or affiliates (e.g., Nebraska Forest Service).

Meteorology/Climatology

- G02-1451-A *Climate Change and Winter Wheat: What Can We Expect in the Future?*
- G96-1311-A Global Warming: What is Known and Why Nebraska Agriculture Should Care
- G90-992-A Evapotranspiration (ET) or Crop Water Use
- G80-526-A The Effect of Weather on Corn: Preseason Precipitation and Yield of Unirrigated Corn
- G98-1362-A Soil Temperatures and Spring Planting Dates
- G81-522-A Effects of Weather on Corn Planting and Seedling Establishment
- G86-803-A Assessing Hail Damage to Corn
- G83-673-A Maturity Dates and Freeze Risks Based on Growing Degree Days
- G86-796-A Growing Degree Day Requirements and Freeze Risks as a Guide to Selecting and Planting Corn Hybrids
- G96-1312-A Autumn Freeze Probabilities
- G96-1281-A Spring Freeze Probabilities
- NF91-39 Precipitation and Sprinkler Irrigation Monitoring for Managing Irrigation Scheduling
- NF96-304 An Introduction to Wind Power for Nebraskans
- NF91-27-A Discussion of 'Greenhouse' Gases
- NF96-265 Tornado Safety
- NF96-266 Lightning Safety

Forestry

- EC1737 Broadleaf Trees for Nebraska
- EC1738 Tree Planting Guide
- EC1760 Trees & Shrubs for Nebraska Conservation Plantings
- EC1762 Nut Tree Cultivars for Nebraska
- EC1764 Windbreak Establishment
- EC1766 Windbreaks for Livestock Operations
- EC1767 Windbreaks for Rural Living
- EC1768 Windbreak Management
- EC1770 Windbreaks for Snow Management
- EC1772 Windbreaks in Sustainable Agricultural Systems
- EC1778 Field Windbreaks
- EC1768 Windbreak Management
- EC1777 Windbreak Renovation

G315 Establishing Black Walnut
G380 Growing Conifers from Seed
G1195 Care of Newly Planted Trees
G1304 Windbreak Design
G1349 Woody Landscape Plants: Selection and Planting
G1350 Woody Landscape Plants
AF0003 Woody Landscapes for People and Wildlife
G1417 Site Preparation: Key to Successful Conservation Tree Planting in Western Nebraska
NF362 Chemical Weed Control in Tree Planting Projects Part I - Pre-emergence Herbicides
NF363 Chemical Weed Control in Tree Planting Projects Part II - Post-emergence Herbicides
EC1224 Pruning Shade Trees
EC1763 How Windbreaks Work
G45 Managing Black Walnut Plantations for Timber 0.25
G60 Working With Wood I. Home Drying Lumber
G60 Working With Wood I. Home Drying Lumber
G431 The Four-Flap Graft: An Easy Grafting Technique for Nut or Hardwood Trees
G923 Windbreak Maintenance and Renovation
G1036 Environmental Stresses and Tree Health
G1329 How to Manage Your Woodlands for Sustained and Maximum Benefits
G1433 Environmental Stresses and Tree Health
AF0004 Hybrid Hazelnuts: An AgroForestry Opportunity
CC365 Stewardship Forest - The Sign You Care
EC1221 Arbor Day a Nebraska Creation
EC1741 Christmas Trees: a management guide
EC1744 Prairie Fires And The Nebraska Pioneer
EC1759 Nebraska's Champion Tree Register 1991
G866 Christmas Tree Selection and Care
G881 Heating With Wood I. Species Characteristics and Volumes
G968 Nebraska's Forest Resources: Acreages and Ownership
NF180 Landscape Tree Appraisal
G1035 Tree Injuries -- Prevention and Care
G1452 Landscaping Around Established Trees
AF0001 Marketing Specialty Forest Products
G314 Native Wood Fence Posts
G334 Timber Sale Contracts
G383 Marketing Your Timber

Water

EC1427 Ponds for Nebraskans
NF429 Controlling Pond Algae with Barley Straw

Wildlife

Book: Prevention and Control of Wildlife Damage – Two notebooks (or on CD), 850 pages; 83 chapters include 80 species accounts, descriptions of registered vertebrate pesticides, and sources for supplies and materials.

EC1761 Poisonous Snakes and Snakebite in Nebraska
EC1763 Deer Damage Control in Nebraska
G02-1464 West Nile Virus – Getting Prepared
G887 Controlling Vole Damage
G908 Controlling Snake Problems Around Homes
G1105 Controlling House Mice

| | |
|----------|--|
| G1106 | Controlling Rats |
| G1110 | The Thirteen-Lined Ground Squirrel: Controlling Damage |
| G1215 | Bait Stations for Controlling Rats and Mice |
| G1217 | Rodent-Proof Construction: Drains and Feeding Equipment |
| G1283 | Using Burrow Builders for Pocket Gopher Control |
| G1288 | Moles and Their Control |
| G1290 | Pocket Gophers and Their Control |
| G1377 | Tree Squirrels and Their Control |
| G1401 | Prevention and Control of Rabbit Damage |
| G1434 | Controlling Beaver Damage |
| G1476 | Prairie Dogs and Their Control |
| G1477 | Fumigation of Burrowing Rodents with Aluminum Phosphide or Gas Cartridges |
| NF247 | Assistance With Wildlife Damage in Nebraska |
| NCR451 | Starling Management in Agriculture |
| G01-1427 | Backyard Wildlife: Bird Houses and Shelves |
| G83-669 | Backyard Wildlife: Feeding Birds |
| G1331 | Backyard Wildlife: To Feed a Hummingbird |
| G84-671 | Backyard Wildlife: Planting for Habitat |
| G1332 | Backyard Wildlife: Tips for Success |
| G84-672 | Backyard Wildlife: Making It Come Alive |
| G279 | Processing Deer |
| NF355 | House Finch "Eye" Disease |
| EC1771 | Windbreaks and Wildlife |
| EC4-H125 | Wildlife Conservation (4-H) |
| EC59381 | Bird Behavior (4-H) |
| EC51582 | Fishing (4-H) |
| MF2266 | Wildlife Habitat Evaluation Handbook, Participant's Manual (4-H, joint with K-State) |
| MF-2265 | Wildlife Habitat Evaluation Handbook, Leader's Guide (4-H, joint with K-State) |

Internet Web Sites (SNR or affiliates, by content or subject area)

Electronic Publications, materials, resource sites

Conservation and Survey Division (materials available include books, reports, pamphlets, topographic and other maps, geologic and soils surveys, satellite images, aerial photographs, and digital geospatial (GIS) data (<http://csd.unl.edu/csd.htm>))

Cooperative Extension publications (<http://extension.unl.edu/publications.html>)

Environmental Resource Center (<http://unerc.unl.edu/links.htm>)

Nebraska Field Research Sites Network (<http://snrs.unl.edu/wedin/nefieldsites/>)

Pesticide Education Resources (<http://pested.unl.edu/>)

University of Nebraska State Museum –

Anthropology Division (<http://www-museum.unl.edu/research/anthropology/anthro.html>)

Botany Division (<http://www-museum.unl.edu/research/botany/botany.html>)

Zoology Division (<http://www-museum.unl.edu/research/zoology/zoology.html>)

Forestry

Nebraska Forest Service (<http://www.nfs.unl.edu/>)

Nebraska Statewide Arboretum (<http://arboretum.unl.edu/>)

Meteorology/Climatology

Climate and Bio-Atmospheric Sciences Group (CBAS – <http://snrs.unl.edu/cbas/>)

Climate and Environmental Change Studies (at UNL) (<http://snrs.unl.edu/climate/>)

National Drought Mitigation Center (<http://drought.unl.edu/>)
Great Plains Regional Climate Center - National Institute for Global Environmental Change
(<http://nigec.ucdavis.edu/greatplains/>)
High Plains Regional Climate Center (<http://www.hprcc.unl.edu/index.html>)
Nebraska Climate Prediction (<http://snrs.unl.edu/climate/prediction/>)
Nebraska Weather and Climate Information (<http://www.hprcc.unl.edu/nebraska/>)

Remote Sensing/GIS

Center for Advanced Land Management Information Technologies (CALMIT –
<http://www.calmit.unl.edu/>)

Water

Water Center (<http://watercenter.unl.edu/>)
Water Sciences Laboratory (<http://waterscience.unl.edu/>)
Nebraska Earth Systems Education Network (NESEN – <http://nesen.unl.edu/>)

Wildlife

Internet Center for Wildlife Damage Management (<http://wildlifedamage.unl.edu/>)
Tern and Plover Conservation Partnership (<http://ternandplover.unl.edu/>)
HerpNeb (Reptiles & Amphibians of Nebraska) (<http://snrs.unl.edu/herpneb/>)
The Wildlife Society – Wildlife Damage Management Working Group
(<http://wildlifedamagegroup.unl.edu/>)
National Animal Damage Control Association (<http://nadca.unl.edu/>)
Western Association of Agricultural Experiment Station Directors, Western Coordinating Committee –
95, Vertebrate Pests of Agriculture, Forestry, and Public Lands (<http://wcc-95.unl.edu/>)
National Pork Board, Rodent Control in Swine Facilities (<http://rodent.swine.unl.edu/>)

Appendix 6.4

SNRS Brochure

Appendix 6.5. EARS Reports (selected, 1998 - 2003)

The Extension Accountability Reporting System (EARS) is an Internet-based system for reporting and retrieving accomplishments and impacts of outreach programming. Faculty, staff, and teams generate reports when a program is completed or when accomplishments and impacts warrant. Reports are usually ½ to 1½ pages in length and some incorporate figures or photos. Extension administration reviews the reports and may accept them as written or request revisions prior to posting on the EARS web site (<http://deal.unl.edu/extension/ears/>), found on the Cooperative Extension web page.

These reports are then available to stakeholders outside the University such as decision-makers, partners, or other interested individuals. Within the University, these reports help link common interests and maintain understanding of the breadth of programs underway. They are also used to help generate federal reports on progress toward goals, and responses to inquiries about outreach programs in specific areas of interest. Below is a list of recent (1998-2003) EARS reports describing programs that were led by the School or in which the School had a significant role, followed by *eight sample reports (listed in bold with page numbers)*.

| Subject Area | Page |
|---|-------|
| Forestry | |
| 6.5-1. Improving Tree Selection and Care in Communities (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=770) | |
| 6.5-3. Eastern Red Cedar Management Goat Grazing Study (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1177) | |
| 6.5-2. Eastern Red Cedar as Landscape Mulch (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1175) | |
| 6.5-4. Tree Care Workshops (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1235) | A6-11 |
| 6.5-5.. Series on Alternative Agricultural Enterprises Held in Washington County (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1598) | |
| 6.5-6. Conservation Buffer Site Visit and Tour (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1940) | |
| 6.5-7. Small Acreage Owner Workshop and Tour (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1863) | |
| 6.5-8. Creating Fire-safe Homes and Properties in Niobrara River Valley (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1622) | |
| 6.5-9. Conservation Tree Planters Workshop for Landowners (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=805) | |
| Meteorology/Climatology | |
| 6.5-10. Crop Watch Newsletter (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1604) | |
| 6.5-11. On-line Weather and Climate Resources (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=230) | A6-13 |
| 6.5-12. Weather in the Classroom Workshop (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1009) | |
| 6.5-13. 1999 Nebraska Earth Science Education Network (NESEN) Summer Workshop Series (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=977) | |
| 6.5-14. 1998 Global Environmental Change Education Workshop (http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=979) | A6-14 |

- 6.5-15. ***The STEDII Project*** - Students and Teachers Exchanging Data, Information, and Ideas
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=980>) A6-15

Wildlife

- 6.5-16. ***Wildlife Habitat Evaluation Program, 2002***
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=2140>) A6-16
- 6.5-17. Bird Celebrations Engage Communities and Education
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=2120>)
- 6.5-18. ***Birds in Trouble – Birds and Industry Help***
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=2100>) A6-18
- 6.5-19. Building a Coalition for Conservation Education
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1173>)
- 6.5-20. Wildlife and People: Conservation for Backyards, Acreages, or Farms
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=310>)
- 6.5-21. ***Wildlife Damage Handbook***
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=344>) A6-19
- 6.5-22. 13th Great Plains Wildlife Damage Control Workshop
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=345>)
- 6.5-23. Dramatization of Changes in Wildlife Populations and Damage Management Techniques – Youth
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=960>)
- 6.5-24. 2001 Student-Professional Workshop – Wildlife Diseases
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1338>)
- 6.5-25. Dealing With Problem Wildlife in Urban Environments - 2000 Animal Control Workshop Series
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1339>)
- 6.5-26. ***Nebraska Urban Pest Management Conference – 2002***
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1270>) A6-20
- 6.5-27. Semi-aquatic Mammals and Water Festivals
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=703>)

Miscellaneous

- 6.5-28. Nebraska Issues Symposium Held in Lincoln
(<http://deal.unl.edu/extension/ears/lib/showReport.cgi?RECORD=1456>)

6.5-4 Tree Care Workshops

IMPACTS OF TREE CARE WORKSHOPS ON NEBRASKA'S COMMUNITY TREE RESOURCES

Maintaining a healthy urban "forest" in Nebraska is a challenge, given the difficult climatic and soil conditions that exist in this prairie state. But urban forests provide enormous benefits to Nebraskans, including reduced heating and air conditioning costs, improved urban wildlife habitat, reduced run-off and flooding, enhanced surface water quality, reduced noise and dust pollution, and the creation of a more beautiful place to live and work. To improve the condition of Nebraska's community forest resource, the University of Nebraska Cooperative Extension (Forestry), the Nebraska Forest Service, and the Nebraska Statewide Arboretum have organized Nebraska Tree Care Workshops beginning in 1991. Since 1996, 1,579 tree care professionals and others interested in tree care have participated in these workshops. These day-long programs are held in six locations around the state each spring, cover a variety of tree selection and care topics, and provide a forum to discuss emerging problems associated with tree care.

To examine the impact of the Workshops on tree care in the state, we conducted (in 2000) a statewide survey of people who participated in at least one workshop from 1996-1999. We sent a comprehensive survey to a random sample of 600 former attendees, of which 193 (32%) were completed and returned. Survey respondents indicated their affiliation with the following groups: Information providers - 32% Commercial service providers - 27% Landowners/homeowners - 21% Other - 14% Both commercial and information providers - 6%

Most attendees learned of the workshops through direct mailing of brochures (58%), or through a friend, newsletter or newspaper (33%). Few (3%) learned of the workshops via email, and none via the WWW. Most attended to improve their tree care knowledge (40%), because of their job related needs (26%), or had an interest in tree care at work or at home (17%).

Attendees reported the following impacts as a result of their participation in the workshops:

- Tree care knowledge and skills of attendees were "improved" or "much improved".
- Over 62% (particularly commercial service providers and information providers) indicated they used the information they learned to train others in tree care. 83% of the respondents trained between one and ten people, 13% trained between 11 and 25, and 4% trained more than 25.
- 55% were more involved in community tree care.
- 31% of all respondents (75% of the information and commercial providers) were more involved in environmental issues.
- 39% (55% of commercial service and information providers) had joined tree care-related organizations.
- 86% thought that the condition of trees under their care had improved.
- 85% reported they planted or recommended a greater diversity of tree species. Greater urban forest diversity leads to more beautiful urban areas, reduced risk of catastrophic disease epidemics, and a more resilient community forest resource.
- 5% thought their income had increased due to their participation. Generalizing about the population of attendees, we would expect 2% to 8% of the population (31-126 people) to experience income gains as a result of attending the workshops.
- Publications distributed at the workshops were used on the average of once a month by all respondents, and slightly more often by information providers.
- Statewide, attendees indicated that management of community tree resources had somewhat improved, with western NE respondents rating tree resource management as "improved".
- 25% reported that their communities had established or changed tree care ordinances.
- 50% indicated they thought their communities had benefitted economically. Such benefits include but are not limited to energy conservation, greater interception and infiltration of precipitation leading to reduced flooding, and improved air quality and human health.

Clearly, the Nebraska Tree Care Workshops have had a considerable impact on improving community tree resources and their management across the state. They have been instrumental in creating a large cadre of well-trained people in tree selection and care. These people often train others and/or provide improved tree-related services to the public, and work in tree-related organizations and their communities to increase the quality of tree care statewide. The size and expertise of this cadre of skilled specialists increases with each passing year, with positive statewide impacts on Nebraska's community forests.

Additional Team Members: David Mooter and Mark Harrell - Nebraska Forest Service, and Justin Evertson, Nebraska Statewide Arboretum

Author: SJO SIAH **Additional Team Members:** Peter Skelton, David Mooter, Mark Harrell, Justin Evertson **Action Plan:** Natural Resources and Environmental Management

6.5-11 On-Line Weather and Climate Resources

Team members, with support from the High Plains Climate Center, have developed a new On-Line System for Weather and Climate Resources. It is intended for decision makers or managers who use resources in agriculture, construction, energy, legal, recreation, transportation, or water sectors. The new system was developed to provide a tool for treating weather as a resource and for assessing potential hazards associated with the weather.

The system features:

. Multiple access (including internet). Real-time weather data (more than 140 AWDN sites). Historical daily climate data (over 100 years at long term sites). Impact statements. Simple station search and selection process. Forms for user specified inputs. Linkages to applications software of the Climate Center. Scheduled output based on user specifications. Many data delivery mechanisms to choose from (ftp, email,...). On-line help and examples

Subscriptions may be initiated with the Center staff at 402-472-6706

Potential users should be prepared to invest a few hours to learn the navigation keys in the new system and to explore the features of the system.

Users have been pleased to find that they can choose which stations, crops, maturity groups, emergence dates, etc. to run and that they can set up an autopilot to automatically send updated reports each morning or each week according to their needs.

Secondary distribution of the data and information from the system is occurring at District Research and Extension Centers and County Offices. Radio, traditional television, and satellite-based information broadcasters also include information from the system. Consultants; farm managers; city, state, and federal employees; and businesses are also regular clients.

It is anticipated that the information system will lead to wise use of resources and improved decision making by: reducing production costs in agriculture; increasing productivity in construction; identifying renewable natural resource levels; providing forensic information to the legal industry; and improving water use efficiency.

A complementary home page (no subscription necessary) provides users with access to recent weather maps (use location:
<http://hpccsun.unl.edu/home.html>)

For more information about the On-Line system call 402-472-6706 or email adutcher@hpccsun.unl.edu

Author: KHUBBARD **Additional Team Members:** DSTOOKSBURY-AGMET, SMEYER-AGMET, WSORENSEN-AGMET, JHINES-AGMET, ADUTCHER-AGMET, MWERNER-AGMET **Action Plan:** Natural Resources and Environmental Management

6.5-14 1998 Global Environmental Change Education Workshop

This 4-day workshop was part of an overall project entitled "Process-Oriented Environmental Change Education: A Model for Connecting Research to the Classroom," funded by the Great Plains Regional Center (GPRC) of the National Institute for Global Environmental Change (NIGEC). In this workshop, similar to the one held in 1997, 6 K-12 earth science teachers recruited non-earth science colleagues in order to examine global environmental change from a multidisciplinary perspective. A total of 13 teachers participated in this workshop (one earth science teacher brought two non-earth science colleagues). During the workshop, the scientific process was modeled for the teacher-teams who were then to develop cooperative, hands-on, process-oriented educational curricula using available environmental change information and data. As educators become more comfortable with global environmental change concepts and data uses, student participation should expand as more students are encouraged to do science. Survey instruments were developed to collect information about the ongoing workshop process. Through the survey, teachers indicated that as a direct result of this workshop:

- 77% had a concrete plan to implement a unit on global environmental change

- 69% learned to use technology to enhance their teaching

- 61.5% will spend more time fostering their students' abilities to observe, classify, predict, and hypothesize (i.e., they will spend more time with their students using the scientific process); 88% of the earth science teachers will spend more time in this endeavor

- 92% learned ways to integrate science, technology, and other subjects into their classes

- 92% were confident that they could develop an interdisciplinary unit on global environmental change

- 46% felt confident that they could help their students interpret results consistent with accepted scientific understanding

- 69% were confident that their ability to teach earth science content had improved

Author: SMEYER **Additional Team Members:** DGOSELIN **Action Plan:** Natural Resources and Environmental Management

6.5-15 The STEDII Project

Students and Teachers Exchanging Data, Information, and Ideas (STEDII) is a program established in 1996 under the auspices of the Nebraska Earth Science Education Network (NESEN) to help K-12 teachers emphasize data collection as a part of their regular weather unit curriculum. NESEN provides not only the basic weather instrumentation to participating schools but also a method to share collected data with other schools via the Internet.

When the participating teachers evaluated the program, the following four outcomes were consistently mentioned:

- STEDII provided a method for students to learn basic weather principles including how different variables are measured and how different variables are related

- STEDII helped students learn how to take data, develop good research techniques, and good critical thinking skills

- As their weather unit progressed, the students started to question data quality (were data "bad" or "good") and they began to develop their own hypotheses and methods to test those hypotheses

- STEDII provided many students (and teachers) with a good first contact to the Internet as students shared the data they collected with other participating schools

Each year the project reaches approximately 2,500 students.

Author: SMEYER **Additional Team Members:** MMESARCH, DGOSELIN **Action Plan:** Natural Resources and Environmental Management

6.5-16 Wildlife Habitat Evaluation Program, 2002

Issues involving wildlife, habitat, and biodiversity are increasingly common in the news and our daily lives. Youth of today will become the next generation of decision makers and will need common sense understanding of wildlife and habitat conservation in order to make informed decisions.

The Wildlife Habitat Evaluation Program (WHEP) is a year-round educational experience that involves youth from ages 8–18, adult leaders, and natural resource biologists. Participants develop life skills while learning about rural and urban wildlife stewardship and preparing for a statewide event and contest, held each spring.

Many participants have never been exposed to this information before and the experience has changed views and career goals for some. Participant comments: "Awesome contest that teaches with fun activities," "keep it up; I had a lot of fun," "learning experience." Evaluations each year consistently show marked learning and life skills development.

During 2002, 55 youth participants (31% girls, 69% boys), 8 judges (natural resource professionals), and 14 coaches or other volunteers participated in the statewide event. Contestants reported average preparation times of 2.3 hours/week for 5.4 weeks (seniors, age 14-19) or 3.8 weeks (juniors, age 12-13). Evaluations indicate youth learning about wildlife and conservation (100% of responses), career choices (91%), working with others (97%), decision making (97%), and public speaking (94%). Of those learning about conservation & wildlife, 56% reported learning a lot or a huge amount and 100% reported learning how to apply the information on land where they lived.

The top senior team from the state contest participated in the national invitational, held in central Ohio, July 2002, where the focus was wetland habitats. Last year, the top Nebraska team went to the Grand Targhee Resort, Wyoming, and in other years to North Carolina, Texas, Tennessee, and other states. Each year, this national trip, funded by sponsors, is a life-changing experience and an introduction to new habitats and new experiences with biologists and young people from across the United States.

Youth can participate in Novice (ages 8-11), Junior, or Senior Divisions and can learn at their own speed. Adult leaders help youth learn through activities and information in the Participant's Manual, supplemented by a Leader's Guide.

The WHEP contest is the primary focus of the 1½ day statewide event, which also includes workshops and other learning experiences. Teams of 3-4 youth, coached by an adult leader, compete in the Junior and Senior Divisions. Youth in the Novice Division participate in a variety of non-competitive educational activities. Top Junior and Senior teams and individuals receive awards, and the top Senior team is eligible to participate at the national invitational, a superb experience funded by sponsors. All participants receive a unique program T-shirt.

Contest components include:

- identifying wildlife foods
- on-site habitat recommendations
- interpreting wildlife habitat using aerial photographs and giving a verbal defense (oral reasons) for decisions,
- rural and urban wildlife management plans.

Nebraska Pheasants Forever Chapters and the Izaak Walton League of America Endowment are primary financial supporters of WHEP in Nebraska. Additional support is provided by Nebraska Division, Izaak Walton League of America; and Nebraska Chapter, The Wildlife Society. Travel expenses for the top senior team to the national event, award trophies, unique T-shirts for all participants, and other support was provided.

Partner agencies include the Nebraska Game and Parks Commission, Natural Resources Conservation Service, and U.S. Bureau of Reclamation/Nebraska-Kansas Area Office in Grand Island. Others participate as needed in various years.

Author: RJOHNSON

Additional Team Members: Additional coordinating team members/contacts: DHemsath - Nebraska College of Technical Agriculture; JLackey and DVirchow - School of Natural Resource Sciences; JLeasure - Bureau of Reclamation/Nebraska-Kansas Area Office; RMcCrary - Amherst; ESiffing - Concordia College; SRiley - Nebraska Game and Parks Commission; BBirstihl and SFerguson - 4-H Youth Development; RPhillips - Seward.

Others involved: PBerthelsen - Nebraska Pheasants Forever Chapters; MMiller - Izaak Walton League of America Endowment; RMettenbrink - Nebraska Division, Izaak Walton League of America; WSheets - Lincoln Izaak Walton League of America, Chapter 43; GSteinauer - Nebraska Chapter, the Wildlife Society; JDrahota, U.S. Fish & Wildlife Service; JMiller and CKerner - Natural Resources Conservation Service; LBadura, DFiggs, BMeduna, BSeitz, and BMoritz - Nebraska Game and Parks Commission.

Action Plan: Natural Resources and Environmental Management

6.5-18 Birds in Trouble -- Volunteers & Industry Help



Endangered least terns (*Sterna antillarum athalassos*) and threatened piping plovers (*Charadrius melodus*) nest in Nebraska on river sand bars and on gravel mine spoil piles where they are vulnerable to predation and potential conflicts with mining operations. The Tern and Plover Conservation Partnership was established in 1999 to protect these and other river birds in a way that reduced conflicts with private industry and that educated and involved local communities. The Partnership's "Adopt-a-Colony" program helps with project activities and engages local community members in endangered species management and protection issues. Volunteers help set up and take down electric fences, establish colony research plots, and monitor populations and reproductive success.

During summers of 2000 and 2001, 125 volunteers adopted 14 colonies each year along the lower Platte River contributing 677 site visits and 1095 volunteer hours. Surveys returned by 55 (44%) of the volunteers showed that 97% of volunteers increased their knowledge about terns, plovers, and their habitat and 100% reported increased appreciation for the birds and river ecosystem. Most

volunteers (76%) felt they could make more of a personal difference in the recovery of terns and plovers, and 61% expressed greater interest in being involved in the decision-making process regarding river issues. Also, a majority (71%) felt they had increased their knowledge of the gravel mining process and 74% agreed that gravel mining companies demonstrated concern for the environment. Volunteers discussed their experiences with an average of 19.8 people (range 4-50), indicating that they reached over 1,000 others about terns, plovers, and Partnership activities.

The public outreach efforts and volunteer program are creating an informed public with greater appreciation and interest in conserving river-dependent wildlife. Comments include: "We clearly understood everything, including the gravel operator's perspective;" "Now that I know more about these endangered species, I have a greater appreciation for them;" "...was happy to aid in the conservation;" "I gained a greater appreciation for nature in general;" "My co-workers became interested in what I was doing, so at times I was able to share information on the plight of the terns and plovers;" "...when I wore the T-shirt, some people would ask me about the program;" "Wrote a letter commenting on Missouri River master manual in regard to managing river for terns and plovers;" "Thank you for the opportunity to help make a difference by doing what I enjoy doing."

Volunteers came from the following Nebraska counties: Butler - 1, Cass - 16, Colfax - 1, Dodge - 5, Douglas - 32, Hall - 1, Lancaster - 28, Platte - 7, Sarpy - 10, Saunders - 6, Washington - 1.

Author: RHELD **Additional Team Members:** This project made possible by grants from: The Nebraska Environmental Trust, The Wildlife Conservation and Restoration Program, and The U.S. Fish and Wildlife Service. Additional support is provided by participating partners.

Partners include the Nebraska Game and Parks Commission, Nebraska Environmental Trust Fund, Lyman-Richey Corporation, Mallard Sand and Gravel, Western Sand and Gravel, Overland Sand and Gravel Company, Arps Gravel and Concrete, Girl Scouts-Great Plains Council, and U.S. Fish and Wildlife Service. Other sand and gravel companies cooperate with the partnership.

Additional coordinators/contacts include: CThody - School of Natural Resource Sciences; JDinan - Nebraska Game and Parks Commission.

Supporting personnel: DManske, JMalfait, KFox, CGrell, SFinkbeiner, and CTaylor - Nebraska Game and Parks Commission; JLaackey, CMeyer, RJohnson - School of Natural Resource Sciences. **Action Plan:** Natural Resources and Environmental Management

6.5-21 Wildlife Damage Handbook

"Prevention and Control of Wildlife Damage"

Edited by Scott E. Hygnstrom, University of Nebraska Cooperative Extension; Robert M. Timm, University of California; and Gary E. Larson, USDA-APHIS-Wildlife Services.

Published by the University of Nebraska Cooperative Extension, USDA-APHIS-Wildlife Services and the Great Plains Agricultural Council.

"Prevention and Control of Wildlife Damage" is recognized as the premier reference book in the field of wildlife damage management. The latest edition of the "Handbook," published in 1994, is available as a two-volume, 850-page book and CD-ROM. It contains 77 chapters on all wildlife species that regularly cause wildlife damage and nuisance problems in North America. Each species chapter includes an identifying illustration, quick-reference management outline, and sections on identification, general biology, damage identification, legal status, economics, prevention and control methods, and references. In addition, the Handbook includes chapters on identification and assessment, obtaining assistance, wildlife diseases, vertebrate pesticides, sample pesticide labels, and a directory of supplies and materials. The Handbook emphasizes an integrated pest management (IPM) approach through the use of cost-effective non-lethal methods and safe, selective use of lethal control methods when justified.

Used by resource specialists throughout the United States, Canada, Mexico and other countries. It can be found in every USDA-APHIS-Wildlife Services office in the nation. Thirteen states have placed a copy in every one of their county extension offices. It is used as a textbook in 15 university wildlife courses. Other primary users include personnel from state natural resources agencies, municipalities, private pest control operators and the general public. Over 8,500 copies sold.

Respondents indicated that they used information from the Handbook at least "once per day" (9%), "once per week" (41%), or "once per month" (50%).

Users reported that the Handbook increased their knowledge of wildlife damage management "considerably" (49%), or "somewhat" (48%).

Users reported that the Handbook increased the efficiency of how they do their job "considerably" (60%), or "somewhat" (34%).

Respondents indicated that on average they saved \$635 in resources protected and \$247 in associated costs each time they used the Handbook. In addition, they saved an average of 2.5 hours finding information, 2.6 hours conducting prevention and control work and 3.9 hours conducting prevention and control work in the future.

We conservatively estimate that the Handbook saves \$220 million in resources and \$210 million in labor each year.

Copies of the Handbook can be ordered (book-\$45, CD-ROM-\$43) by writing Wildlife Damage Handbook, 202 Natural Resources Hall, University of Nebraska, Lincoln, NE 68583-0819, or calling 402/472-2188.

Author: SHYGNSTROM **Additional Team Members: Action Plan: Natural Resources and Environmental Management**

6.5-26 URBAN PEST MANAGEMENT CONFERENCE - 2002

This program was developed to meet the educational needs of Nebraska's professional pest control firms, public health employees, grain fumigators, food processors, sanitarians and others who work in related areas of urban pest management. These individuals in many cases must be federal/state certified and this conference allows them an opportunity to certify/recertify to use general and restricted use pesticides when providing services to Nebraskans. This program, initiated at the request of a Nebraska commercial grain fumigation firm, has been offered and conducted annually since 1992.

A high percentage (96.3%) of questionnaire respondents (n=80) felt that speakers and topics presented at the 2002 UPM Conference met their needs. Attendees felt that information presented to them would result in: reduced pesticide usage (13.8% of respondents), increased use of nonchemical controls (66.3%), greater appreciation for IPM approaches (76.3%), improved knowledge of pests (80.0%), greater profits for their businesses (42.5%), better knowledge of the law and regulations (67.5%), safer pesticide use practices (75.3%) and improved ability to meet pesticide applicator certification standards (66.3%). Over 98% percent of respondents felt that attendance at this and other Nebraska UPM Conferences has had a positive impact on their levels of knowledge and their businesses.

Subject matter is identified through assessment of clientele needs and is also received through our conference advisory committee and surveys of UPM Conference audiences the year previous. Subject matter includes pest identification, biology, damage assessment, decision-making, recommendations for environmentally safe and effective control, to ensure safety of the pest manager and people, animals and ecosystems.

Educational methods include live speaker presentations by local, national and international subject matter authorities, illustrated with PowerPoint visuals, overheads, videotapes, proceedings articles, handouts, an informational packet and hands-on laboratory sessions for conference participants.

A total of 190 attendees representing Nebraska pest control, food processing, food service, grain storage, hotel/motel, sanitary, regulatory, health related and other industries participated in this years UPM Conference.

Author: DKEITH
Additional Team Members: JALBRECHT, JFECH, FBAXENDALE, MELLIS, DFERRARO, RGAUSSOIN, LGIESLER, SHYGNSTROM, DJANSEN, JKALISCH, SKAMBLE, DKEITH, WKRAMER, SNIEMEYER, BOGG, COGG, JRUPNOW, LSCHULZE, DSMITH, DSTEINEGGER, JWATKINS
Action Plan: Community and Residential Environment Enhancing Food Safety in the Food Chain

Appendix 6.6

Natural Resource Links SNR Newsletter

Eight issues of *Natural Resource Links* were developed in the School of Natural Resource Sciences prior to the merger in July 2003 with the Conservation and Survey Division and Water Center. Following the merger, this newsletter name will be unchanged but it will be lengthened from eight to twelve pages to accommodate the additional breadth in coverage.

CHAPTER 7 - SURVEY PROGRAMS

7.1 Introduction

7.1.1 Definition of “Survey”

Survey programs are different from “traditional” academic units and it may be useful for the reviewers to be provided with information of what the characteristics of a survey are. In September 1996, the then Vice Chancellor of the IANR, Dr. Irwin Omtvedt asked the members of the Research/Survey Task Force and School of Natural Resources Implementation Committee to define “survey functions”. Accordingly, in a memo dated October 7, 1996, Dr. Robert Diffendal, based on experience, reading applicable state and federal statutes, and reviewing the range of literature published by survey organizations, defined “Surveys” as having the following characteristics:

- Are based on systematic, comprehensive real world data acquisition;
- Involve data collection, data analysis, synthesis, and conclusions about the various facet(s) of the natural resource being studied;
- Commit investigator(s) to comprehensive research in specific geographic areas such as drainage basins and geologic basins; or political divisions such as cities, counties, state, the nation (in the case of the U.S.G.S. or Biological surveys), or the world (CALMIT);
- Pursue systematic research that builds and enlarges a data base and provides an accumulation of knowledge and understanding about the topic surveyed;
- Connect with other similar systematic research work done elsewhere;
- Are a public responsibility and are not personal or proprietary;
- Maintain the survey data and the resulting studies in the form of maps, reports, publications etc., where they can be accessed on demand by researchers and other members of the public;
- Are updated periodically and thus show trends through time;
- Are independent of person(s) undertaking survey, that is, are continued by others if an individual researcher(s) departs;
- Provide information that bears on the public well-being and protection, including economic development, health and safety, environmental quality of life, etc.

7.1.2 Relevant Legislation Governing CSD

The Conservation and Survey Division (CSD) was constituted by the Nebraska State Legislature in 1921 (Section 85-163) of the Nebraska Statutes. CSD is unique among state geological surveys in having very specific state statutes related to its mission, which demonstrates the importance the Legislature attached both to defining the organization and designating it as a unit within the University of Nebraska. CSD is mentioned in 24 sections of the Revised Statutes of Nebraska, but three of these sections are especially important. Sections 85-164 and 85-165 passed in 1921; and Section 85-1.104 passed in 1973.

Section 85-163 pertains to the creation and duties of the Conservation and Survey Division:

There is hereby created the Conservation and Survey Division of the University of Nebraska, which shall include the following state surveys: Soil, geological, water and water power, forest, road materials, and industrial. The Conservation and Survey Division shall perform the duties hereinafter defined:

- (11) Survey and describe the natural resources of the state, including soil, water, water power, potash, forests, road materials, and cement;
- (12) Study the climate, physical features, geology, and mineral resources of the state;
- (13) Study and describe the operations, production, and importance of the leading industries of the state;
- (14) Investigate and report upon conservation problems of the state;

- (15) Study the water-bearing formations of the state, and assist the citizens in locating water supplies;
- (16) Secure and preserve the logs of wells drilled in the state, and preserve specimens from each stratum, member, formation penetrated in said drillings, and inspect such drillings at any time during their progress, and require the person or persons in charge of drilling or prospecting to submit full data in regard to the specimens and logs of the wells;
- (17) Prepare and show lantern slides or pictures, including motion pictures, of the state's resources, industries, institutions and development, to be used for educational and industrial purposes within the state and for publicity purposes without the state, and secure and distribute other educational films and slides in Nebraska for educational purposes;
- (18) Compile and record, or publish information with reference to, the state's resources, industries and development, and when called upon to do so by an interested party, investigate and report upon oil, mineral, and gas structures and properties situated outside the state and leases or interests therein or thereon being sold or offered for sale in Nebraska. In cases or propositions wherein said investigations show that mineral, oil, or gas properties are misrepresented, or that fraud is practiced in selling same, their officers or agents shall be notified by the Conservation and Survey Division, and if they continue to so operate the same in Nebraska after said notice is given, the Division shall report its findings to the Attorney General for action;
- (19) Serve the citizens as an information bureau in regard to the resources, industries and development of Nebraska

Section 85-164 pertains to the powers, director and expenses of the Conservation and Survey Division:
The Conservation and Survey Division is given police power and authority for the purpose of carrying into effect and performing the duties defined in Section 85-163. The Board of Regents shall appoint a chief or director of the Division, who shall direct the work of the Division, subject to the approval of the regents. All expenses to 85-165 shall subject to the approval of the regents of the University of Nebraska, and paid out of appropriations made from time to time by the Legislature.

Section 85-165 pertains to Conservation and Survey Division agreements with federal departments:
The Conservation and Survey Division may enter into such agreements with federal departments as may be necessary to carry on cooperative surveys and investigations in the state, the agreements to be subject to the approval of the Board of Regents of the University of Nebraska.

Section 85-1.104 pertains to the establishment of the Institute of Agriculture and Natural Resources, of which the Division was made a part:

A University of Nebraska Institute of Agriculture and Natural Resources shall be established at the University of Nebraska-Lincoln, which shall embrace, but not be limited to, the following divisions or administrative units:

- (1) College of Agriculture;
- (2) Agricultural Experiment Station;
- (3) Cooperative Extension Service;
- (4) Conservation and Survey Division; and
- (5) Water Resources Research Institute

The University of Nebraska Institute of Agriculture and Natural Resources shall be headed by a vice chancellor, and each division or administrative unit shall have a dean, director, or other chief administrative officer.

In the other 20 sections, numerous Division functions are specified to include:

- A. participation in the Nebraska cooperative soil survey program;

- B. membership on the State Water Management Board (no longer in existence);
- C. membership on various natural-resource related boards;
- D. providing of research information and services to various state agencies and governments and agencies;
- E. involvement in the certification of well drillers;
- F. responsibilities in the management of Nebraska Educational Lands; and
- G. cooperation with the Nebraska State Forester.

7.1.3 CSD Mission

The mission of the CSD is derived from state statutes including:

- 1) Objectively characterize and evaluate Nebraska's natural resources, especially in areas related to geology, hydrology, soil sciences and geography;
- 2) Provide results of these actions to the public and to governmental and private agencies;
- 3) To maintain a strong capability to conduct research, to provide service, and to educate both public and academic audiences in the following specific areas:
 - A) Quantity and quality of both groundwater and surface water with emphasis on aquifer characterization, aquifer-stream interaction, and water and chemical movement through the vadose and phreatic zones;
 - B) The geologic framework as it relates to water resources, land use, minerals, public safety, economic development and geologic history;
 - C) Soils interpretation with emphasis on their areal occurrence and characteristics;
 - D) Remote sensing and the application of geographic information systems; and
 - E) Development of automated natural resources databases containing the results of the Division's survey, characterization and research activities.
- 4) To perform all activities using a multi-disciplinary approach involving interaction between Division staff members and those of other university units; local, state, and federal agencies; and private organizations and individuals.

7.1.4 CSD Administration: Current and Future (post-integration)

CSD became part of the newly created Institute of Agriculture and Natural Resources (IANR) in 1973. It is one of six dean-level administrative units reporting to the IANR Vice-Chancellor. IANR, in turn reports directly to the Chancellor of the University of Nebraska-Lincoln. Further administration detail on the constitution of IANR, its mission, responsibilities, etc. can be found in Chapter 2. CSD's mission and responsibilities are defined within the framework of IANR's. In fulfilling its mission as a broad-based earth science unit, CSD (like IANR) has public service, research, scholarly service areas, and teaching accomplished informally or through joint or courtesy appointments with academic units or on a contract basis. In 1997, with the creation of the School of Natural Resource Sciences (SNRS), several CSD faculty were encouraged to have joint appointments in both units, with the result that many aspects of natural resources related research and service came under the joint administration of CSD and SNRS. Examples included the Center for Advanced Land Management Information Technologies (CALMIT) which conducts research and provides expertise in geospatial technologies, and the Nebraska Earth Science Education Network (NESEN) an outreach activity that provides a mechanism for improving communication and linkages between K-12 earth-science teachers, resources, and professional expertise.

In 2001, with severe budget cuts afflicting the state of Nebraska and consequently impacting the university, it was recommended by IANR that the two units - SNRS and CSD be merged. An important source of conflict was the fact that CSD, being a dean-level unit, reported directly to the IANR Vice-Chancellor. On the other hand, the Director of SNRS reported to the IANR Deans. After much discussion it was decided that CSD functions would be overseen by one of the two Associate Directors.

This Associate Director would, however, report to the Director of the integrated unit, who in turn would report to the IANR Deans. Further detail on the complete administrative structure of the integrated unit is described in Chapter 2.

7.2 CSD Goals

In 2001, CSD underwent its 5-year review process. Specific goals were highlighted in the Self-Study Report prepared for the review.

The CSD mission statement stated earlier in this report highlights the overarching role of the Conservation and Survey Division – to help create well-informed citizens capable of making sound and rational decisions about natural resource issues. This is accomplished in various ways.

The division provides an integrated program of research, service, education and outreach focused on Nebraska's natural resources. CSD faculty and staff provide critical information and assistance to public agencies, educational institutions, organizations, businesses and citizens working to conserve the state's land, water and vegetation resources. The Division collects basic resource data in support of both research and educational programs throughout the university and across the state.

Basic to the Division program is research on the state's geologic framework, knowledge of which is necessary to understand the natural resources of Nebraska. Geologic research activities are complemented by strong programs focusing on groundwater, surface water, wetlands, natural hazards, minerals, oil and gas, land use and land cover (vegetation, wetlands, irrigation) and soils. The Center for Advanced Land Management Information Technologies (CALMIT) provides expertise and statewide leadership in geographic information systems and remote sensing.

The Division responds to questions from citizens, agencies, businesses and municipalities for information about Nebraska's natural resources. The Division publishes a broad range of reports, articles, maps and atlases, and houses extensive archives of aerial photographs, remote sensing imagery, digital spatial databases, maps and cross-sections showing the variety of Nebraska's natural resources and the influences of human activity.

The following goals, listed with objectives for each, have been developed to assist the Division in meeting its mission and role.

GOAL: Provide leadership to establish a stronger focus for natural resources in the university and the state.

- Provide programmatic leadership for natural resources in IANR, including coordinating natural resources research and service and developing a natural resources facility.
- Develop more collaborative relationships to enhance acquisition of natural resources data.
- Increase faculty participation in multi disciplinary natural resources research.
- Increase the Division's participation in teaching natural resources courses.

- GOAL: Improve service and information dissemination through automation of extensive natural resource databases for the state.**
- Provide leadership in establishing a statewide geographic information system (GIS) in cooperation with the Nebraska GIS Steering Committee.
 - Design procedures and set priorities for data automation to include assigning longitude/latitude to data.
 - Digitize all soils and geologic maps and automate all well data and resource production data. Include support for soil-map digitizing and soil-data automation within soil project agreements.
 - Provide leadership to give users "friendly" software to access data.
- GOAL: Enhance linkages both within and outside the university and expand outreach activities.**
- Increase cooperative projects with state and local agencies, city and county governments, as well as with the departments of Geosciences; Biological Systems Engineering; and the School of Natural Resources Sciences.
 - Increase and expand linkages with K-12 educators through the NESEN network.
 - Identify and establish projects for additional Educational Circulars and start planning for a regional and/or county atlas series.
 - Expand and improve information transfer mechanisms through the Internet, electronic publishing, additional conventional publications, workshops and service.
 - Establish additional cooperative agreements with federal agencies to facilitate interagency working relationships.
- GOAL: Establish a comprehensive geologic database.**
- Provide Quaternary geologic maps and derivative maps for principal urban areas of Nebraska.
 - Complete four remaining 1:250,000 scale geologic maps.
 - Establish procedures and documentation for stratigraphic unit compilations and complete the stratigraphic lexicon.
- GOAL: Enhance the position of CSD as a center of expertise in integrated hydrologic systems research.**
- Quantify groundwater-surface water relationships and the physical characteristics of groundwater flow systems in Nebraska.
 - Increase and improve utilization of numerical analysis for understanding subsurface physical and chemical processes, as well as the influences of irrigation wells on groundwater systems.
 - Begin investigations of *in situ* techniques for measuring aquifer properties and using depositional modeling to predict those properties.
 - Strengthen research activities related to wetlands.
 - Coordinate with soil scientists on projects related to understanding the relationships between the physical properties of the vadose zone and the distribution of agrichemicals.
- GOAL: Enhance the current CSD/CALMIT leadership position in remote sensing and geographic information systems (GIS) within the state, region and nation.**
- Expand the use of GIS and remote sensing as routine tools for assessment and management of Nebraska's land and water resources.
 - Enhance interaction with other programs in CSD and other units in IANR through cooperative research projects, development of new courses, and cross-listing of courses.

- Enhance methods for improving satellite-based monitoring and analysis of land-surface, environmental and biophysical conditions at local to global scales of observation.
- Increase field research directed towards collection of basic spectral- reflectance and ancillary data sets, especially as related to aquatic ecosystems.
- Expand existing outreach/workshop program to include additional short courses, visiting scientists and post-doctoral appointments and an international emphasis.

GOAL: Establish the CSD soils program as the primary source of soils expertise and products in Nebraska.

- Increase soils program interaction with other natural resource and environmental programs.
- Develop soil-interpretation products for real estate tax equalization, on-site sewage and solid-waste disposal.
- Provide intermediate automated soils products to clientele, and on completion of soil survey projects, supply clientele with digital (GIS) soils maps and attribute data from CSD and other agencies.
- Enhance information services for landowners and operators.

As part of an Institute of Agriculture and Natural Resources program, the above goals and objectives were used to develop the following three action plans for 2000 to 2003. These action plans identify three areas of focus. We realize that our core programs of geology, remote sensing/GIS, soils, and water are on-going and projects not related to our actions will be driven by the core programs.

These goals also fit well in the mission and goals of the integrated SNRS/CSD unit, and are further enhanced because the Survey will now have easier access to resources such as faculty, staff, and equipment. The water program serves as an excellent example of the advantages of being in an integrated unit. Several CSD faculty with water-related expertise had joint appointments with CSD and SNRS. They also worked with the UNL Water Center. With the integrated unit that now has the Water Center in it, a more efficient operational framework is developed for cooperation, coordination, and execution of research and survey functions.

7.3 CSD Programs and Current Activities

The CSD can be effectively divided into four program areas including Geology, Water, CALMIT, and Soils.

Geology. Continuing broad-based geologic projects including geologic field mapping. This is a part of the U.S.G.S. STATEMAP project continuing in three areas of Nebraska. Mapping is underway on the Alliance, Grand Island and Fremont 1 x 2 degree quadrangles.

Collection and interpretation of data on Precambrian-age crystalline rocks and Lower and Middle Paleozoic-age rocks for the Nebraska deep well data set. The data on Precambrian-age rocks will be used to integrate the characteristics of the basement rocks of Nebraska into a regional interpretation of tectonic history. The deep well data set will be updated and customize to allow effective manipulation and interpretation of geologic history.

Regional stratigraphy and depositional history of the Dakota Formation in eastern Nebraska, the genesis and petrology of dinosaur-track-bearing sandstones in the Dakota, and acid rock drainage and sulfate mineral formation in pyritic shales of the upper Dakota.

Compilation of an update of the directory of Nebraska Pits, Quarries, and Mines, as part of the update of Nebraska's Mineral Industry Survey for the U.S.G.S.

The biometric measurement, epifaunal survey and censuses on described and un-described species of invertebrate fossils, especially crinoids and trilobites from the middle and late Pennsylvanian and early Permian from the North American mid-continent.

Integrated research on the spatio-temporal coupling of geological, ecological and climatic dynamics of the Nebraska Sand Hills.

Water. Hydrologic systems research is a principal objective of the Division. The effort is focused upon quantitative assessment of the hydrogeologic and geochemical properties of ground water and surface water systems. For nearly 90 years, the Division's own test drilling efforts along with the accumulation of drillers' logs and cuttings from others has permitted evaluation of Nebraska's hydrogeological setting. An extensive network of observation wells permits assessment of droughts and the consequent impact to ground water reserves.

To assist Nebraska's regulatory officials, Division faculty have employed isotope research as a means to better understand the interaction of ground water development and the flow of nearby streams. An example is in the Pumpkinseed Creek basin of the Panhandle. There, Division faculty have assisted in investigation of secondary permeability in the Brule Formation. As a result of that research, the North Platte Natural Resources District has closed the basin to further water well construction and is currently developing regulatory programs designed to reduce conflicts among water users.

Elsewhere, Division faculty have assisted Natural Resources Districts in their preparation of comprehensive ground water management plans. Through experience in such undertakings, faculty find that additional data collection and analysis is often needed to answer particular issues important to district officials.

Chemical characterization of Sand Hills lakes and local ground water resources at NU's Gudmundsen Ranch has expanded to include remote sensing. The work is important to inter-disciplinary colleagues involved in range land forage research for the cattle industry.

Faculty members frequently are called upon to present technical workshops for licensed well drillers and pump installers and for persons responsible to collection of water quality data. Several are responsible for teaching classes and seminars offered to undergraduate and graduate students in geology, engineering, regional planning, law and other disciplines.

The development of an integrated hydrologic systems research program is one of the main goals of the Division and is reflected in one of the action plans. Research by many faculty is focusing on the quantitative assessment of the hydrogeologic and geochemical properties of groundwater and surface water systems and their relationships. Chemical characterization of the Western lakes region in the Sandhills has expanded to include integration of remote sensing and hydrogeology with a focus on the Crescent Lake Wildlife Refuge area. Work on the Dismal River is continuing with studies on the contribution of groundwater and wetlands to streamflow through "boiling" sand springs.

Other water-related research efforts include: (1) the study of agricultural nonpoint source pollution in Holt County where monitoring wells have been installed at three Best Management Practices (BMP) sites; (2) a water-sampling regime around high-capacity wells; (3) investigations at a riparian wetland on the North Platte River with both freshwater and alkali components and in paired wet meadows at the Gudmundsen Sandhills Research Lab, examining their general hydrologic dynamics using both physical

and chemical techniques; (4) a study in the Panhandle region of the state examining canal and irrigation recharge to groundwater; (5) a study of the saline wetlands located in the Rock Creek Watershed; and (6) a study to clean up contaminated groundwater through irrigation.

Remote Sensing/GIS. CALMIT (described in an earlier chapter, and in Section 7.6.1) conducts and is responsible for remote sensing and GIS activities at CSD. Information services and data delivery at CSD is also involved in GIS activities. Natural resources data and databases developed through CSD are freely available via the web site (<http://csd.unl.edu>). Currently, approximately 60 data layers are available for downloading in the form of ArcInfo export files. These datasets represent original survey data as well as derived databases developed by CSD faculty and staff. Current efforts for digital data distribution and access are focused on continued development of comprehensive geologic and water resources databases. It is anticipated that these current activities will further enhance CSD's teaching, research and survey activities and better serve the public with access to more extensive data and derived database products.

In addition to those data developed through CSD, complete statewide coverage of Digital Raster Graphics (DRGs) and digital elevation data are available via the web site. The full series of DRGs, scanned images of the standard U.S.G.S. topographic maps, are available at 1:24,000, 1:100,000 and 1:250,000 map scales. Nebraska digital elevation data are available in the form of 30 meter Digital Elevation Model (DEM) data. Elevation data are provided in GIS format by county.

Along with CSD's digital data products, GIS services for people requiring basic data manipulation, projection or format transformation of existing GIS databases and plotting of digital data are also available. These services and the capabilities to field questions regarding GIS and GPS technologies have proven to be a valuable asset to individuals, agencies and private organizations and consultants within the state. CSD also continues to work toward print on demand services where feasible.

Soils. Mapping of the second generation of soil surveys in Nebraska is complete. Modern soil surveys have been published for 91 of Nebraska's 93 counties. As a result, digitization of modern soil surveys is the current focus of the soils program. The SSURGO project is a joint responsibility of the USDA NRCS, the Nebraska Department of Natural Resources and CSD.

The third generation of soil surveys, based on the update of soils information within Major Land Resource Areas (MLRA), is now underway throughout Nebraska. The Division is currently cooperating with the USDA Natural Resources Conservation Service and Agricultural Experiment Stations in Colorado, Iowa, Kansas, Minnesota, Missouri and South Dakota on MLRA soil projects. These projects include updates of older second generation soil surveys in Deuel, Dundy, Gage, Hall, Kimball, Saunders, Sarpy, and Washington counties.

Additional soils projects include: the effect of soil survey updates on soil interpretations; pesticide mobility as related to soil texture and organic matter content; the detection of spatial patterns of dust effects on soils throughout the mid-west; revision of the High School Land Judging manual; pedology and geomorphology of the Rainwater Basin; and pedology of Sand Hills soils in response to land use.

7.4 Data and Information Delivery

Distribution of information to the public is an important service provided by the Division. Part of CSD's mandate is to investigate and record information about the geologically related 10 natural resources of the state. This means the Division inventories, analyzes and evaluates the rock and mineral deposits, groundwater supplies and soils of the state. As a result, CSD maintains a huge database, including data on more than 17,000 oil and gas wells and more than 5,000 test holes (drilled for geologic and hydrogeologic research), as well as information on all irrigation and some water wells in the state (more than 100,000 wells).

Using collected data, research results, and the accumulated expertise of the staff, the Division fields requests for information and services from citizens, agencies, businesses, cities and towns and other state and local natural-resource organizations. Frequent inquiries involve specific information and assistance on groundwater supplies; environmental matters ranging from the siting of buildings and landfills to groundwater contamination; mineral deposits, including oil and gas; geologic history; identification of rocks and fossils; soils and their uses; and high-altitude perspectives available from remote sensing imagery.

The Division distributes information on Nebraska's resources to general and scientific audiences by publishing several series of publications. These include CSD geologic studies, guidebooks, resource reports (examinations of specific resources), water survey publications, soil survey reports, and educational circulars (lay-audience guides to field sites, natural history or hazards, or resource-analysis tools). In addition, atlases, field-guides and Division-produced maps and cross sections illustrate various aspects of Nebraska's geology, water, soils or geography. Also available are reprints of articles written by Division faculty for scientific journals. A publications catalog listing all material published or reprinted by CSD, as well as the target audiences for each publication series, is available.

For about 20 years the Division has maintained a formal agreement with the U.S.G.S. designating the Division as the Earth-Science Information Center (ESIC) representative for Nebraska. ESIC serves as a clearinghouse for information on maps, remote sensing and digital cartographic data. Free assistance in locating and ordering earth-science information is available upon request. The Division's ESIC and map-sales responsibilities include storing and selling all U.S.G.S. maps for Nebraska, various geologic, soils and wetlands maps, as well as many special- purpose maps, examining, for example, land use, center-pivot irrigation, aquifer characteristics, groundwater pollution, and other aspects of natural resource use. The ESIC collection of aerial and satellite imagery includes thousands of black-and-white photos, some dating back to the 1930s, for most areas of Nebraska, color-infrared photos dating to the mid-1970s for many counties, and Landsat MSS imagery dating back to 1972.

7.5 Teaching by CSD faculty

While not within the mission framework, several CSD faculty have and are making substantial contribution to teaching at UNL. In all, seven CSD faculty are involved in regularly teaching courses to either undergraduate or graduate students. These faculty have partial appointments in teaching units such as the School of Natural Resource Sciences and the Department of Geosciences.

Sixteen CSD faculty members have status on the graduate faculty – 11 as Fellows and 5 as Members. Division faculty advise both M.S. and Ph.D. candidates. The Division has no academic curricula at either the undergraduate or graduate levels; hence, all of the advisors of the CSD graduate faculty are affiliated with other university units. In addition to chairing students' committees for advanced degrees, Division faculty may serve as members on committees. University policy requires that when a CSD faculty member chairs a graduate committee, a faculty member from the graduate student's department must be included on that committee. Division graduate faculty have advised students in a wide range of areas, such as: invertebrate paleontology, invertebrate paleoecology, sedimentology, stratigraphy,

hydrogeology, environmental geology, soils, remote sensing and geographic information systems, among others.

While the Division often supports graduate and undergraduate students through research grants, CSD faculty also provide other forms of non-financial aid such as technical advice and review, and counsel relating to the student's research project. CSD faculty provide expertise not available from other academic departments. Other forms of assistance include the use of drafting room facilities, cartographic expertise, use of computers and digital processing, motor vehicles, and laboratory facilities. Graduate students also have access to basic geologic data that are in the Division's care, which include fossil collections, rotary drift and core drill samples, and electric well logs.

Division faculty are also active in the area of non-traditional teaching. They participate in a large number of continuing education activities such as evening classes, off-campus classes, conferences, workshops, seminars and independent study programs in both credit and non-credit programs.

Another area where the Division has expanded its activity is the area of K-12 education and "teaching, the teachers." The Nebraska Earth Science Education Network (NESEN) was conceived by CSD faculty in 1992, in cooperation with other university units, to: (1) promote and enhance K-12 earth-science education; (2) help students become better informed about the complexities of environmental and natural resources problems; and (3) improve the transfer of earth-science information to the K-12 teaching community.

Because CSD now becomes part of an "academic" unit, some of the problems associated with teaching and advising will be eliminated. There is also a potential that over the next five years, the faculty may become more involved in teaching activities such as increasing their teaching FTE (those who may currently have minimal or no teaching), hiring new faculty who would contribute significantly to teaching as well as play a major role in survey functions, and increased access by students to expertise and facilities that may have formerly been restricted because of the limited teaching by CSD faculty and staff.

7.6 Future Directions

The most important task of the CSD within the integrated SNR is to become proactive on natural resources related issues within and outside the state of Nebraska. This involves a continuation of the ongoing programs as well as the introduction of new ones. Besides the goals stated above, which in effect are a continuation of CSD's mission, the integration with the School of Natural Resources permits a broader operational framework. Thus, this section of the report focuses on new programs and issues that CSD can implement over the next five years.

7.6.1 Implementation of a Land Use and Land Cover Program

For over 15 years, CSD has been defined as the Nebraska geological, water and soils survey "and CALMIT (i.e., GIS/remote sensing)." Although there has been substantial merit in indicating to the "outside world" that CSD has special expertise in GIS and remote sensing (and we do), it has not always been clear, either internally or externally, how CALMIT's mission relates to CSD *survey* activities. In fact, most of CALMIT's *survey* activities have focused on inventory, characterization and monitoring of land use and land cover (LULC). In the past, it has been suggested by some faculty that CSD ought to strive to be recognized as a comprehensive natural resources survey, i.e., that we ought to commit ourselves to be the Nebraska geological, water, soils and land cover/land use survey. Thus we would fill a niche in land use/land cover inventory and assessment occupied by no other agency. The integration of CSD and SNRS now provides an opportunity to consider ways in which we might restructure and enhance our survey activities to include **land use/land cover** and a **biological/ecological survey**.

Land cover and/or land use data are required by a large number of Nebraska public agencies (municipal, local, regional, state, federal) at various scales and spatial resolutions. Such data are needed for a wide range of applications including, among others, wildlife habitat assessment, conservation planning, emergency preparedness and response, water quality assessment, property valuation and appraisal, and municipal and county planning and zoning.

Land use and land cover are distinctly different and are best presented as two separate databases.

Land cover is defined as the type of material that covers the earth's surface at a specific location at a specific time. **Land use** is the manner in which human beings utilize a specific tract of the earth's surface. As an example, the land use in an area might be cropland, but the land cover at a specific location within this area of cropland might be wheat, corn, soybeans, bare soil, grass or even trees (as in a windbreak). In an area of single-family residential land use, the land cover at a specific location might be asphalt, concrete, grass or trees. Note that land cover may change dramatically over short periods of time. For example, a field that had a land cover of wheat in May might be bare soil in August. The land use will not have changed during this period.

Land use and land cover mapping can be accomplished through field (GPS-based) surveys, air photo (e.g., DOQQ) interpretation and satellite image analysis. The level of spatial and classificatory detail obtainable, accuracy, cost and temporal currency of products developed will vary with the data analysis methodology used and the skills and experience of data analysts. The appropriate selection of methodology is driven by user requirements and funding available. In general, costs for land cover and land use mapping will increase in direct proportion to requirements for higher spatial, classificatory and temporal resolution.

Observations

- All recent efforts to assess and map Nebraska's land cover or land use have been grant-funded;
- No state agency is currently charged with inventory or assessment of Nebraska's land use or land cover. CSD's charter can be interpreted to include such work (see Section 7.1.1 legislative statute 85-163 sections 1 and 2), and it would fill a niche occupied by no other agency;
- A survey conducted for the Nebraska GIS Steering Committee in July 1998 indicated that at least 54 agencies/organizations have a need for land use and/or land cover information (e.g., for wildlife habitat assessment, conservation planning, facilities siting, utilities routing, emergency preparedness and response, water quality assessment, environmental hazard assessment, property valuation and appraisal, and municipal and county planning and zoning);
- CSD has a record in land use and land cover mapping that goes back nearly 30 years, although land use/land cover has never been formally recognized as a programmatic area of emphasis;
- CALMIT has established leadership in land use/land cover mapping via remote sensing;
- Most current CSD efforts in land use and land cover mapping are grant-funded;
- CALMIT's new U.S.G.S.-funded AmericaView project will provide a mechanism for archiving and delivering some land use and land cover data.

Short term goals and products (2004-2005)

- obtain SNR administrative/faculty commitment to LULC as major programmatic area of emphasis within the survey component of the School (i.e., CSD; advertise this commitment to a broad audience (e.g., Nebraska GIS Steering Committee, NRDs, USDA/NRCS, etc.)
 - CSD focus should be upon developing and maintaining land use and land cover data at scales of 1:100,000 - 1,000,000 (larger scale work should be handled locally)
 - goal should be to update land cover data at five year intervals (initially)
 - basic research and special LULC projects (e.g., COHYST) should be funded externally by users (as is current practice)
- integrate LULC program with other survey programs (especially water)

- develop prototype for mapping condition of LULC (e.g., drought stress, crop development) on routine basis
- develop marketing plans, enhance outreach and training activities
- initiate delivery of LULC data to SNR/CSD clients through ESIC and AmericaView
 - provide on-line access to existing land use and land cover products (see Table 7.1)

Table 7.1. Land Cover Data Resources

Land Cover/Land Use Data Produced by CALMIT

Land Cover of Nebraska (Gap) - 1992-3
Platte River watershed west of Columbus (COHYST) - 1997
Platte River watershed west of Columbus (COHYST II) - 2000
Niobrara River Watershed - 2000
Republican River Watershed - 1995
Rainwater Basin Joint Venture - 2000
Standardized Vegetation Index - 2000
Seasonal Vegetation Characteristics - 1990-present

Other Land Cover and Related Datasets to be Distributed by CSD

U.S.G.S. Land Use/Land Cover Data ("LUDA") -1980's
U.S.G.S. National Land Cover Dataset - 1993
U.S.G.S. National Land Cover Dataset - 2000 (in production)

USDA NASS Crops and Land Cover - Eastern Nebraska (2002)
USDA NASS Crops and Land Cover - statewide 2003 (in production)
USDA National Resources Inventory

EPA - Omernik's Ecoregions of Nebraska
 USDA - Major Land Resource Areas
 USFS - Bailey's Ecoregions of Nebraska

Long term goals and products (beyond 2004)

- Develop new and improved methods for using remote sensing to characterize, inventory and monitor Nebraska's land cover and land use
- Develop prototype for regular estimation of biophysical parameters (e.g., leaf area index)
- Develop plan for regularly characterizing Nebraska's surface water via remote sensing

Resources needed

- Most work can probably be done with grant funding, but some new commitments of state funds are needed
- Initially need at least a 50% FTE B-line coordinator for LULC survey (e.g., pick up part of J. Arnold currently on soft dollars)
- Funding for satellite data and media (\$5000/year) and computing (\$5000/year)
- Commitment of small percentages of existing CSD map sales, GIS staff and publications staff for marketing and delivery of data

7.6.2 Biological/Ecological Survey

Biological and ecological survey involves regular systematic collection of information about plants and animals (including vertebrates, invertebrates, microbes, etc.), and characterization of the spatial manifestations of their interaction within ecosystems. Some agencies, such as the Nebraska Game and Parks Commission (NG&PC) and the State Museum have limited programs that focus on game species or "endangered" species, but there is no coordinated program for comprehensive biological survey in Nebraska. Because there are many participants, implementation of such a program would be substantially more involved than establishing a LULC survey program. It is suggested that the CALMIT Gap Analysis Program provides a unique foundation upon which to build this aspect of survey activity.

Observations

Although some agencies (e.g., Nebraska Game and Parks Commission and the Nebraska State Museum, U.S. and Nebraska Forest Services) have programs to do limited biological and ecological surveys, no Nebraska agency is currently charged with regular comprehensive inventory or assessment of Nebraska's biological or ecological resources; CALMIT has established leadership in such work through its Gap Analysis Project (terrestrial and aquatic).

Short term goals and products (2003-2004)

- Obtain SNR administrative/faculty commitment to biological/ecological survey as major programmatic area of emphasis within the survey component of the School. i.e., CSD; advertise this commitment to a broad audience (e.g., Nebraska GIS Steering Committee, NRDs, state agencies, etc.)
 - CSD focus should be upon developing and maintaining biological/ecological data at scales of 1:100,000 - 1,000,000 (larger scale work should be handled locally)
 - goal should be to update inventories at 5-10 year intervals (initially)
 - basic research and special projects should be funded externally by users (as is current practice)
- Integrate biological/ecological survey program with other survey programs
- Develop linkages and cooperative programs with NG&PC, State Museum, USFWS, Nebraska Forest Service, Audubon, TNC, Nebraska Natural Heritage Program and others
- Examine and assess similar ongoing programs in other states (especially Kansas Biological Survey)
- Develop marketing plans, enhance outreach and training activities
- Initiate delivery of Gap data to SNR/CSD clients through ESIC and Gap
 - provide on-line access to existing Gap products

Long term goals and products (beyond 2004)

- Develop new and improved methods to characterize, inventory and monitor Nebraska's biological and ecological resources

Resources needed

- Some work can probably be done with grant funding, but a new commitment of state funds will be needed because this effort will involve substantial coordination by someone expert in biological/ecological survey; Geoff Henebry is the ideal person for this in my opinion;
- Need at least a 50% FTE coordinator for biological/ecological survey (e.g., pick up 50% of Geoff Henebry currently on soft dollars)
- Modest funding for travel and data acquisition and media (\$2500/year) and computing (\$2500/year)
- Commitment of small percentages of existing CSD map sales, GIS staff and publications staff for marketing and delivery of data

7.6.3 New Faculty Hires (potential)

The CSD is faced with three open positions, two from retirement (Roger Pabian - Research Geologist - Invertebrate Fossils/Stratigraphy; Robert Diffendal -) and another (Joe Mason - Research Geologist - Geomorphology/Quaternary Stratigraphy) due to leaving UNL. At least two position descriptions have been drafted to potentially replace these two positions. They are:

Geologist - Quaternary Geomorphology
Earth Scientist - Geographic Information Systems

At this time no prioritization has been assigned to these positions. However, the position of Earth Scientist (GIS) should be coordinated with the GIS position that SNRS is placing high priority on. It is feasible that given the teaching and research focus of SNR on geospatial technologies, that between 1.5-2.0 positions can be acquired in these fields. Furthermore, it would be to the overall benefit of SNR if these positions carry with them a teaching component

7.7 Challenges

Only a few months have passed since the formal integration of CSD with SNRS. The new unit is in its infancy and there is no doubt that several challenges will be faced in the very near future and over the next five years. Beyond the challenges, issues, and resource needs addressed in the other chapters, issues specific to the survey functions would include:

Academic Framework: Both units (CSD & SNRS) pursue natural resources as the prime context for research, teaching and extension. However, differences lie in the framework within which these were accomplished. Technically, CSD operated as a non-academic unit with minimal emphasis on teaching, while a substantial focus was on extension related issues. The challenge here is to have more CSD faculty participate actively in teaching. The benefits will accrue to the unit through increases in enrollment and attracting new students into the survey realm.

Adaptation: There is no doubt that SNR is in a state of flux because it is in its formative stage and this may (and will) require adjustments/changes by faculty and staff of the two former units in the mode of operations and functions that were once performed independently by the two units. Success will depend largely on each individual being acceptable to the potential changes that this integration will bring and/or offering alternatives or a course of action that can resolve rather than aggravate situations.

Continuity: CSD has a large clientele base, and functional continuity of the goals, objectives, and services of the CSD is as important to them as it would be to the former CSD faculty and staff. From that perspective, the potential administrative structure of SNR is a major step in the right direction. By having an “Associate Director” in charge of survey functions, it ensures the continuity of such services.

Resource Allocation: A potential conflicting issue could arise from changes in resources allocation. Once two units that operated with two separate budgets now have to share a single (albeit larger budget).

At a time of “budgetary restraint” decisions may have to be made at the administrative level on re-allocation of resources for the “greater good” of the unit rather than specific programs or sub-programs within the unit. Consequently, these issues could become contentious if they have detrimental impacts on certain goals and objectives of the “survey” function.

CHAPTER 8 - CHALLENGES: 2004-2008

8.1 Introduction

With the support of IANR and upper administration, natural resources programs have gained significant visibility and recognition at UNL, first through the formation of the School of Natural Resource Sciences in 1997 and through creation of the School of Natural Resources (SNR) in July 2003. The SNR faculty and staff are excited about the tremendous opportunities that the recent integration has to offer, and yet understandably frustrated by “growing pains” inherent in this relatively rapid evolution. Thus, this CSREES five-year review comes at a particularly crucial time. It is also clear that this document is more review than preview, in that we are in the process of redefining ourselves. Consequently, this chapter outlines what we consider to be some of the central questions/challenges facing us. We seek your ideas and counsel on how best to achieve our vision and fulfill our mission over the next five years.

8.2 Cross-cutting Themes

Since SNR was formed just two months ago, we have yet to conduct a strategic planning process that would lead to the identification and prioritization of issues that we need to address in the new unit. From a national perspective for example, what are the pressing issues in natural resources that will shape the lives of people in the next 5-10 years? Over the next five years, perhaps SNR’s greatest challenges (and opportunities) are a direct result of our recent merger and the pending move into a new building. Indeed, Hardin Hall itself presents some important challenges, such as raising sufficient funds during difficult economic times to accommodate additional laboratory space so that all faculty can be housed in the new building. *Specifically, how do we integrate our increasingly diverse faculty and staff into a cohesive unit that reflects a sum that is greater than its parts? How do we balance the need to maintain or improve disciplinary strengths while fostering interdisciplinary excellence?*

Relatively rapid change, even in academic institutions, is typically accompanied by some degree of resistance to and resentment of change. Faculty and staff are understandably concerned about a variety of issues in the new unit, including for example annual evaluations, as well as operating, technical and clerical support and changes in staff responsibilities. *What is your sense of faculty and staff morale at present? What steps should we take to create a truly integrated unit particularly from a personnel standpoint?*

Allocation and reallocation of resources is an issue that was discussed in SNRS in the year prior to the formation of SNR. The history of technician support, assistantship assignments, and operating funds in each of the former units was somewhat unique. Thus, our discussions have focused on an equitable means of distributing funds across the entire School to support all faculty regardless of their specific appointment or history of affiliation. *Is a formula-based approach (and the criteria proposed) an effective way of addressing this issue and one that you would recommend? What other tools might be effective in achieving our goal?*

Given the workload associated with implementing all of the changes in which we are currently engaged and that have been ongoing for several years, as well as those likely to be identified in this review, faculty and staff have invested a significant amount of time and effort in this process. While this effort has been conducted in a teamwork atmosphere among faculty and staff, the time commitment involved is a concern. *We are working toward resolving these issues, and ask you advice on special ways you have managed such issues.*

As has been pointed out in prior chapters (see Chapter 3 for list of potential positions discussed thus far), we anticipate a significant number of retirements over the next several years; at least four faculty have

retired or will retire over the next two years. In addition, we will be hiring three new faculty over the next two years as part of the new Cooperative Fish and Wildlife Research Unit. At the same time, we perceive the need to develop new programmatic strengths in at least two areas - ecosystem science and human dimensions of natural resources. At the same time, faculty salaries represent the largest portion of state support, thus retirements are key events when flexibility exists in the funding pool. *What are your suggestions for specific areas where we need to replace faculty expertise and/or add new expertise in order to enhance our capabilities and competitive posture?*

We view our role in managing and developing our field, center and laboratory facilities as critical to our long-term success in all areas of teaching, research, and extension/outreach/survey, yet this role entails a tremendous commitment of both time and resources. *Are we taking on too much or should we continue to move down the current path? How do we secure the support necessary to develop these crucial resources?*

8.3 Teaching (Chapter 4)

One of our greatest challenges is to increase the number, diversity, and excellence of the undergraduate students in our majors. Chapter 4 outlines our ideas on how to strengthen our undergraduate programs through the development of a strong recruitment and retention plan, an increased emphasis on teaching, and on designing state-of-the-art teaching laboratories in the new building. We also plan to hire a full-time Recruitment Coordinator this calendar year, have recently totally revised our web site (now focused more on students), initiated development of a recruitment plan, and have begun the process of reviewing our core curriculum and majors' requirements (including ecology and quantitative skills). *What is your assessment of our draft recruitment and retention plan and present efforts to increase our undergraduate enrollments? Do we need to improve and expand upon these efforts? What steps should we take to get faculty more engaged in teaching, as well as reward teaching efforts?*

It is clear that we also need to increase the number of students in our graduate programs. We are working to create additional competitive assistantships within the School and increase the number of specializations at the Ph.D. level. *What is your assessment of our plan to increase the number of students in our graduate program? What do you recommend regarding our goal to create a professional M.S. degree program?*

8.4 Research (Chapter 5)

Research has always been an area of strength in the School, as well as in the merged units prior to their coming together. The former Departments of Agricultural Meteorology and Forestry, Fisheries & Wildlife, respectively, were the top two research units (in terms of grant dollars per research FTE) in IANR when they merged in 1997 to form SNRS. *How do we maintain and enhance our strengths in research and yet meet the myriad of general challenges facing us, as well as those in teaching, extension/outreach, and survey? How might we strengthen our centers while helping to enhance research overall in the School? How do we encourage faculty to attract more extramural funding?*

8.5 Extension and Outreach (Chapter 6)

In light of the somewhat similar public outreach goals of extension/outreach and survey, these areas can perhaps benefit most by the recent merger. Within IANR, extension infrastructure has always been well developed in agriculture but not in natural resources. The recent merger, however, presents unprecedented opportunities to create essentially a new, modern infrastructure of service and education to external clientele in natural resources. *What changes need to be made to take full advantage of the opportunities afforded by the merger, and how do we best implement such changes?*

8.6 Survey (Chapter 7)

CSD has a longstanding history at UNL. Faculty central to the core mission of the Survey were concerned about the recent merger because of a perception that the Survey mission could be compromised as a result. Nevertheless, most realize that the merger also affords the new unit with the opportunity to enhance and perhaps redefine survey functions to even better serve the citizens of Nebraska. We view the merger of our Survey activities with Extension and outreach efforts as a natural fit and one that has significant potential in the natural resources area. *How do we effectively integrate these activities while maintaining the core mission and identity of the Survey?*

CHAPTER 9 - FACULTY VITAE

TALA AWADA, Assistant Professor, 80% Research, 20% Teaching

Areas of interests: Plant Ecophysiology, Gas Exchange, Water Relations, Forest and Grassland Ecology

Contact: tawada@unl.edu, 402/472-8483

EDUCATION

B.S. Lebanese University, Beirut (1992)

DSPU Mediterranean Agronomic Institute of Chania, Greece (1993)

M.S. Mediterranean Agronomic Institute of Chania, Greece (1995)

Ph.D. University of Saskatchewan, Canada (graduation, 2000)

PROFESSIONAL EXPERIENCE

2001-present Assistant Professor, School of Natural Resources, University of Nebraska-Lincoln (UNL)

2000-2001 Research Assistant Professor / 0.5 FTE, School of Natural Resources, University of Nebraska-Lincoln

1999-2000 Research Assistant Professor / 0.5 FTE, Department of Agronomy, University of Nebraska-Lincoln

1997-1999 Instructor, Agricultural Meteorology laboratory, University of Saskatchewan, Canada

1996-1997 Research Assistant, University of Saskatchewan, Canada

1995 Research Assistant, Mediterranean Agronomic Institute of Chania, Greece

HONORS AND AWARDS

Plant Sciences Meritorious Ph.D. Student Award, University of Saskatchewan, Canada (1999)

Best oral presentation, Graduate Student Symposium, University of Saskatchewan, Canada (1999)

Graduate scholarship, University of Saskatchewan, Canada (CAD \$ 45,000) (1996-1999)

Full scholarship, Mediterranean Agronomic Institute at Chania (M.A.I.Ch), Greece (1992-1995)

TEACHING

Courses Taught (Fall, Spring)

NRES 310 Introduction to Forest Management (SO1, SO2, FO2)

NRES 424/824 Forest Ecology (FO1)

Master and Doctoral Students Advised

Jing Li (Ph.D. School of Natural Resources, expected 2005) (Co-advisor) Thesis title: TBD

Kathleen Eggemeyer (M.S. School of Natural Resources, expected 2004) Functional Characteristics of Trees and Grasses in Nebraska Sandhills.

RESEARCH

My research interests focus on plant ecophysiology, forest and grassland ecology and ecosystem responses to environmental stresses. As a graduate student and a researcher, I have gained tremendous experience working on the ecology of Mediterranean, Boreal, NA grasslands and Nebraska Sandhills ecosystems. Currently, I am studying the impacts of tree invasion on ecosystem functions in the Nebraska Sandhills; determining the impacts of drought and defoliation on major warm-season grasses in Nebraska; investigating the use of warm- and cool-season grasses in Agroforestry projects; and examining the above- and below-ground functional characteristics of Great Plains grasses, shrubs and trees.

SELECTED GRANTS AND CONTRACTS

Evaluation of Hazelnut Hybrids for the Region of Great Plains: Nutrient, Water Use and Light Harvesting Efficiencies, Horticultural Research Institute, \$5,000, pending.

Application and Evaluation of Advanced Technologies for Assessing the Water Balance of A Forest Ecosystem in Greece [T. Awada (P.I. in USA) and K. Radoglou (P.I. in Greece)], Scientific and Technological Cooperation Between RTD Organisations in Greece and RTD Organisations in U.S.A., \$60,000 (Euro); Pending.

The Impact of Tree Encroachment on Water Balance in Nebraska Sandhills. EPSCOR Small Grant Program for Nebraska Women in Science, \$3,000; 2003.

Ecosystem Consequences of Forest Establishment in the Nebraska Sandhills, Research Council-UNL, \$10,000; 2002-2003.

Ecosystem Consequences of Forest Establishment in the Nebraska Sandhills, Layman Award, UNL, \$10,000; 2002-2003.

Equipment Grants (Co-Investigator with J. Brandle and D. Wedin), Institute of Agriculture and Natural Resources, UNL. \$10,000; 2002.

Impacts of Pinus ponderosa Establishment on Ecosystem Functions in the Sandhills of Nebraska, McIntire Stennis Funds, USDA. \$94,250; 2001-2003.

Novel Methods for Developing Broad Spectrum Stress Tolerant Plants (Co-Investigator with M. Dickman, D. Dunigan, S. Baenziger, T. Clemente), ARD-UNL, \$76,500; 2001-2003.

Travel Grant, ARD-UNL, \$1,050; 2000-2001.

SELECTED PUBLICATIONS

Awada, T., D.D. Dunigan, and M.B. Dickman. 2003. *Animal Anti-apoptotic Genes Ameliorate Drought Tolerance in Tobacco Plants*, *Canadian Journal of Plant Science*, 83, 499-506.

Awada, T., M.E.L. Perry, and W.H. Schacht. 2003. *Ecophysiological Responses of the C₃ Bromus inermis and the C₄ Andropogon gerardii to Various Canopy Levels of Fraxinus pennsylvanica*, *Canadian Journal of Plant Science*, 83, 533-540.

Awada, T., K. Radoglou, M. Fotelli, and H. Constantinidou. 2003. *Seedling Ecophysiology of Three Mediterranean Pine Species Under Contrasting Light Regimes*, *Tree Physiology*, 23, 33-42.

Awada, T., L.E. Moser, W.H. Schacht, and P.E. Reece. 2002. *Stomatal Variability of Native Warm-season Grasses from the Nebraska Sandhills*, *Canadian Journal of Plant Science*, 82, 349-355.

Awada, T., R.E. Redmann, and G.M. Henebry. 2001. *Spatial Pattern of White Spruce (Picea glauca) Regeneration Along the Chronosequence After Fire*, in *Forest Research: A Challenge for an Integrated European Approach* (K. Radoglou, ed.), Thessaloniki, Greece, Vol. I, pp. 359-364.

Awada, T., K. Radoglou, M.N. Fotelli, and E.I.A. Constantinidou. 2001. *Seasonal Dynamics of Photosynthesis Under Contrasting Light Regimes for Three Mediterranean Pine Species*, in *Forest Research: A Challenge for an Integrated European Approach* (K. Radoglou, ed.), Thessaloniki, Greece, Vol. II, pp. 537-542.

Awada, T. and R.E. Redmann. 2000. *Acclimation to Light in Planted and Naturally-regenerated Populations of White Spruce Seedlings*, *Canadian Journal of Botany*, 78, 1495-1504.

Awada, T. K. Radoglou, and H. Constantinidou. 1996. *Diurnal Change of Photosynthesis in Mediterranean Pine Species During Year Under Atmospheric Drought*, in *Proceedings of the International Workshop on Resource Utilization from Cell to Canopy* (K. Radoglou, ed.), Eurosilva, Thessaloniki, Greece, October 1996, 135-138.

OTHER PROFESSIONAL ACTIVITIES

Fellow, Center for Great Plains Studies, Lincoln, NE

Associate Member, Center for Grassland Studies, Lincoln, NE

Reviewer, Canadian Journal of Botany and Journal of Arid Environment

Judge, Association of Landscape Ecology Annual Meeting, 2002

Member, organizing committee, Association of Landscape Ecology Annual Meeting, 2002

Judge, Ecological Society of America Buell/Braun Awards, ESA Annual Meeting, 2001

JERRY F. AYERS, Associate Professor, 60% Conservation and Survey Division, 40% School of Natural Resource Sciences; overall 25% Teaching, 70% Research, 5% Scholarly Service

Areas of Interest: Regional Groundwater Flow Systems, Saline Wetland Hydrology, Groundwater Flow Modeling, Quantification of Groundwater Recharge, Application of Geophysical Methods to the Near-surface Environment

Contact: jayers1@unl.edu, 402/472-7545

EDUCATION

BA Geology, California State University (1972)

MS Geology, Washington State University (1976)

PhD Geology, Washington State University (1980)

PROFESSIONAL EXPERIENCE

1997-Present Associate Professor, School of Natural Resources Science; Research Hydrogeologist, Conservation and Survey Division, University of Nebraska-Lincoln

1989-1997 Associate Professor, Department of Geology; Research Hydrogeologist, Conservation and Survey Division, University of Nebraska-Lincoln

1985-1989 Assistant Professor, Department of Geology; Research Hydrogeologist, Conservation and Survey Division, University of Nebraska-Lincoln

1984-1985 Visiting Assistant Professor in Geology, Department of Geology, Washington State University

1979-1984 Assistant Professor, Water and Energy Research Institute, University of Guam

TEACHING (last five years)

Courses Taught (Fall)

GEOL 442/842; NRES 442/842 Environmental Geophysics I

GEOL 443/843; NRES 443/843 Environmental Geophysics II

Masters and Doctoral Students Advised

Paul Koester (M.S. Geology 2003) Temporal Soil Water Loss Estimation for Box Butte County, Nebraska.

RESEARCH (last five years)

Research emphasis over the last five years has been along two fronts. As an extension of work started in 1993 on the hydrogeology of saline wetlands, funding was obtained to expand investigations on two saline wetland tracts within the Salt Creek watershed. Results from this work has provided valuable insight into the composition of the geologic terrane beneath these unique wetlands, as well as the mechanisms of saline water transport. The second front is related to the development of a water-resources database and groundwater-flow model for Box Butte county, an area with over 1300 irrigation wells. The premise of this work is to provide the Upper Niobrara-White NRD, as well as other NRDs, with a set of tools for use in the management of their water resources.

SELECTED GRANTS AND CONTRACTS (last five years)

Hydrogeology of Saline Wetlands, U.S. Environmental Protections Agency, \$73,764; 1997-2001.

Groundwater Flow Modeling of Box Butte County, Upper Niobrara-White Natural Resources District, \$109,460; 1998-2004.

Foundation Study for the Management and Preservation of Saline Wetlands in Eastern Nebraska, U.S. Environmental Protections Agency, \$115,694; 2002-2004.

SELECTED PUBLICATIONS

Szilagyi, J., F.E. Harvey, and J.F. Ayers. Accepted. *Regional Estimation of Base Recharge to Ground Water Using Water Balance and a Base-flow Index*, **Ground Water**.

Chen X.H., J. Goeke, J.F. Ayers, and S. Summerside. 2003. *The Observation Well Network Design for Pumping Tests in Unconfined Aquifers*, **Journal of the American Water Resources Association**, 39, 17-32.

Ayers, J.F. 2000. *Seismic Refraction Analysis of Multiple Dipping Interfaces—Revisited*, **Journal of Environmental and Engineering Geophysics**, 5, 1-5.

Ayers, J.F. 1998. *Groundwater Flow Dynamics Beneath Atoll Islands*, **Hydrology in the Humid Tropic Environment** (Proceedings of International Symposium held at Kingston, Jamaica, November 1996).

Ayers, J.F., X. Chen, and D. Gosselin. 1998. *Behavior of Nitrate-nitrogen Movement Around a Pumping High-capacity Well: a Field Example*, **Ground Water**, 36, 325-337.

Chen, X. and J.F. Ayers. 1998. *Aquifer Properties Determined from Two Analytical Solutions*, **Ground Water**, 36, 783-791.

Chen, X., J.F. Ayers, and D. Gosselin. 1998. *Analysis of Nitrate-nitrogen Movement near High-capacity Irrigation Wells*, **Ground Water Monitoring Review**, 18, 1-9.

Chen, X. and J.F. Ayers. 1997. *Utilization of the Hantush Solution for the Simultaneous Determination of Aquifer Parameters*, *Ground Water*, 35, 751-756.

OTHER PROFESSIONAL ACTIVITIES

Member, National Ground Water Association, 1977-Present

Member, American Geophysical Union, 1979-Present

Member, Society of Exploration Geophysicists (Near Surface Section), 1986-Present

Member, Society of Environmental and Engineering Geophysics, 1993-Present

Review Editor, Journal of Ground Water, National Ground Water Association, 1990-Present

Francis V. Belohlavy, Instructor, 85% Research, 15% Extension/Outreach

Areas of Interest: Soil Survey, Soil Interpretation, Environmental Planning, Geographic Information Systems

Contact: fvb@unl.edu, 402/472-7485

EDUCATION

A.S. Northeast Community College, Norfolk, NE (1971)

B.S. Soils and Plants and Soil Management, University of Nebraska-Lincoln (1973)

Post B.S. Soils, University of Nebraska-Lincoln (1990-98)

PROFESSIONAL EXPERIENCE

1973-present Instructor, Conservation and Survey Division, University of Nebraska-Lincoln

RESEARCH (last five years)

Soil Survey field mapping in Boyd, Holt, Garfield, Loup, Blaine, Greeley, Sioux and Garden Counties, Nebraska

1989-1996 Statewide Soil Database, Lincoln

1995-1999 Update of Soil Surveys in Nebraska, including Gage County

2000-present Digital Soil Surveys, soil interpretation

EXTENSION (last five years)

Provided assistance to public on soil interpretation issues including land use, wet basements, on-site waste disposal.

SURVEY (last five years)

See research.

Digitizing of published and non-published Nebraska Soil Surveys, Nebraska Cooperative Soil Survey.

SELECTED GRANTS AND CONTRACTS (last five years)

Nebraska Soil Survey Acceleration Fund, Nebraska Legislature, 1973-present.

OTHER PROFESSIONAL ACTIVITIES

Member, Nebraska Professional Soil Scientists Society

Member, Nebraska On-site Waste Disposal Task Force, University of Nebraska

PATRICIA R. BOEHNER, Lecturer, 25% Teaching

Areas of interest: Sustainable agriculture and development, agroecology, grassland ecology, environmental science.

Contact: pboehner3@unl.edu, 402/467-1957

EDUCATION

B.S. Rangeland Resource Management, Oregon State University (1983)

M.S. Forestry, Fisheries and Wildlife, University of Nebraska-Lincoln (1986)

Agricultural Intern, The Land Institute (private educational and research program on sustainable agriculture and sustainable society), Salina, KS (1987)

Ph.D. Agronomy, University of Nebraska-Lincoln (2001)

PROFESSIONAL EXPERIENCE

1994-present Lecturer, School of Natural Resource Sciences, University of Nebraska-Lincoln (UNL)

1990-1993 Assistant Instructor/Youth Activities Coordinator, Department of Agronomy, University of Nebraska-Lincoln

HONORS AND AWARDS

Irvin A. and Agnes E. Nelson Fellowship (1994)

Teaching Award, Parent's Recognition (1995)

TEACHING

Courses Taught (Fall, Spring)

AGRI/NRES 103 Food, Agriculture and Natural Resource Systems (F, S 94-03)

SELECTED PUBLICATIONS

Boehner, P.R. 2001. *Maize/soybean Strip Intercropping in Eastern Nebraska*, Ph.D.

Dissertation, University of Nebraska, Lincoln.

Boehner, P.R., L.E. Moser, R.P. Waldren, and R.C. Shearman. 1997. *Advanced Degrees in Agronomy: Value Perceptions from the North Central Region of the US*, *Journal of Natural Resources and Life Sciences Education*, 26, 170-176.

Boehner, P.R., J.R. Brandle, and S. Finch. 1992. *Windbreak Establishment*, *University of Nebraska Extension*, EC 91-1764-B, 4 pp.

- Boehner, P.R., K. Mossi, J.B. Youngquist, and A. Miner. 1988. *Women and Sustainable Agriculture: Opportunities and Challenges, International Sustainable Agriculture Conference Proceedings*, Columbus, OH.
- Boehner, P.R. 1987. *Eastern Gamagrass: In Transition from Forage to Food Crop*, *The Land Report*, 31, 8-12.
- Boehner, P., A. Kullenberg, P. Butler, and V. Mecko-Ray. 1987. *Farming as a Livelihood: A Women's Perspective*, *The Land Report*, 31, 21-24.
- Handley, M.K. and P.R. Boehner. 1987. *Variability in Resistance to Anthracnose and Leaf Rust in *Tripsacum dactyloides* Crosses Segregating for Sex Ratio*, *The Land Institute Research Report*, 4, 30-35.
- Mecko-Ray, V., P. Butler, A. Kullenberg, and P. Boehner. 1987. *The Role of Women Has Changed, and My Husband Doesn't Want Pie!*, *The Land Report*, 30, 35-39.
- Boehner, P.R. 1986. *Effect of Pre-burn Artificial Litter and Prescribed Burning on Smooth Brome (*Bromus inermis* Leyss.)*, M.S. Thesis, University of Nebraska-Lincoln.

JAMES R. BRANDLE, Professor, 70% Research, 30% Teaching

Areas of Interest: The role of woody plants in sustainable agricultural systems, specifically the mechanisms associated with windbreak technology, agroforestry and biological control, and the economic benefits of including woody plants in our agricultural landscapes.

Contact: jbrandle@unl.edu, 402/472-6626

EDUCATION

B.S. Botany, University of Tennessee, Knoxville (1966)

M.S. Forest Biology, University of Missouri, Columbia (1970)

Ph.D. Tree Physiology, University of Missouri, Columbia (1974)

PROFESSIONAL EXPERIENCE

1997-present Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln (UNL)

1981-1997 Associate Professor, Department of Forestry, Fisheries and Wildlife, University of Nebraska-Lincoln

1975-1981 Assistant Professor, Department of Forestry, Fisheries and Wildlife, University of Nebraska-Lincoln

1974-1975 Post-doctoral Fellow, Department of Range Science, Utah State University

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 417/817, HORT 418/818 Agroforestry Systems in Sustainable Agriculture (F98, F99, F00, F01)

NRES, HORT, BIOS 849 Woody Plant Growth and Development (with E. Pappozzi) (F98, F00)

NRES 310 Introduction to Forest Management (with T. Awada) (S99, S00, S01, S02)

Masters and Doctoral Students Advised or Co-Advised

Jing Li (Ph.D. Natural Resource Sciences, expected 2005) Modeling Light Climate of Riparian Forest Buffers.

Jeremy Hiller (M.S. Natural Resource Sciences, expected 2004) Woody Species Succession in Field Windbreaks in East Central Nebraska.

James Kriz (M.S. Entomology, with Steve Danielson, expected 2003) Patch Effects on Coccinellidae (Coleoptera) in Alfalfa Fields.

- Lori A. Hoagland (M.S. Natural Resource Sciences 2002) *Analysis of Integrated Farming Systems in Eastern Nebraska.*
- Qing Jiang Hou (M.S. Biometry, with Linda Young, 2002) *Spatial Modeling of Biomass in Nebraska Windbreaks.*
- Barbara K. Good (M.S. Forestry, Fisheries and Wildlife 1999) *Central Platte River Forests: Breeding Birds and Woody Vegetation.*
- Qing Jiang Hou (M.S. Forestry, Fisheries and Wildlife 1999) *Soil Moisture within the Windbreak/Crop Interface and a Comparison of the Three Types of Sensors for Measuring Soil Water Content.*
- Xinhua Zhou (Ph.D. Horticulture and Forestry 1999) *On the Three-dimensional Aerodynamic Structure of Shelterbelts.*
- Mark L. Marsh (M.A. Economics 1997, and Ph.D. Horticulture and Forestry 1999) *The Value of Shelterbelts to Agricultural Production in the Northern Great Plains: An Economic Assessment in a Changing Climate.*

RESEARCH

Over the past five years we have focused on developing a better understanding of the flow mechanisms associated with windbreak structure. We have defined the three-dimensional structure of a tree windbreak in terms of surface area and volume and their arrangement. Working with colleagues at Iowa State University and the U.S. Forest Service we have continued to improve a hydrostatic flow model original developed at ISU. Working with colleagues in the Departments of Animal Science, Agronomy and Horticulture, and Entomology we have a number of cooperative efforts to define and evaluate the role that woody plants play in agricultural landscapes with emphasis on biological control of pests, diversification of production systems, carbon sequestration in woody species, the reduction of carbon dioxide emissions from agriculture and the enhancement of wildlife habitat all as a part of an integrated agricultural system. In cooperation with the USDA-NRCS, we have developed a series of 10 Extension Circulars on windbreak technology. Over 750,000 copies have been distributed in over 25 countries in the last 10 years.

Brandle, J., X. Zhou and L. Hodges. 2002. *How windbreaks work*, EC-02-1763.

Brandle, J. and L. Hodges. 2000. *Field windbreaks*, EC-00-1778.

Stange, C., J. Wilson, J. Brandle and M. Kuhns. 1998. *Windbreak renovation*, EC-98-1777.

Brandle, J.R. and H.D. Nickerson. 1996. *Windbreaks for snow management*, EC-96-1770.

Stange, C. and J.R. Brandle. 1996. *Windbreak management*, EC-96-1768.

Quam, V.C., L. Johnson, B. Wight and J.R. Brandle. 1994. *Windbreaks for livestock operations*, EC-91-1766.

- Wight, B., T.K. Boes and J.R. Brandle. 1993. *Windbreaks for rural living*, EC-91-1767.
- Johnson, R.J., M.M. Beck and J.R. Brandle. 1992. *Windbreaks and wildlife*, EC-91-1771.
- Quam, V.C., J. Gardner, J.R. Brandle and T.K. Boes. 1992. *Windbreaks in sustainable agricultural systems*, EC-91-1772.
- Boehner, P., J.R. Brandle and S. Finch. 1991. *Windbreak establishment*, EC-91-1764.

SELECTED GRANTS AND CONTRACTS

- Change in Filter Strip Performance over Time* (with M. Dosskey, U.S. Forest Service Corresponding PI; J. Brandle and K. Hoagland, Cooperators), U.S. Department of Agriculture-CSREES-NRICGP, \$74,521; 2002-2005.
- Integrated Crop/Livestock/Agroforestry Research for Sustainable Systems in Nebraska* (with T. Klopfenstein, C. Francis and J.R. Brandle), U.S. Department of Agriculture-CSREES, \$556,098; 1995-2004.
- Modeling Corn and Soybean Production in a Sheltered Field* (with C. Mize, ISU, corresponding PI), U.S. Department of Agriculture-CSREES-NRICGP, \$569,000 (Cooperative Project with Iowa State, \$109,501 to UNL); 2000-2003.
- Seedscape - Practically Speaking*, U.S. Department of Agriculture-Forest Service, National Agroforestry Center, \$73,719; 2000-2004.
- Prediction of Woody Biomass in Tree-based Buffers*, U.S. Department of Agriculture-Forest Service, National Agroforestry Center, \$52,798; 2000-2002.
- Agroforestry Systems Statistical Analysis* (with Linda Young, Biometry), U.S. Department of Agriculture-Forest Service, National Agroforestry Center, \$72,158; 1999-2003.

SELECTED PUBLICATIONS

- Zhou, X.H., J.R. Brandle, C.W. Mize, and E.S. Takle. 2003 (submitted, accepted with revisions). *Three-dimensional Aerodynamic Structure of a Tree Shelterbelt: Definition, Characterization and Working Models*, **Agroforestry Systems**.
- Hou, Q.J., J.R. Brandle, and M.M. Schoeneberger. 2003 (in press). *Root-pruning Alters Soil Moisture at the Windbreak/crop Interface*, **Agroforestry Systems**.
- Josiah, S.J., R. St-Pierre, H. Brott, and J.R. Brandle. 2003 (in press). *Productive Conservation: Diversifying Farm Enterprises by Producing Specialty Woody Products in Agroforestry Systems*, **Journal of Sustainable Agriculture**.
- Zhou, X.H., J.R. Brandle, E.S. Takle, and C.W. Mize. 2003 (in press). *Relationship of Three-dimensional Structure to Shelterbelt Function: a Theoretical Hypothesis*, (Invited paper - Brandle), **Journal of Crop Production**.

- Takle, E.S., J.R. Brandle, R.A. Schmidt, R. Garcia, I.V. Litvina, W.J. Massman, X.H. Zhou, G. Doyle, and C.W. Rice. 2003. *High-frequency Pressure Variation in the Vicinity of a Surface CO₂ Flux Chamber*, **Agricultural and Forest Meteorology**, 114, 245-250.
- Beecher, N.A., R.J. Johnson, J.R. Brandle, R.M. Case, and L.J. Young. 2002. *Agroecology of Birds in Organic and Non-organic Farmland*, **Conservation Biology**, 16, 1620-1631.
- Zhou, X.H., J.R. Brandle, E.S. Takle, and C.W. Mize. 2002. *Estimation of the 3-dimensional Aerodynamic Structure of a Green Ash (*Fraxinus pennsylvanica* Marsh.) Shelterbelt*, **Agricultural and Forest Meteorology**, 111, 93-108.
- Easterling, W.E., J.R. Brandle, Q. Guo, C.J. Hays, and D.S. Guertin. 2001. *Simulating the Impact of Human Land Use Change on Forest Composition in Great Plains Agroecosystems with the Seedscape Model*, **Ecological Modeling**, 140 (1-2), 163-176.
- Brandle, J.R., L. Hodges, and B. Wight. 2000. *Windbreak Practices*, Chapter 4 in **North American Agroforestry: An Integrated Science** (H.E. Garrett., W.J. Rietveld and R.F. Fisher, eds.), American Society of Agronomy, 79-118.
- Danielson, S.D., J.R. Brandle, L. Hodges, and P. Srinivas. 2000. *Bean Leaf beetle (*Coleoptera: Chrysomelidae*) Abundance in Soybean Fields Protected and Unprotected by Shelterbelts*, **Journal of Entomological Science**, 35, 385-390.

MARK E. BURBACH, Geoscientist, 75% Extension/Outreach, 25% Research
Areas of Interest: Groundwater-Level Monitoring, Groundwater Monitoring, Environmental
Sampling and Training

Contact: mburbach@unl.edu, 402/472-8210

EDUCATION

B.S. Natural Resources, University of Nebraska-Lincoln (1985)
M.C.R.P. Community and Regional Planning (Water Resources Planning and Mgt),
University of Nebraska-Lincoln (1988)
Ph.D. (ABD) Community and Human Resources (Leadership Studies), University of
Nebraska-Lincoln (All But Dissertation)

PROFESSIONAL EXPERIENCE

2003-present Environmental Scientist, School of Natural Resources, University of
Nebraska-Lincoln (UNL)

1989-2003 Field Coordinator, Water Center, University of Nebraska-Lincoln

HONORS AND AWARDS

NACTA Graduate Student Teaching Award, National Association of Colleges and Teachers of
Agriculture (2002)

Certificate of Recognition for Contributions to Students, University of Nebraska-Lincoln,
Teaching Council and the Parents Association (2002)

Holling Family Teaching Award Nominee, University of Nebraska-Lincoln (2001)

Best Student Paper, Institute of Behavioral and Applied Management (1998)

TEACHING

Courses Taught (Fall, Spring, Summer)

ALEC 102 Interpersonal Skills for Leadership (F99, F00, S00, F01, F02)

RESEARCH

Research emphasis has been on the impact of management practices on ground water
quality and quantity. Numerous studies have focused on the contaminant load in the vadose
zone and its potential impact on ground water. New sampling techniques have been
investigated with emphasis on direct-push technologies. Current and future research will
focus on integrating ground water monitoring networks with real-time data access by end
users.

EXTENSION

Extension emphasis has been on training local and state officials and the public on ground monitoring methods, site characterization and the potential impacts of land use management practices on ground water. Numerous workshops and annual training programs have been developed across the state. Current and future extension efforts will address improving ground water-level monitoring and reporting methods.

SURVEY

Survey emphasis has been on assessments of ground water conditions in vulnerable areas. Emerging areas of agrichemical contamination have been identified and management recommendations offered to potentially impacted persons. Current and future survey efforts will assess ground water-level monitoring needs particularly with respect to focusing resources.

SELECTED GRANTS AND CONTRACTS

Vadose Zone Sampling within the Upper Tri-Basin NRD, Tri-Basin Natural Resources District, \$2,105; Jan. 2002-June 2002.

Vadose Zone Sampling within the Upper Niobrara-White NRD, Upper Niobrara-White Natural Resources District, \$14,823; Jan. 2002-June 2002.

Platte Valley Vadose Zone Agrichemical Study, Lower Platte North Natural Resources District, \$3,325; Jan. 2001-June 2002.

Todd and Platte Valley Vadose Zone Agrichemical Study, Lower Platte North Natural Resources District, \$5,035; Jan. 2000-June 2002.

Evaluation and Assessment of Agrichemical Contaminants in the Creighton, NE Area and Management Assistance to the Lewis and Clark NRD, Lewis and Clark Natural Resources District, \$77,150; Feb. 1997-June 2000.

Aquifer Response Test and Estimation of Agrichemical Loading in the Waverly Ground Water Reservoir Area, Lower Platte Natural Resources District, \$35,375; July 1995-June 1996.

SELECTED PUBLICATIONS

Spalding, R.F., M.E. Exner, D.D. Snow, D.A. Cassida, M.E. Burbach, and S.J. Monson. 2003. *Herbicides in Ground Water Beneath Nebraska's Management Systems Evaluation Area, Journal of Environmental Quality*, 32, 92-99.

Burbach, M.E. 2002. *Teaching Tips – Graduate Students, NACTA Journal*, 46 (4), 54.

- Spalding, R.F., Z.K. U, S.W. Hyun, G.E. Martin, M.E. Burbach, S.I.I. Yang, M. Kim, M.E. Exner, and S.J. Song. 2001. *Source Identification of Nitrate on Cheju Island, South Korea, Nutrient Cycling in Agroecosystems*, 61 (3), 237-246.
- Spalding, R.F., D.G. Watts, J.S. Schepers, M.E. Burbach, M.E. Exner, R.J. Poreda, and G.E. Martin. 2001. *Combating Nitrate Leaching in Irrigated Agriculture, Journal of Environmental Quality*, 30 (4), 1184-1194.
- Zlotnik, V.A., R.F. Spalding, M.E. Exner, and M.E. Burbach. 1995. *Sampling of Agricultural Contamination in High Capacity Wells. Journal of Soil and Water Conservation*, 50 (1), 95-101.
- Burbach, M.E. and R.F. Spalding. 1994. *Investigation and Evaluation of Agrichemical Transport Near Waverly, Nebraska, Research Briefs*, 2, 1-2.
- Spalding, R.F., M.E. Burbach, M.E. Exner, D.R. Alexander, and L. Para-Vicary. 1994. *Sprinkler Irrigation: A VOC Remediation Alternative, Technology: Journal of the Franklin Institute*, 331A, 231-241.
- Spalding, R.F., D.D. Snow, D.A. Cassada, and M.E. Burbach. 1994. *Study of Pesticide Occurrence in Two Closely Spaced Lakes in Northeastern Nebraska, Journal of Environmental Quality*, 23 (3), 571-578.
- Zlotnik, V.A., R.F. Spalding, M.E. Exner, and M.E. Burbach. 1993. *Sampling of Non-point Source Contamination in High-Capacity Wells, Water Science and Technology*, 28 (3-5), 409-413.
- Exner, M.E. M.E. Burbach, D.G. Watts, R.C. Shearman, and R.F. Spalding. 1991. *Deep Nitrate Movement in the Unsaturated Zone of a Simulated Urban Lawn, Journal of Environmental Quality*, 20, 658-662.

OTHER PROFESSIONAL ACTIVITIES

- Facilitator, Lincoln Children's Museum Leadership Development Workshop, March 2003*
- Reviewer, Institute of Behavioral and Applied Management, Annual Conference*
- Chair, Staff Professional Development Committee, School of Natural Resource Sciences, University of Nebraska-Lincoln, 2001-2002*
- Member, Social Committee, School of Natural Resource Sciences, University of Nebraska-Lincoln, 1998-present*
- Member, Courtesy Committee, School of Natural Resource Sciences, University of Nebraska-Lincoln, 1998-present*

MARVIN P. CARLSON, Professor, 100% Conservation and Survey Division

Areas of interest: Scientific Basis for Conservation of Natural Resources, Geologic History and Tectonic Framework of Nebraska, Valid Data and Perceptions for Resource Decisions

Contact: mcarlson1@unl.edu, 402/472-7549

EDUCATION

B.S. Geology, University of Nebraska-Lincoln (1957)

M.S. Geology, University of Nebraska-Lincoln (1963)

Ph.D. Geology, University of Nebraska-Lincoln (1969)

PROFESSIONAL EXPERIENCE

1976-present Professor, Conservation and Survey Division, University of Nebraska-Lincoln

1984-present Research Geologist, Conservation and Survey Division, University of Nebraska-Lincoln

1970-1986 Assistant Director, Conservation and Survey Division, University of Nebraska-Lincoln

1963-1984 Principal Geologist, Conservation and Survey Division, University of Nebraska-Lincoln

1958-1963 Stratigrapher, Conservation and Survey Division, University of Nebraska-Lincoln

HONORS AND AWARDS

Certificate of Merit, Division of Environmental Geosciences, American Association of Petroleum Geologists (2003)

Elected Chief Trustee, International Basement Tectonics Association (2002)

Professional Geologist, State of Nebraska (1999)

Elected Fellow, Geological Society of America (1971)

SURVEY

Basic research, service, publications, and papers related to Paleozoic lithostratigraphy, Precambrian tectonics, and mineral resources of northern Midcontinent. Presentations and workshops on aspects of earth science for teachers, elementary-college classes, councils, and general public groups. Significant activity in advising on policy for state and local regulatory and management agencies. Participate in numerous committees/groups

interested in resource development, environmental impacts, waste disposal, stress on natural resource systems, and public perceptions of earth science.

SELECTED GRANTS AND CONTRACTS

Regional Carbon Sequestration Partnerships-Phase I, University of Kansas/U.S. Department of Energy, Invited Proposal, \$100,000; 2003-2007.
Application Review for Low-Level Radioactive Waste Facility Siting in Nebraska, Nebraska Department of Environmental Quality, Multi-year, \$951,955; 1991-1999.

SELECTED PUBLICATIONS

- Carlson, M.P. 2002. *A Basement Framework Hypotheses for the Tectonic Architecture and Geologic History of the Western Mid-Continent, USA*, American Association of Petroleum Geologists, Hedberg Research Conference, "Late Paleozoic Tectonics and Hydrocarbon Systems of Western North America – The Greater Ancestral Rocky Mountains", Vail, Colorado; 4.
- Carlson, M.P. 2002. *Basement Control on Phanerozoic Structures and Tectonics – Midcontinent USA*, Geological Society of America Abstracts with Programs, 2002 Annual Meeting, Denver, CO; 78.
- Carlson, M.P. 2001. *Island Arcs, Accretionary Terranes and Midcontinent Structure*, Conservation and Survey Division Resource Notes, Vol. 15, No. 1, 15-18.
- Carlson, M.P. and S.B. Treves. 2000. *The Precambrian History of Nebraska and Adjacent Regions: A Record of the Accretionary Growth of North America; in Variscan-Appalachian dynamics; the building of the Upper Paleozoic basement*, Basement Tectonics 15, A Coruna, Spain Program and Abstracts, 75-78.
- Carlson, M.P. 1999. *Transcontinental Arch – A Pattern Formed By Rejuvenation of Local Features Across Central North America*, in *Tectonics of Continental Interiors* (S. Marshak, B. van der Pluijm and M. Hamburger, eds.), *Journal of Tectonophysics*, 303, 225-235.
- Carlson, M.P., R.R. Burchett, and W.H. Sydow. 1999. *Occurrence and Development of Petroleum in Nebraska*, *Transactions of the 1999 AAPG Midcontinent Section Meeting*, Kansas Geological Survey Open-File Report 99-28, 1-4.
- Carlson, M.P., S.B. Treves, and R.J. Goble. 1999. *New Data and Interpretations for the Precambrian, Mid-Continent USA*, in *Proceedings of the Thirteenth International Conference on Basement Tectonics* (K. Sinha, ed.), Kluwer Academic Publishing, 49-64.
- Carlson, M.P. 1998. *Evidence From the Stratigraphic Record for Basement Deformation in Southeastern Nebraska, Mid-Continent U.S.A.*, in *Proceedings of the Twelfth*

International Conference on Basement Tectonics (J.P. Hogan and M.C. Gilbert, eds.), Kluwer Academic Publishing, 227-228.

Carlson, M.P. 1998. *The Application of Basement Tectonic Research to the Occurrence of Energy, Mineral, and Other Natural Resources - Focus on Mid-Continent North America, Proceedings of the Fourteenth International Conference on Basement Tectonics*, Ouro Preto, Brazil, 188-189.

OTHER PROFESSIONAL ACTIVITIES

Four decades of *providing technical support to numerous state and local agencies as to appropriate development and conservation of natural resources as a major part of Nebraska's economic and environmental base*

Numerous presentations to citizen groups and classes on geology and utilization of natural resources (publication "Geology, Geologic Time, and Nebraska")

Science Teacher Workshops "What's in a Rock" and "The Earth in 4 Dimensions"

Member Nebraska Academy of Science (1959-), Sigma Xi (1964-), Geological Society of America (1961-), Nebraska Geological Society (Founding) (1968-), American Association for Advancement of Science (1970-), Iowa Geological Society (1989-), American Association of Petroleum Geologists (1989-), Kansas Geological Society (2001-), International Basement Tectonics Association (1980)

Governor's Appointee Technical Representative Interstate Oil and Gas Conservation Commission, 1971-date

Advisor Student Chapter American Association of Petroleum Geologists, 2000-date

Chief Trustee International Basement Tectonics Association, 2002-date

Advisory Board, Division of Environmental Geosciences, American Association of Petroleum Geologists, 2001-date

Chair, Preservation of Sample and Core Committee, American Association of Petroleum Geologists, 2002-date

Advisor, National Research Council Study on Preservation of Geologic Data, 2002

Selected Programs Conducted 2003

Presentation with R.M. Joeckel, The Nemaha Uplift - Cursor and Its Precursors, North Central Section Geological Society of America, Kansas City, MO.

Presentation with R.M. Joeckel, Earthquake History, Seismicity, and Related Tectonics in Nebraska, North Central Section Geological Society of America, Kansas City, MO.

Invited Abstract, Basement Control on Tectonic and Seismic Patterns Across the Great Plains, Earthscope Workshop, Kansas State University.

Abstract Accepted with S.B. Treves, Characterization and Geologic Setting of the Elk Creek Carbonatite, Southeast Nebraska, USA, 8th International Kimberlite Conference, Victoria, BC, Canada.

Selected Programs Conducted 2002

Presentation, Accretionary Basement Control on Structures of Central USA, 2001 Geological Society of America Abstracts with Programs, Boston, MA, Vol. 33, No. 6.

Presentation, Basement Control of Phanerozoic Structures, Midcontinent USA, 16th International Conference on Basement Tectonics, Rolla, MO, May, 2002.

Presentation, A Basement Framework Hypotheses for the Tectonic Architecture and Geologic History of the Western Mid-Continent, USA, American Association of Petroleum Geologists, Hedberg Research Conference, "Late Paleozoic Tectonics and Hydrocarbon Systems of Western North America – The Greater Ancestral Rocky Mountains", Vail, CO.

Presentation, Basement Control on Phanerozoic Structures and Tectonics – Midcontinent USA, Geological Society of America Abstracts with Programs, 2002 Annual Meeting, Denver, CO.

Provided general comments to attorneys involved in litigation and presented 4 days of court testimony.

Lead participant in CSD Workshop for Nebraska Department of Roads on geologic framework of Nebraska.

Presented talk to 31st Annual Conference of Midwest Geotechnical Engineers on need to use geology in planning.

XUN-HONG CHEN, Associate Professor, 75% Research, 25% Scholarly Service

Areas of Interest: Groundwater Hydrology and Modeling, Conjunctive-use Models, Stream-Aquifer Interactions, Aquifer and Streambed Tests

Contact: xchen2@unl.edu, 402/472-0772

EDUCATION

B.S. Geology, Zhejiang University, China (1982)

M.S. Geology, California State University-Northridge (1988)

Ph.D. Hydrogeology, University of Wyoming (1994)

PROFESSIONAL EXPERIENCE

1998-present Associate Professor, Conservation and Survey Division and School of Natural Resources, University of Nebraska-Lincoln (UNL)

1994-1998 Assistant Professor, Conservation and Survey Division and School of Natural Resources, University of Nebraska-Lincoln

1991-1994 Consulting Hydrogeologist, TriHydro Corporation, Laramie, Wyoming

1982-1985 Instructor, Department of Geology, Zhejiang University, China

HONORS AND AWARDS

Outstanding Senior Thesis Award, Zhejiang University, China (1982)

TEACHING

Masters and Doctoral Students Advised

HuiHua Huang (M.S. Hydrogeology 2000) Evaluation of stream-aquifer interactions considering streambed sediment and stream partial penetration effects. (Co-advisor)

Qingyuan Lou (M.S. Computer Science 1999) Financially Supported in 1999

Xiaodan Song (Ph.D. Biological Systems Engineering 2003) Advised and Financially Supported between 1998-1999.

Supported and Advised Three Post-Doc Researchers (Xi Chen, Longcang Shu, and Yanfeng Yin).

RESEARCH

Development of groundwater flow models for the analyses of stream depletion of the Republican and Platte rivers in Franklin, Red Willow, Kearney, and Buffalo counties;

Development of a groundwater flow model in the Nebraska Sand Hills for the analysis of

the water cycle; Development of an inverse method for design of observation well network for pumping tests in unconfined aquifers; Development of methodologies for the analysis of stream depletion (baseflow reduction and induced stream infiltration) and stream water and groundwater interactions; Determination of hydraulic properties of the High Plains Aquifers (alluvial sediments, aquitards, and the Ogallala Group).

SURVEY

Development of extended permeameters for measurement of directional hydraulic conductivities in streambed; Investigation of streambed hydraulic conductivities of the Platte River between Ashland and Kearney, the Republican River between McCook and Red Cloud, and the Little Blue River; Design and construction of observation well networks for pumping tests near Wood River and Shelton, south-central Platte Valley; Long-term groundwater level monitoring in the Republican and Platte River valleys, and southeast Nebraska; Development of computer programs for converting the present test-hole data files to database files; Analyses of the test hole logs in the area between Hitchcock and Webster counties of the Republican River valley.

SELECTED GRANTS AND CONTRACTS

Watershed Processes Modeling in Irrigated River Valleys – Integration of a Groundwater Flow Model with Surface Water Model, University of Nebraska–Lincoln Research Council (Maude Hammond Fling Faculty Research Fellowship), \$10,000; 2003.

Investigation of Directional Hydraulic Conductivities of Streambeds and Evaluation of Their Roles in Stream–aquifer Interactions, U.S. Geological Survey, \$31,646; 2001–2003.

Groundwater Level and Temperature Monitoring Instrumentation for State-wide Network (with Mark Kuzila), University of Nebraska–Lincoln, Water Center, \$17,028; 2002.

Secure Distribution Information (SDI) Infrastructure (with UNL Computer Sciences and Engineering), National Science Foundation–EPSCoR, \$1,500,000; 2001–2004.

Using Integrated Modeling Techniques to Investigate the Hydrological Cycle in the Nebraska’s Sand Hills (Including Groundwater Systems, Surface Water, and the Atmosphere) (with C. Rowe), NOAA, \$225,000; 2000–2003.

Determination of Aquifer and Aquitard Hydraulic Properties and Their Role in Streamflow Depletion, Platte River Valley, Nebraska, DOI–U.S. Geological Survey, \$50,000; 1998–2001.

Pumping Test Analysis and Evaluation of the Impact of Irrigation Well Pumpage on the Stream–aquifer Systems along the Republican Valley, Nebraska, Nebraska Department of Water Resources, \$72,423; 1997–1999.

Groundwater Modeling and Analysis of Streamflow Depletion in Franklin and Red Willow Counties, Nebraska, Nebraska Department of Water Resources, \$17,586; 1998-1999.

Hydraulic Characterization of the Stream-aquifer Interface: Theory, Field Implementation, and Practical Ramification (with V. Zlotnik), DOI-U.S. Geological Survey, \$105,000; 1998-2001.

SELECTED PUBLICATIONS

Chen, X.H. and X. Chen. (in press). *Effects of Aquifer Anisotropy on the Migration of Infiltrated Stream Water to a Pumping Well*, **Journal of Hydrologic Engineering ASCE**.

Chen, X. and X.H. Chen. 2003 (in press). *Stream Water Infiltration, Bank Storage, and Storage Zone Changes Due to Stream-stage Fluctuations*, **Journal of Hydrology**.

Chen, X.H. and Y. Yin. 2003. (in press). *Semi-analytical Solutions for Evaluation of Stream Depletion in Shallowly Penetrating Gaining Streams*, **Ground Water**.

Chen, X.H. 2003. *Analysis of Pumping-induced Infiltration in Gaining Streams*, **Journal of Hydrology**, 275 (1-2), 1-11.

Chen, X., X.H. Chen, Q. Hu, C. Rowe, and M. Anderson. 2003. *Geological and Climatic Controls on Streamflows in The Nebraska Sand Hills*, **Journal of American Water Resources Association**, 39 (1), 217-228.

Chen, X.H., J. Goeke, J.F. Ayers, and S. Summerside. 2003. *Observation Well Network Design for Pumping Tests in Unconfined Aquifers*, **Journal of American Water Resources Association**, 39 (1), 17-32.

Chen, X.H. and L.C. Shu. 2002. *Stream-aquifer Interactions: Evaluation of Depletion Volume and Residual Effects From Ground Water Pumping*, **Ground Water**, 40 (3), 284-290.

Chen, X.H. 2001. *Migration of Induced-infiltrated Stream Water Into Nearby Aquifers Due to Seasonal Ground Water Withdrawal*, **Ground Water**, 39 (5), 721-728.

Chen, X.H., and Y. Yin. 2001. *Streamflow Depletion: Modeling of Reduced Baseflow and Induced Stream Infiltration From Seasonally Pumped Wells*, **Journal of American Water Resources Association**, 37 (1), 185-195.

Chen, X.H. 2000. *Measurement of Streambed Hydraulic Conductivity and its Anisotropy*. **Environmental Geology**, 39 (12), 1317-1324.

Chen, X.H., J. Goeke, and S. Summerside. 1999. *Hydraulic Properties and Uncertainty Analysis for an Unconfined Alluvial Aquifer*, **Ground Water**, 37 (6), 845-854.

OTHER PROFESSIONAL ACTIVITIES

Invited lectures: "Groundwater Surface Water Interactions," Hohai University, China, January 2003; "Numerical Modeling of Groundwater Flow in Porous Media," Zhejiang Petroleum Institute, China, December 1999; "Mathematical Modeling in Hydrogeology," Zhejiang University, China, June 1998

Member of a UNL delegation to China

Reviewers of manuscripts for various professional journals and research proposals for NSF

STEVE D. COMFORT, Associate Professor, 10% Teaching, 75% Research,
15% Extension/Outreach

Areas of Interest: Soil Environmental Chemistry

Contact: scomfort@unl.edu, 402/472-1502

EDUCATION

B.S. Soil Science and Agricultural Education, University of Wisconsin-Madison (1981)

M.S. Soil Science, University of Minnesota (1984)

Ph.D. Soil Science, University of Wisconsin-Madison (1989)

PROFESSIONAL EXPERIENCE

1997-present Associate Professor, School of Natural Resources, University of
Nebraska-Lincoln (UNL)

1992-1997 Assistant Professor, Department of Agronomy, University of Nebraska-
Lincoln

1989-1992 Postdoctoral Research Associate, Soil Chemistry and Soil Physics, Department
of Plant, Soil, and Environmental Sciences, Montana State University

1988-1989 Postdoctoral Research Associate, Soil Chemistry, Department of Crop and Soil
Sciences, Oregon State University

HONORS AND AWARDS

Recognition of Junior Faculty for Excellence in Research Award, Institute of Agriculture and
Natural Resources, University of Nebraska-Lincoln (1996)

Editor's Citation for Excellence in Manuscript Review, Journal of Environmental Quality
(1996)

American Society of Agricultural Engineers Blue Ribbon Award for Extension Publication
"Pesticide Runoff and Water Quality in Nebraska" by S.D. Comfort, T.G. Franti and
S.K. Smith (1997)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 451/851 Soil Environmental Chemistry (SOO, SO2)

NRES 491/891 Professional Presentation Skills Seminar (SO3)

Masters and Doctoral Students Advised

- H.K. Boparai (Ph.D. Soil Science, expected 2005) *Remediating Chloroacetanilides-Contaminated soil and Groundwater with Dithionite Reduced Soils.*
- S. Onanong (Ph.D. Soil Science, expected 2005) *Using Vertical Attachment and LUMO Energies to Predict Dehalogenation Rates of Environmental Contaminants by Zerovalent Iron.*
- J. Park (Ph.D. Soil Science, expected 2004) *Remediating Munitions-Contaminated Soil with Zerovalent Iron and Surfactants.*
- M. Adam (M.S. Environmental Engineering, expected Aug, 2003) *Treatability Studies for In-Situ Remediation of an RDX-Contaminated Aquifer.*
- T. Santapanajaru (Ph.D. Soil Science 2002) *Remediating Chloroacetanilide-Contaminated Water using Zerovalent iron.*
- E.L. Bier (M.S. Soil Science 1997) *Remediating RDX-Contaminated Soil by Abiotic Oxidation and Reduction Treatments.*
- J. Singh (Ph.D. Soil Science 1997) *Natural and Accelerated Detoxification of Atrazine and RDX in Contaminated Soil and Water.*
- D.L. Tyess (M.S. Soil Science 1996) *Relationships Between Atrazine Mineralization and Soil Characteristics in the Presence of Atrazine-Degrading Microorganisms.*
- Z.M. Li (Ph.D. Soil Science 1996) *Remediating TNT-Contaminated Water and Soil by Fenton Oxidation.*
- J.L. Martin (M.S. Soil Science 1995) *Metabolism of 2,4,6-Trinitrotoluene (TNT) by Pseudomonas savastanoi.*

RESEARCH

My research focuses on developing abiotic reductive and oxidative approaches to remediating soil and water containing recalcitrant organic contaminants. Examples include the use of the Fenton reaction, KMnO_4 , and $\text{UV}/\text{H}_2\text{O}_2$ for treating nitroaromatics and nitramines in contaminated soil and water. Considerable emphasis has been placed on using zerovalent iron as an abiotic chemical reductant of TNT, RDX, HMX, and selected pesticides. Past research has focused on the fate and transport of herbicides in the vadose zone using laboratory transport columns (vacuum chambers, soil columns) and field-scale monitoring systems. Empirical observations have been coupled with the use of computer simulation models for predicting the transport and degradation of pesticides in the vadose zone and evaluating methods of quantifying chemical nonequilibrium transport.

EXTENSION

My extension efforts concentrate on developing extension publications and outreach programs to protect ground and surface water in Nebraska. Emphasis is placed on

chemical/waste use and water quality concerns from a soil chemistry perspective. Examples of extension publications include:

Comfort, S.D., P.J. Shea and F.W. Roeth. 1994. *Understanding Pesticides and Water Quality in Nebraska*, Cooperative Extension Service, University of Nebraska-Lincoln, Extension Circular, EC94-135. 16 pp.

Comfort, S.D., T.J. Franti and S. Smith. 1996. *Pesticide Runoff and Water Quality in Nebraska*, Cooperative Extension Service, University of Nebraska-Lincoln, Extension Circular, EC96-143, 19 pp.

Comfort, S.D. 1997. *Environmental Problems Associated with Land Application of Animal Wastes, Manure Matters*, Vol. 3, No. 11.

Comfort, S.D. and K.D. Frank. 2001. *pH and Liming*, p. 51-58 in *Nutrient Management for Agronomic Crops in Nebraska*, Cooperative Extension Service, University of Nebraska-Lincoln, Extension Circular ECO1-155-S.

SELECTED GRANTS AND CONTRACTS

Predicting Contaminant Dehalogenation Rates from Electron Scattering Studies (with P. Shea and P. Burrow), U.S. Department of Agriculture-National Research Initiative (NRI), \$150,000; 2001-2003.

Laboratory Treatability Studies for In-situ Treatment of a Rdx-contaminated Aquifer (with P. Shea), Sandia National Laboratory, \$75,000; 2002-2003.

Chemical Oxidation/Reduction Innovative Technology Evaluation for the Massachusetts Military Reservation (with C. Jones and P.J. Shea), Ogden Environmental and Energy Services, Inc., \$61,280; 2001.

Bench-Scale Investigations into the Treatment of HMX-Contaminated Soils, Sandia National Laboratories, \$21,750; 2001.

State-of-the-Art Mass Selective Detector for Identification and Confirmation Analyses (with P. Shea), National Research Initiative (NRI) Equipment Grant, \$21,582; 1995-1996.

SELECTED PUBLICATIONS

Comfort, S.D., P.J. Shea, T.A. Machacek, and T. Satapanajaru. 2003 (in press). *Pilot-scale Treatment of Rdx-contaminated Soil with Zerovalent Iron*, *Journal of Environmental Quality*, 32.

Huang, Y.H., T.C. Zhang, P.J. Shea, and S.D. Comfort. 2003 (in press). *Effects of Oxide Coating and Selected Cations on Nitrate Reduction by Iron Metal*, *Journal of Environmental Quality*, 32.

- Satapajar, T., S.D. Comfort, and P.J. Shea. 2003 (in press). *Enhancing Metolachlor Destruction Rates with Aluminum and Iron Salts During Zerovalent Iron Treatment*, *Journal of Environmental Quality*, 32.
- Gaber, H.M., S.D. Comfort, P.J. Shea, and T.A. Machacek. 2002. *Metolachlor Dechlorination by Zerovalent Iron During Unsaturated Transport*, *Journal of Environmental Quality*, 31, 962-969.
- Smith, S.K., T.G. Franti, and S.D. Comfort. 2002. *Impact of Initial Soil Water Content, Residue Cover, and Post-herbicide Irrigation on Atrazine and Metolachlor Runoff*, *Transactions of the ASAE*, 45, 1817-1824.
- Comfort, S.D., P.J. Shea, T.A. Machacek, H. Gaber, and B.-T. Oh. 2001. *Field-scale Remediation of a Metolachlor Spill Site Using Zerovalent Iron*, *Journal of Environmental Quality*, 30, 1636-1643.
- Gorneau, W.S., T.G. Franti, B.L. Benham, and S.D. Comfort. 2001. *Reducing Long-term Atrazine Runoff from South Central Nebraska*, *Transactions of the ASAE*, 44, 45-52.
- Oh, B.-T., G. Sarath, P.J. Shea, R.A. Drijber, and S.D. Comfort. 2000. *Rapid Spectrophotometric Determination of 2,4,6-trinitrotoluene in a Pseudomonas Enzyme Assay*, *Journal of Microbiological Methods*, 42, 149-158.
- Bier, E.L., J. Singh, Z. Li, S.D. Comfort, and P.J. Shea. 1999. *Remediating Hexahydro-1,3,5-Trinitro-1,3,5-Triazine-contaminated Water and Soil by Fenton Oxidation*, *Environmental Toxicology and Chemistry*, 18, 1078-1084.
- Singh, J., S.D. Comfort, and P.J. Shea. 1999. *Optimizing Eh/pH for Iron-mediated Remediation of Rdx-contaminated Water and Soil*, *Environmental Science and Technology*, 33, 1488-1494.

OTHER PROFESSIONAL ACTIVITIES

Associate Editor, Journal of Environmental Quality, 1997-2000

KENNETH F. DEWEY, Professor, 40% Teaching, 45% Extension/Outreach,
15% Research

Areas of Interest: Severe Storms Meteorology/Climatology, Climate Variations, Snow and
Ice Studies

Contact: kdewey1@unl.edu, 402/472-2908

EDUCATION

Ph.D. Geography, University of Toronto (1973)

M.S. Geography, Northern Illinois University (1970)

B.A. Geography, Elmhurst College, Elmhurst, Illinois (1969)

PROFESSIONAL EXPERIENCE

1997-present Professor, School of Natural Resource Sciences, University of Nebraska-
Lincoln

1989-1997 Professor, Geography/Geosciences, Meteorology Program, University of
Nebraska-Lincoln

1981-1988 Associate Professor, Geography, Meteorology Program, University of
Nebraska-Lincoln

1978-198 Assistant Professor, Geography, Meteorology Program, University of
Nebraska-Lincoln

1976-1977 Research Associate, Techniques Development Lab, NWS, Washington, D.C.

1974-1976 Assistant Professor, Geography, Meteorology Program, University of
Nebraska-Lincoln

HONORS AND AWARDS

Seven University of Nebraska Alumni Association Teaching Awards (Spring 2003, 2002,
1998, 1997, 1996, 1994, and 1992)

UNL Outstanding Teacher Award (1983)

TEACHING

Courses Taught (Fall, Spring, Summer)

METR 200 Weather and Climate (S99, S00, S01, F01, S02, S03)

METR 351 Basic and Applied Climatology (S98, S99, S00, F00, F01, F02)

METR 451 Severe Storms Meteorology, Climatology (S98, S00)

METR 498 Research in Applied Climatology (S01, S03)

METR 498 Natural Disasters (S99)

Masters and Doctoral Students Advised

Jesse Kosch (M.S. Geosciences, 2003) *A Snowfall Climatology for Southeast Nebraska.*

Chad Kauffman (Ph.D Geosciences, 2001) *Evaluation of the ASOS Impact on Climatic*

Normals and Assessment of Variable-length Time Periods in Calculations of Normals.

Chad Kauffman (M.S. Geography, 1997) *A Comparative Analysis of Several Climatological Indices to Evaluate Heat-Related Mortality in St. Louis, Missouri.*

RESEARCH

Recent research has concentrated on science teaching methods and the creation of climate products for the High Plains Regional Climate Center. I had 22 research presentations at professional meetings during the past 5 years. Over 150 climate products are created annually by me at the web site that I maintain: <http://www.hprcc.unl.edu/nebraska>. This web site now receives 4 million "hits" or page requests per year. I have also had 4 UCARE grants to help undergraduates conduct research.

EXTENSION

I organize and present an annual one-day public education weather symposium, "Central Plains Severe Weather Symposium", that attracts 2000 members of the public. I gave 61 extension presentations to the public during the period October 1999 through October 2002. I gave three 3-day "weather in the classroom" workshops to help bring weather science into the K-12 curriculum in Nebraska. I also help organize and present two storm spotter training workshops each year.

SELECTED GRANTS AND CONTRACTS

UNL-UCARE Research Grant (with K. Klute), \$2400; Summer 2003.

UNL-UCARE Research Grant (with E. Green), \$2400; Summer 2002.

NOAA/NWS for the Public Severe Weather Symposium, \$1500; Spring 2002.

NOAA/HPRCC for the Public Weather Symposium, \$1500; Spring 2002.

Free advertising of a 30-second commercial on the cable system for 21 days Time Warner Cable, equivalent expense of \$20,000; Spring 2002.

Multi disciplinary grant for "Weather in the Classroom" workshops, School of Natural Resource Sciences, UNL, \$8908; Summer 2001.

Weather in the Classroom workshops, UNL Science and Math Initiative, \$7500; Summer 2001.

Research Grant (with Christy Carlson), UNL-UCARE, \$2400; Summer 2001.

Seed grant to develop a "Weather in the Classroom" workshop, UNL Science and Math Initiative, \$5400; Summer 2000.

Extension, High Plains Regional Climate Center, National Weather Service, and UNL School of Natural Resource Sciences, Geosciences, \$10,200; 1999-2000, for Weather Symposium October 7, 2000.

Research Grant with Erin Robinson, UNL-UCARE, \$240; Summer 2000.

Nebraska Earth Science Education Network, to develop a research project with high school science teachers, \$1,000; Summer 2000.

Creating an Electronic Atlas, UNL School of Natural Resource Sciences, Interdisciplinary Proposal, \$7,000; Summer 1999.

An Electronic Atlas of Nebraska's Climate University of Nebraska Research Council Summer Fellowship, \$6,500; June 1998-August 1998.

The Impacts of Climate Change Using Long Term Daily Records over Grassland Regions of the Northern Hemisphere National Institute for Global Environmental Change, Department of Energy, \$43,475; July 1995-June 1996.

The Impacts of Climate Change Using Long Term Daily Records over Grassland Regions of the Northern Hemisphere, National Institute for Global Environmental Change, Department of Energy, \$55,888; July 1994-June 1995.

SELECTED PUBLICATIONS

Dewey, K.F. 2001. *Weather in the West*, 105 p.

Dewey, K.F. 2001. *Climate and the West*, *Journal of the West*, 6-9.

Dewey, K.F. 2001. *Weather of the West*, *Journal of the West*, 31-38.

Dewey, K.F. and S. Meyer. 2000. *Active Learning in Introductory Climatology*, *Journal of College Science Teaching*, 29, 265-272.

Dewey, K.F. and S. Narumalani. 2000. *A Climate Atlas of Nebraska*, Published on the Internet at <http://www.hprcc.unl.edu/nebraska/atlas.html>

Leathers, D.J., M.A. Palecki, D.A. Robinson, and K.F. Dewey. 1998. *A Climatology of the Daily Temperature Range Annual Cycle in the United States*, *Climate Research*, 9, 197-211.

Dewey, K.F. and M. Anderson. 1997. *Television Broadcast Meteorology Weather Forecast Accuracy Study Omaha, Nebraska*, Study conducted for and published by the Pulitzer Corporation, 78 p.

Dewey, K. 1996. *The Weather and Climate Of Nebraska*, NEBRASKALand Magazine, January-February 1996 Special Issue, 138 p.

Robinson, D.A., D.J. Leathers, M.A. Palecki, and K.F. Dewey. 1996. *Some Observations on Climate Variability as Seen in Daily Temperature Structure*, *Atmospheric Research*, 37, 119-131.

OTHER PROFESSIONAL ACTIVITIES

Member, Graduate Committee, School of Natural Resource Sciences, 1999-2002

Member, Promotion and Tenure Committee, School of Natural Resource Sciences, 2000-present; Chair, 2002-present

Member, Curriculum Committee, School of Natural Resource Sciences, 2002-present

Member, Planning Committee, Center for Great Plains Studies 2004 Annual Symposium

Academic Senate Representative, 1996-2000

President, Omaha, NE, American Meteorological Society Chapter, 2001-2002

Faculty Advisor, UNL Student AMS Club

Organizer of the Annual Central Plains Severe Weather Symposium

Co-organizer of spring spotter training workshops, Lancaster and Saline Counties

UCAR Member Representative

Member, Planning Committee, 4th Annual Conference High Plains Chapter of the AMS/NWA

Maintain Geosciences Meteorology Student alumni site and meteorology student activity site

ROBERT F. DIFFENDAL, JR., Professor, 100% Survey; Licensed Professional Geologist (NE)-#G-0002

Areas of Interest: Fluvial Sedimentology, Geomorphology, Cenozoic Paleogeography, Stratigraphy, and Paleontology of the Great Plains, Geologic Resources of the Great Plains, Geomorphology and Stratigraphy of Eastern China, Curriculum Development
Contact: rfd@unl.edu, 402/472-7546

EDUCATION

A.B. *Geology, Franklin and Marshall College (1962)*

M.S. *Geology, University of Nebraska (1964)*

Ph.D. *Geology, University of Nebraska (1971)*

PROFESSIONAL EXPERIENCE

1986-present *Professor, Conservation and Survey Division, University of Nebraska-Lincoln (UNL)*

1980-1986 *Associate Professor, Conservation and Survey Division, University of Nebraska-Lincoln*

1974-1980 *Associate Professor, Doane College*

1970-1974 *Assistant Professor, Doane College*

1969-1970 *Assistant Professor, St. Dominic College*

1966-1969 *Instructor, St. Dominic College*

ADMINISTRATIVE EXPERIENCE

2001-present *Coordinator, Natural Resources and Research Complex, School of Natural Resource Sciences, University of Nebraska-Lincoln*

1997-2000 *Assistant Director, School of Natural Resource Sciences, University of Nebraska-Lincoln*

1990-1991 *Interim Associate Director, Conservation and Survey Division, University of Nebraska-Lincoln*

1978-1979 *Associate Dean, Doane College*

1977-1979 *Chairman, Natural Science Division, Doane College*

HONORS AND AWARDS

Honorary Visiting Professor, Zhongshan University Guangzhou, China (1998-2000)

Guest Professor, Chengdu University of Technology, Chengdu, China (1998)

Fellow, Center for Great Plains Studies, University of Nebraska (1990)

Distinguished Service Award, Geology Department, University of Nebraska (1990)
Fellow, Geological Society of America (1989)

TEACHING (last five years)

Masters and Doctoral Students Advised

Patricia Helland (M.S. Geology 2003) *Application of Quartz Sand Grain Surface Textural Analysis to Determine Sedimentary History of a North Atlantic Marine Core and a Boulder Clay from East Central China.*

Service on Doctoral Committees

Eric Straffin (Ph.D. Geology 2000)

James Durbin (Ph.D. Geology 1999)

Song-Tao Wang (Ph.D. Geology 1998)

SURVEY

My major emphases over the last five years have been geologic mapping of various parts of Nebraska, publication of maps, articles, and educational materials, and giving talks and leading field trips for people in Nebraska and elsewhere. These talks and trips were mostly related to geologic earth resources. Over the five year period, 1998-2003, I have produced more than 1,356 published pages of research information in journals, survey publications, guidebooks, etc.; have completed preliminary field geologic maps of 30 7.5' quadrangles in Nebraska; have contributed to completion of the map, *Ecoregions of Nebraska and Kansas*; have gotten the completed geologic map of the Broken Bow Quadrangle by V. Souders through the U.S. Geological Survey publication process; and given talks and/or led field trips for at least 7,349 people in Nebraska and elsewhere outside of the usual presentations at professional society meetings.

SELECTED GRANTS AND CONTRACTS

Grand Island Quadrangle (Co-principal investigator), U.S. Geological Survey STATEMAP, \$188,212; 2002-2003.

Grand Island Quadrangle (Co-principal investigator), U.S. Geological Survey STATEMAP, \$193,870; 2001-2002.

O'Neill Quadrangle (Co-principal investigator), U.S. Geological Survey STATEMAP, \$102,066; 2000-2001.

Test Hole Log Books (Co-principal investigator), COHYST-Platte River Basin, \$164,300; 1998-2000.

O'Neill Quadrangle (Co-principal investigator), U.S. Geological Survey STATEMAP, \$102,817; 1999-2000.

O'Neill Quadrangle (Investigator), U.S. Geological Survey STATEMAP, \$79,635; 1998-1999.

Determination of Aquifer and Aquitard Hydraulic Properties (Co-principal investigator), U.S. Geological Survey, \$50,000; 1998-2001.

SELECTED PUBLICATIONS

Pabian, R.K. and R.F. Diffendal, Jr. 2003. *Late Pennsylvanian and Earliest Permian Cyclic Sedimentation and Paleocology in Southeastern Nebraska, Missouri Geological Survey Special Publication, 11, 35-52.*

Diffendal, R.F., Jr. and 7 others. 2002. *Field Guide to the Harlan County Lake Area, Harlan, County, Nebraska, University of Nebraska, Conservation and Survey Division, Educational Circular, 16, 61 + vi p.*

Huang, P-H, R.F. Diffendal, Jr., and M. Yang. 2002. *Structural and Geomorphic Evolution of Hangshan (Yellow Mountain), Anhui Province, China, TER-QUA Symposium Series, 3, 109-124.*

Diffendal, R.F., Jr. and J. Goeke. 2000. *Arthur County Test-Hole Logs, University of Nebraska, Conservation and Survey Division, Nebraska Water Survey Test-Hole Report, 3, 56 + xviii p.*

Diffendal, R.F., Jr. and J. Goeke. 2000. *Keith County Test-Hole Logs, University of Nebraska, Conservation and Survey Division, Nebraska Water Survey Test-Hole Report, 51, 115 +xx p.*

Diffendal, R.F., Jr. 2000. *Cheyenne County Test-Hole Logs, University of Nebraska, Conservation and Survey Division, Nebraska Water Survey Test-Hole Report, 17, 246 + xxiv p.*

Diffendal, R.F., Jr. 1999. *Geology of the Rock Creek Station State Historical Park, University of Nebraska, Conservation and Survey Division, Educational Circular, 11a, 16 p.*

Diffendal, R.F., Jr. 1999. *Earth in Four Dimensions-Development of the Ideas of Geologic Time and History, Nebraska History 80, 95-104.*

Diffendal, R.F., Jr. 1999. *Deuel County Test-Hole Logs, University of Nebraska, Conservation and Survey Division, Nebraska Water Survey Test-Hole Report 25, 93 +vi p.*

Huang, P-H. and R.F. Diffendal, Jr. 1998. *Mountain Evolution and Environmental Changes of Huangshan, China (In Chinese with English Abstract), Scientia Geographic Sinica, 18, 401-408.*

OTHER PROFESSIONAL ACTIVITIES

Associate Editor and Editorial Board, Journal of Geosciences of China, E-journal, 1999-present

Executive Secretary, North-Central Section, Geological Society of America, 1997-present

UNL Chancellor's Speakers Bureau, 2001-2003

Geological Society of America Annual Program Committee, 2002-2005

NASULGC Mineral and Energy Resources Section, University of Nebraska representative, 1999-present

Chairman and Organizer, 1995 Geological Society of America North-Central/South-Central Sections Combined Meeting, Lincoln, NE, 1992-1995

President, University of Nebraska Faculty Senate, 1988-1989

Past-President, University of Nebraska Academic Senate, 1989-1991

Secretary, University of Nebraska Faculty Senate, 1987-1988

DUANE A. EVERSOLL, Research Geologist and Professor; 45% Scholarly Service, 55% Research (as of September 1, 2003 I will be 0.5 FTE in the Survey Division at 27.5% Research and 22.5% Scholarly Service); Registered Geologist in Nebraska and Wyoming; Courtesy Appointment with Department of Geosciences

Areas of interest: Environmental and Engineering Geology (Nebraska Landslides), Geology of Southwestern Nebraska, Geology field tours of Nebraska

Contact: deversoll2@unl.edu, 402/472-7524, Fax 402/472-4608

EDUCATION

B.S. Geology, University of Nebraska-Lincoln (1958)

M.S. Geology, University of Nebraska-Lincoln (1977)

PROFESSIONAL EXPERIENCE

2000-present Professor, Conservation and Survey Division, University of Nebraska-Lincoln (UNL)

1991-2000 Associate Director Conservation and Survey Division, Institute of Agriculture and Natural Resources (IANR), University of Nebraska-Lincoln

1983-2000 Associate Professor, Conservation and Survey Division, University of Nebraska-Lincoln

1977-1983 Assistant professor, Conservation and Survey Division University of Nebraska-Lincoln

1974-1977 Instructor, Conservation and Survey Division, University of Nebraska-Lincoln

1960-1974 Bridge Geologist, Nebraska Department of Roads, Lincoln, Nebraska

1959-1960 Geophysicist, Continental Geophysical Company, Dallas, Texas

HONORS AND AWARDS

Selected by United States Geological Survey (USGS) to participate in a 7 state landslide loss pilot project (2000-2002)

Selected by Italian National Research Council to attend 1990 Hydrogeological Hazards Studies Summer School in Perugia, Italy (June-August 1990)

SURVEY

Major research emphases has been on Engineering Geology -Nebraska Landslides, Coordination of a grant on County Test Hole Log Books; and research on Southwestern Nebraska Geology. Publication of "Landslides in Nebraska" by 2004; Updating and

publishing 9 County test hole log books by end of 2003; and to publish County Geological reports, maps and cross-sections on 6 Southwestern Nebraska Counties (Red Willow, Hitchcock, Dundy, Chase, Hays and Frontier).

Major scholarly service has been on locating water supplies (wells), mainly in SW Nebraska; solving landslide problems and general engineering geological problems across the state for the Nebraska Department of Roads. Provided 12 geological field trips to various groups/organizations in last 5 years. Provide various Cub or Boy Scout troops with advice on their geology badges.

SELECTED GRANTS AND CONTRACTS

Compilation, Updating and Publication of County Test Hole Log Books for Nine Nebraska Counties (Coordinator for 5 other CSD geologists), Platte River Basin and Cooperative Hydrology Study Group (COHYST II), \$14,938; Jan. 1, 2003-Sept. 30, 2003.

Feasibility of Estimating Nebraska Landslide Damage Loss Costs and Recommendations for Convening a National Landslide Loss Cost Conference, United States Geological Survey (USGS), \$7,000; Sept. 1, 2001-August 31, 2002.

Test Hole Log Book Compilation and Publication for Selected Nebraska Counties (Project Coordinator and Researcher), Platte River Basin and Cooperative Hydrology Study (COHYST II), \$95,945; April 1, 2001-March 31, 2002.

Compilation and Publication of County Test Hole Log Books for 31 Nebraska Counties in Platte River Basin (Coordinator for 7 other CSD geologists), Platte River Basin and Cooperative Hydrology Study Group (COHYST I), \$164,300; Oct. 1, 1998-March 31, 2000.

Geology of the Lower Platte Rivers Mineral Resources and Geologic Hazardous Areas-Landslide Prone Areas (Coordinator and PI), Lower Platte River Corridor Alliance, \$31,000; Jan. 1, 1999-Dec 31, 2000.

Data Storage of Geological Logs From Water Well Registrations, Nebraska Information Technology Commission, \$22,200; Project Principal Coordinator, Oct. 1, 1998-June 30, 1999. Project was continued for additional \$24,805 from July 1, 1999 to December 31, 2000.

Republican River Studies (Project Coordinator and Research Geologist), Nebraska Department of Water Resources, \$27,000; March 1, 1997-December 31, 1999.

SELECTED PUBLICATIONS

Diffendal, R.F. Jr., D.R. Mohlman, R.G. Corner, F.E. Harvey, K.J. Warren, S. Summerside, R.K. Pabian, and D.A. Eversoll. 2002. *Field Guide to the Geology of Harlan County*

Lake Area, Harlan County, Nebraska – with a History of Events Leading to Construction of Harlan County Dam, Educational Circular 16, Conservation and Survey Division, IANR, University of Nebraska-Lincoln, p. 37-41.

Eversoll, D.A. 2002. *Frontier County Test Hole Log Book, Nebraska Water Survey Test-Hole Report No. 32, Conservation and Survey Division, IANR, University of Nebraska-Lincoln, 93 p.*

Eversoll, D.A.. 2000. *Hayes County Test Hole Log Book, Nebraska Water Survey Test-Hole Log Report No. 43, Conservation and Survey Division, IANR, University of Nebraska-Lincoln, 56 p.*

Eversoll, D.A. 1998. *Red Willow County Test Hole Log Book, Nebraska Water Survey Test-Hole Report No. 73, Conservation and Survey Division, IANR, University of Nebraska-Lincoln, 187 p.*

Diffendal, R.F. Jr., C.A. Flowerday, R.L. Skelly, F.G. Ethridge, D.A. Eversoll, and B.E. Bailey. 1997. *Geology of Niobrara State Park, Knox County, Nebraska and Adjacent Areas – with a Brief History of the Park, Gavins Point Dam, and Lewis and Clark lake, 1997, Educational Circular 13, Conservation and Survey Division, IANR, University of Nebraska-Lincoln, p. 22-24.*

OTHER PROFESSIONAL ACTIVITIES

Member, Geological Society of America (GSA), 1986-present; Chair, Engineering Geology Division, 2001; presented at last 6 annual meetings on Nebraska Landslides and Engineering Geology

Member of Association of Engineering Geologists (AEG)

President-Elect of National Association of State Boards of Geology (ASBOG), Board Member since 1999; Member of the Council of Examiners, 1994-1999

President Nebraska AgRelations Council, 2002-2004, Member since 1993

Past President Nebraska Agribusiness Club, 2000-2001, Member since 1992

Member of Sigma Xi, 1983-present

Member of Nebraska Geological Society, Charter member and Secretary 1969, President 1975

ANATOLY A. GITELSON, Professor, 15% Teaching, 85% Research

Areas of Interest: Radiative transfer, Remote sensing of environment (terrestrial and aquatic systems, atmosphere), Optical properties of leaves and phytoplankton

Contact: gitelson@calmit.unl.edu, 402/472-8386

EDUCATION

M.S. Electronics, The Institute of Radio Technology, Taganrog, USSR (1964)

Ph.D. Radio Physics, The Institute of Radio Technology, Taganrog, USSR (1972)

PROFESSIONAL EXPERIENCE

2000-present Professor, School of Natural Resources Sciences, University of Nebraska-Lincoln (UNL)

1997-1999 Head, Department for Environmental Physics and Energy Research, Ben-Gurion University of the Negev, Israel

1996-2000 Professor, Department of Geological and Environmental Sciences, Ben-Gurion University of the Negev, Israel

1990-2000 Senior Scientist, Grade A+, Remote Sensing Laboratory, J. Blaustein Institute for Desert Research, Ben-Gurion University of the Negev, Israel

1981-1989 Head, Remote Sensing Laboratory, Hydrochemical Institute, USSR Environmental Protection Agency, Rostov-on-Don, USSR.

1977-1981 Senior Scientist, Institute for Nuclear Research, Academy of Sciences of the USSR, Moscow.

1973-1977 Head, Laboratory for Electrodynamics, Physical Institute, Rostov-on-Don State University, USSR.

1964-1972 Engineer, Institute for Microwave Electronics, Krasnodar, USSR.

HONORS AND AWARDS

Best work of the year 1977 in Solid State Physics: Physical Properties of Thin Ferroelectric Films, Solid State Physics, 1977, 19 (6), 1556-1560; 19 (7), 1913-1919. USSR Academy of Sciences (1997)

Best work of the year 1981 in Physics of High Energy Particles: Lower Limit on the Proton Lifetime According to Data from the Baksan Underground Telescope, American Institute of Physics, 0021-0/81/120651-3. USSR Academy of Sciences (1981)

DAAD Fellowship, German Academy of Sciences, Karlsruhe University (1996)

Israeli State Prize for the best scientific contribution to Israeli development (1998)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 896 Quantitative Remote Sensing of Terrestrial and Aquatic Ecosystems (SOO)
(SO1) (SO2) (SO3)

Masters and Doctoral Students Advised

Veronica Ciganda (Ph.D. Agronomy, expected 2006) Non-destructive Assessment Pigment Content and Composition in Higher Plant Leaves.

Giorgio Dall'Olmo (Ph.D. Natural Resource Sciences, expected 2005) Remote Quantification of Chlorophyll Concentration in Productive Turbid Waters.

Andres Viña (Ph.D. Natural Resource Sciences, expected 2004) Remote Estimation of Biophysical Properties of Plant Canopies.

RESEARCH

Conceptual model, which relates remotely measured reflectance and pigment content in leaves was developed and applied for non-destructive quantification of chlorophylls, carotenoids and anthocyanins in leaves. The same conceptual model was applied to quantify remotely chlorophyll content in plant canopy and in productive waters.

Techniques for remote quantification of vegetation cover, leaf area index, biomass, and plant photosynthetic activity (CO_2 fluxes) were developed and tested.

Quantitative remote techniques for assessment of chlorophyll-a and tripton in productive turbid waters were developed.

Atmospherically resistant indices were developed for retrieval of vegetation biophysical characteristics from satellite data.

SELECTED GRANTS AND CONTRACTS

Flood in Arid Units by Earth Remote Techniques, Commission of the European Communities, 97,000 ECU; 1997-1999.

Launching the Remote Sensing System for Estimation of Seasonal Dynamics of Arid Zone Pasture and Crop Productivity Using AVHRR Data, US Agency for International Development, CDR/CAD program, \$79,000; 1998-2000.

Remote Sensing Monitoring Quality of Israeli Aquatic Environments based on SeaWiFS, MERIS, and MODIS data, Israeli Ministry of Science, \$855,000; 1999-2001.

Remote Sensing Techniques for Real-time Monitoring Phytoplankton, Non-organic Suspended Matter and Dissolved Organic Matter Distribution in Lake Kinneret, Israeli Ministry of Infrastructure, Water Commission, \$90,000; 1999-2001.

Novel Remote Sensing Techniques for Detection of Early Stages of Plant Stress, Israeli Ministry of Agriculture, (105,000 NIS); 1998-2001.

Estimation of Seasonal Dynamics of Arid and Semi-arid Zone Pasture Productivity in Mongolian Gobi Using NOAA/AVHRR Data, U.S. Agency for International Development, AID/CDR/CAD program, \$200,000; 2000-2003.

Development of National Aquatic Ecosystems Classifications and Reference Conditions: Development and Implementation of a Comprehensive Lake and Reservoir Strategy for Nebraska as a Model for Agriculture Dominated Ecosystems (Co-PI), U.S. Environmental Protection Agency, \$1,224,706; 2001-2003.

Carbon Sequestration, Climate Change and New Economic Opportunities for Nebraska, Co-PI, DOE, \$789,000; 2001-2003.

Consequences of Institutional Change: Land-cover Dynamics in Kazakhstan 1960-2000, NASA, \$538,571; 2001-2004.

SELECTED PUBLICATIONS

Gitelson, A.A., U. Gritz, and M.N. Merzlyak. 2003. *Relationships Between Leaf Chlorophyll Content and Spectral Reflectance and Algorithms for Non-destructive Chlorophyll Assessment in Higher Plant Leaves*. *Journal of Plant Physiology*, 160 (3), 271-282.

Gitelson, A.A., A. Viña, T.J. Arkebauer, D.C. Rundquist, G. Keydan, and B. Leavitt. 2003. *Remote Estimation of Leaf Area Index and Green Leaf Biomass in Maize Canopies*, *Geophysical Research Letters*, 30 (5), 1248. doi:10.1029/2002GL016450.

Gitelson A.A., Y.J. Kaufman, R. Stark, and D. Rundquist. 2002. *Novel Algorithms for Remote Estimation of Vegetation Fraction*, *Remote Sensing of Environment*, 80, 76-87.

Gitelson, A.A., R. Stark, U. Grits, D. Rundquist, Y. Kaufman, and D. Derry. 2002. *Vegetation and Soil Lines in Visible Spectral Space: a Concept and Technique for Remote Estimation of Vegetation Fraction*, *International Journal of Remote Sensing*, 23, (13), 2537-2562.

Gitelson, A.A., Y. Zur, O.B. Chivkunova, and M.N. Merzlyak. 2002. *Assessing Carotenoid Content in Plant Leaves with Reflectance Spectroscopy*, *Photochemistry and Photobiology*, 75 (3), 272-281.

Gitelson, A.A., M.N. Merzlyak, and O.B. Chivkunova. 2001. *Optical Properties and Non-destructive Estimation of Anthocyanin Content in Plant Leaves*, *Photochemistry and Photobiology*, 74 (1), 38-45.

Gitelson, A.A., C. Buschmann, and H.K. Lichtenthaler. 1999. *The Chlorophyll Fluorescence Ratio F735/F700 as an Accurate Measure of the Chlorophyll Content in Plants*, *Remote Sensing of Environment*, 69, 296-302.

Gitelson, A. and Y. Kaufman. 1998. *MODIS NDVI Optimization to Fit the AVHRR Data Series - Spectral Considerations*, *Remote Sensing of Environment*, 66 (3), 343-350.

- Gitelson, A. and M. Merzlyak. 1997. *Remote Estimation of Chlorophyll Content in Higher Plant Leaves*, *International Journal of Remote Sensing*, 18 (12), 291-298.
- Gitelson, A., Y. Kaufman, and M. Merzlyak. 1996. *Use of a Green Channel in Remote Sensing of Global Vegetation from EOS-MODIS*, *Remote Sensing of Environment*, 58, 289-298.

JAMES W. GOEKE, Research Hydrogeologist, 75% Scholarly Service, 25%
Research

Areas of Interest: Water, Earth History

Contact: jgoeke1@unl.edu, 402/472-0661

EDUCATION

B.S. Geology, University of Wisconsin (1966)

M.S. Groundwater Geology, Colorado State University (1970)

PROFESSIONAL EXPERIENCE

1976-present Research Hydrogeologist, Conservation and Survey Division, University
of Nebraska-Lincoln

West Central Research and Extension Center, North Platte, NE

1970-1976 Hydrogeologist, Conservation and Survey Division, University of Nebraska-
Lincoln

HONORS AND AWARDS

Tree Planters State Award from the Nebraska Statewide Arboretum (1995)

State Foresters Award from the Nebraska State Forest Service (1995)

The Maurice Kremer Groundwater Achievement Award (2001)

TEACHING

Courses Taught (Spring, Fall, Summer)

The following are one-day teaching efforts, locally arranged for grade school children.

High Plains Water Expo

Water Riches Field Day

Sandhills Academy

Range Camp

GSL Youth Field Day

RESEARCH

Regional Groundwater Studies

Stream/Aquifer Relationships

Meadow Hydrology

Sandhills History

Stream Evolution

SURVEY

Acid Rain/Dioxin

Groundwater Level Changes

Drought Impacts

Republican River Compact Resolution

SELECTED GRANTS AND CONTRACTS

USGS Test Hole Lithologic Log Descriptions

USGS Platte River Aquifer Parameter Estimation

COHYST Test Hole Log Books

SELECTED PUBLICATIONS

Chen, X.-H., J. Goeke, and S. Summerside. 1998. *Geology, Hydrogeology and Aquifer Hydraulic Properties from Five Test Sites in the Republican River Valley, Nebraska, Contract Report for Nebraska Department of Water Resources.*

Bentall, R. and J. Goeke. 1995. *Map Observation of Nebraska Drainage Systems, GSA Abstract.*

Goeke, J., A. Matherne, and D. Gosselin. 1994. *Hydrogeologic Dynamics of the Wet and Dry Valleys at the Gudmundsen Sandhills Research Laboratory, UNL Proceedings Report, WCC 94-01.*

McClellan, J.S., H.-H. Chen, and J. Goeke. 1994. *Simulation of Ground-Water Movement in the High Plains Aquifer, Southern Sandhills Area, West Central Nebraska, USGS Open File Report, 94-XXX, 50 pp.*

Kranz, B., J. Goeke, and D. Hay. 1993. *Understanding Groundwater, UNL-IANR NebGuide, G93-1128-A.*

Kranz, B., D. Gosselin, D. Hay, and J. Goeke. 1993. *Glossary of Water Related Terms, UNL-IANR NebGuide, G93-1191.*

Goeke, J.W. 1992. *Hydrogeology of Parts of the Twin Platte and Middle Republican Natural Resources Districts Southwestern Nebraska, Nebraska Water Survey, Paper No. 70, 89 p.*

OTHER PROFESSIONAL ACTIVITIES

Board Member and NE Representative, Ogallala Aquifer Institute

Board Member, Keep Nebraska Beautiful Board

Member, North Platte Civil Service Commission

Trustee, Nebraska Nature Conservancy

Member, Platte River Water Management Committee

Member, Republican River Task Force

Member, Nebraska Statewide Arboretum and Friends of the Viehmeyer Arboretum

DAVID C. GOSSELIN, Professor, 45% Research, 45% Scholarly Service, 10% Teaching

Areas of Interest: Hydrogeology, Geochemistry, and Science Education

Contact: dgosselin2@unl.edu, 402/472-8919

EDUCATION

B.S. Geology, College of St. Thomas, St. Paul, MN (1982)

Ph.D. Geology, South Dakota School of Mines and Technology Rapid City, SD (1987)

PROFESSIONAL EXPERIENCE

2003-present Professor, School of Natural Resources, University of Nebraska-Lincoln (UNL)

1995-2003 Associate Professor, School of Natural Resource Sciences and Conservation and Survey Division, University of Nebraska-Lincoln

1993-Present Director, Nebraska Earth Systems Education Network, University of Nebraska-Lincoln

1989-1995 Assistant Professor and Research Hydrogeologist/Geochemist, Conservation and Survey Division, University of Nebraska-Lincoln

1988-1989 Postdoctoral Trainee, Analytical Chemistry Group; Battelle-Pacific Northwest Laboratory and Northwest College and University Association for Science, Richland, WA

HONORS AND AWARDS

Catalyst Award for dedicated service to science education, Nebraska Association of Teachers of Science (1999)

Institute of Agriculture and Natural Resources Team Award for Mid-Nebraska Water Quality Demonstration Project (1995)

TEACHING (last five years)

Courses Taught (Fall, Spring, Summer)

NRES 299a Earth Systems Science for Educators (F97, S98, F98, S99, F99, S00, S01, F01, F02)

NRES 299b Ecosystems of Northeast Nebraska (F01)

NRES 103 Recitation (F00)

NRES 896 Independent Study: Integrated Earth Systems Science Research (Su00, F00)

CURR 895 Independent Study (Su97, Su00)

Masters and Doctoral Students Advised

Steve Drda (M.S. Geology 1998) Hydrology of Two Interdunal Valleys in the Nebraska Sand Hills.

RESEARCH

My research focuses on the application of geochemical and hydrogeologic principles to both basic and applied scientific problems. Examples include assessing: local and state-wide groundwater quality; the physical and chemical hydrogeology of groundwater resources; the behavior of trace elements and natural occurring isotopes in groundwater; the potential impact of environmental change on Sand Hills environments; and developing groundwater management strategies. Accomplishments since my advancement to associate professor includes 17 refereed journal articles (16 published, 1 in review) and 26 authored or co-authored non-refereed abstracts and/or contract reports.

EDUCATIONAL OUTREACH AND SCHOLARLY SERVICE

My experiences in informal educational programming have allowed me to develop an effective educational outreach and scholarly service program. One clientele group that we have focused on are K-12 educators. In 1999, I was honored by the Nebraska Association of Teachers of Science with their Catalyst Award in "Appreciation for Dedication to Science Education." Outcomes of my educational outreach activities since promotion to associate professor includes 11 refereed journal articles and authored or co-authored 19 non-refereed abstracts and/or contract reports.

SELECTED GRANTS AND CONTRACTS (last five years)

Evapotranspiration: Linking Ground Water Hydrology with Local Climate in the Nebraska Sand Hills (with Tim Arkebauer and 3 collaborators), UNL-Agricultural Research Division Interdisciplinary Grant, \$20,000; 2001.

Using Trace Elements for Labeling Corn Tissues and Insect Pests for Mark-Recapture Experiments (with Blair Siegfried and 3 collaborators), UNL-Agricultural Research Division Interdisciplinary Grant, \$39,920; 2000-2001.

Arsenic Strategy for Small Water Supply Systems in Nebraska (with 2 collaborators), U.S. Environmental Protection Agency, \$50,000; 2002-2003.

Assessing the Occurrence of Arsenic in Groundwater: Implications for Small Water Supply Systems in Nebraska (with 2 collaborators), U.S.G.S. 104b Grants Program, \$15,000; 2003-2004.

Integration of Earth System Science Research and Education: Involving Teachers in Scientific Research and Scientists in Inquiry-Based Learning (with Ron Bonstetter), National Science Foundation, \$74,204; 2000-2002.

Creating Connections between Regional Climate Change Information and the Public: A Multifaceted Approach (with Steve Meyer), National Institute of Global and Environmental Change, \$161,874; 1999-2003.

Process-oriented Environmental Change Education: A Model for Connecting Research to the Classroom (with Steve Meyer), National Institute of Global and Environmental Change, \$119,000; 1996-1999.

Teacher Professional Development Program in Support of Earth Science in the Community (EarthComm) American Geological Institute, \$57,851; 1999-2000.

SELECTED PUBLICATIONS

Gosselin, D.C., R.H. Levy, and R.J. Bonnstetter. 2003. *Using Earth Science Research to Develop Collaboration Between Scientists at a Research University and K-12 Educators: Insights for Future Efforts*, *Journal of Geoscience Education*, 51, 113-120.

Gosselin, D.C. and J.L. Macklem-Hurst. 2002. *Pre/Post Knowledge Assessment of an Earth Science Course for Elementary/Middle School Education Majors*, *Journal of Geoscience Education*, 50, 169-176.

Gosselin, D.C., F.E. Harvey, and C.D. Frost. 2001. *Geochemical Evolution of Ground Water in the Great Plains (Dakota) Aquifer of Nebraska: Implications for the Management of a Regional Aquifer System*, *Journal of Ground Water*, 39 (1), 98-108.

Gosselin, D.C. and M. Khisty. 2001. *Simulating the Influence of Two Shallow, Flow-through Lakes on a Ground Water System*, *Hydrogeology Journal*, 9, 476-486.

Gosselin, D.C., S. Lowrey, and S.J. Meyers. 2000. *Process-oriented Environmental Change Curriculum Development Workshops*, *Journal of Geoscience Education*, 48, 631-635.

Gosselin, D.C., D.C. Rundquist, and S. McFeeters. 2000. *Remote Monitoring of Selected Groundwater-Dominated Lakes in the Nebraska Sand Hills*, *Journal of the American Water Resources Association*, 36 (5), 1039-1052.

Gosselin, D.C., S. Drda, F.E. Harvey, and J. Goeke. 1999. *Hydrologic Dynamics of Two Interdunal Valleys in the Central Sand Hills Nebraska*, *Ground Water*, 37, 924-933.

Gosselin, D.C., J. Headrick, F.E. Harvey, and R. Tremblay. 1999. *Fluoride in Nebraska's Groundwater*, *Ground Water Monitoring and Remediation*, 19, 87-95.

Gosselin, D.C. and 8 others. 1999. *The Nebraska Earth Science Education Network Electronic Communication Project*, *Journal of Geoscience Education*, 47, 12-16.

Ayers, J.F., X. Chen, and D.C. Gosselin. 1998. *Behavior of Nitrate-Nitrogen Movement Around a Pumping High-Capacity Well: A Field Example*, *Journal of Groundwater*, 36, 325-337.

OTHER PROFESSIONAL ACTIVITIES

Member, UNL Outreach Council, 1996

Member, Faculty Advisory Committee, College of Agricultural Sciences and Natural Resources, 1999-2000

Member, School of Natural Resources Faculty Implementation Committee, 1996-1997

Member, IANR Faculty Conference Planning Committee, 1999

Member, International Center for Groundwater Research and Education Planning Committee, 1999

Member, Conservation and Survey Division and School of Natural Resources Integration Committee, 2002-present

Chair and Co-Chair, Curriculum Committee, July 1998-June 1999

Member, Conservation and Survey Division Management Team, 1999-present

Member, Director's Advisory Committee, School of Natural Resource Sciences, 2001-present

Member, Secondary Science Education Advisory Committee - Teacher's College, 1998-present

Stephen L. Hartung, Instructor, 85% Research, 15% Extension/Outreach
Areas of Interest: Soil Survey, Soil Interpretation, Environmental Planning, Geographic Information Systems
Contact: shartung@unl.edu, 402/472-3236

EDUCATION

B.S. Natural Resources, University of Nebraska-Lincoln (1975)
M.S. Soils Genesis and Classification, University of Nebraska-Lincoln (1983)

PROFESSIONAL EXPERIENCE

1976-present Instructor, Conservation and Survey Division, University of Nebraska-Lincoln

RESEARCH (last five years)

1976-1998 Soil Survey field mapping in Lancaster, Cass, Otoe, Saline, Cheyenne, Garden, Saunders, Washington and Sarpy Counties, Nebraska
1998-present Recompilation for Digital Soil Surveys, soil interpretation

EXTENSION (last five years)

Provided assistance to public on soil interpretation issues including land use, wet basements.

SURVEY (last five years)

See research.
Recompilation of published Nebraska Soil Surveys for digitization, Nebraska Cooperative Soil Survey.

SELECTED GRANTS AND CONTRACTS (last five years)

Nebraska Soil Survey Acceleration Fund, Nebraska Legislature, 1976-present.

OTHER PROFESSIONAL ACTIVITIES

Member, Nebraska Professional Soil Scientists Society

F. EDWIN HARVEY, Associate Professor, 20% Teaching, 65% Research, 10% Service

Areas of Interest: Hydrologic Science, Hydrogeology, Environmental Isotope Applications, Wetland Hydrology

Contact: feharvey1@unl.edu, 402/472-8237

EDUCATION

B.S. Geology/Geophysics Olivet Nazarene University (1986)
Field Camp Geologic Mapping, Indiana University (1987)
M.S. Hydrogeology, Purdue University (1990)
Ph.D. Hydrogeology, University of Waterloo [Ontario, Canada] (1996)

PROFESSIONAL EXPERIENCE

2002-present Associate Professor, School of Natural Resource Sciences, University of
Nebraska-Lincoln (UNL)
1997-2002 Assistant Professor, School of Natural Resource Sciences, University of
Nebraska-Lincoln
1996-1997 Assistant Professor, Conservation and Survey Division, University of
Nebraska-Lincoln

HONORS AND AWARDS

Center For Great Plains Studies Fellow, University of Nebraska-Lincoln (2003)
Adjunct Faculty Member, University of Waterloo (2002)
Graduate Faculty Fellow, University of Nebraska (1999)
Graduate Faculty Member, University of Nebraska (1996)
Pearson Medal for Outstanding/Creative Research in a Ph.D. Project, University of Waterloo (1996)
Golder Associates Ltd./Waterloo Center for Groundwater Research Award for Most Innovative/Commercial Research, University of Waterloo (1995)

TEACHING (last five years)

Courses Taught (Fall, Spring, Summer)

NRES 353/853 Hydrology (presently in development to be taught sometime
next year) (SO4)
NRES 917 Environmental Isotope Hydrology (SO3)
NRES 419L/819L Chemistry of Natural Waters Laboratory (S99, OO, O2)

- NRES 419/819 *Chemistry of Natural Waters (S99, 00, 02)*
- NRES 468/868 *Wetlands (Team taught with Kyle Hoagland and Bill Zanner)*
(F98, 00, 02)
- GEOL 898 *Groundwater/Surface Water Interaction (Team taught with Vitaly Zlotnik) (S99)*
- GEOL 470/870 *Field Techniques in Hydrogeology (Groundwater/Surface Water Interaction & Water Chemistry Sampling/Analysis Techniques Sections, Team taught with Vitaly Zlotnik) (S98, 00, 02)*

Masters Students Advised/Co-Advised or Committee Member (A), (C), or (CM)

- Kathleen Eggemeyer (C) (M.S. Natural Resource Sciences, in progress) Functional Characteristics of Trees and Grasses in the Nebraska Sandhills.*
- Paul Koester (CM) (M.S. Geosciences, in progress) Temporal Soil Water Loss Estimation Using Limited Climatic Data in Box Butte County, Nebraska.*
- Tracy Sizemore (CM) (M.S. Geosciences, in progress) Controlling Factors for Ammonia Degradation in the Shallow Aquifer at the Agrium Plant, Beatrice, Nebraska.*
- Kelli Warren (A) (M.S. Natural Resource Sciences, in progress) Topic Undecided.*
- Randy Stotler (CM) (M.S. Hydrogeology, Dept. Earth Sciences, U. Waterloo, 2003) Changes in Geochemistry, Isotopes and Residence Times Within the Waterloo Moraine Aquifer Complex.*
- Tamie Jovanelly (CM) (M.S. Geosciences, 2001) Groundwater-Surface Water-Climate Interactions for Two Lakes in Southeastern North Dakota.*
- Tina Kurtz (A) (M.S. Geosciences, withdrew) Hydrogeology of Peatland Fens in the Nebraska Sand Hills: The Role of Groundwater in the Development of Glacial Relict Wetland Ecosystems.*
- Jennifer Schellpeper (A) (M.S. Natural Resource Sciences, 1999) Investigating Ground and Surface Water Relationships in the Republican River Basin of Nebraska Using Water Chemistry and Environmental Isotopes.*
- Brian Thomas (A) (M.S. Geosciences, withdrew) Hydrogeology of Saline Wetlands in Nebraska.*
- Steve Drda (C) (M.S. Geosciences, 1998) Hydrology of Two Interdunal Valleys in the Nebraska Sand Hills.*
- Mary L. Bisbee (CM) (M.S. Geosciences, 1997) Geology, Soils and the Potential for Further Migration into the Groundwater of Hazardous Material From the University of Nebraska Agricultural Field Laboratory in Saunders County, Nebraska.*
- Jacqueline Headrick (CM) (M.S. Geosciences, 1996) Fluoride in Nebraska Groundwater.*

RESEARCH

Ecohydrology – the interactions of the hydrologic cycle and ecosystems, applications of environmental isotopes in hydrologic sciences, aquifer paleohydrology, groundwater/surface water interaction, regional hydrogeology and hydrogeochemistry, wetland hydrology and hydrogeochemistry, development of instrumental techniques and instrumentation in hydrology

SELECTED GRANTS AND CONTRACTS

Collaborative Research: An Investigation of Flow and Solute Transport in a Floodplain Aquitard, National Science Foundation, \$360,539; in revision for 2003 submission.

Sand Hills Biocomplexity: Integrating Biogeophysical Processes Across Space and Time, National Science Foundation, \$1,800,000; 2003–2008.

Assessing the Occurrence of Arsenic in Groundwater: Implications for Small Water Supply Systems in Nebraska, U.S. Geological Survey, \$15,000; 2003–2004.

Foundation Study for the Management and Preservation of Saline Wetlands in Eastern Nebraska, U.S. Environmental Protection Agency, \$143,114; 2002–2003.

Arsenic Strategy for Small Water Supply Systems in Nebraska, U.S. Environmental Protection Agency, \$50,000; 2002–03.

Equipment Grants, UN Water Center, \$8,470, \$34,534, \$20,000, \$9,500; 2001, 2001, 2002, and 2003 respectively.

Core Facility Funds for Groundwater Chemistry Laboratory Salaries, Nebraska Research Initiative, UNL Water Center, \$30,750/year; 2001–present.

Evapotranspiration: Linking Ground Water Hydrology With Local Climate in the Nebraska Sand Hills, UNL Agricultural Research Division – Interdisciplinary Research Program, \$20,000; 2001–2002.

Using Trace Elements for Labeling Corn Tissues and Insect Pests for Mark–Recapture Experiments, UNL Agricultural Research Division – Interdisciplinary Research Program, \$39,860; 2000–2002.

Determining Paleoclimate Variations in the Eastern Great Plains (Nebraska) Using Oxygen Isotopes of Phosphate from Modern and Fossil Beaver Teeth, UNL School of Natural Resource Sciences – Interdisciplinary Research Program, \$10,000; 2000–2001.

Source of Groundwater Beneath Loup City, Nebraska, Loup City, Nebraska, \$17,300; 2000–2001.

Estimation of Streambed Hydraulic Conductivity Along the Platte River of Nebraska, Cooperative Hydrology Study (COHYST), \$110,000; 1999–2000.

Hydrogeology of Saline Wetlands in Eastern Nebraska, U.S. Environmental Protection Agency, \$112,014; 1997–2001.

Republican River Study, Nebraska Department of Water Resources, \$213,473; 1997-2001.

SELECTED PUBLICATIONS

- Gosselin, D.C., F.E. Harvey, C. Frost, R. Stotler, and P.A. Macfarlane. 2003 (in press). *Strontium Isotope Geochemistry in the Central Part of the Great Plains (Dakota) Aquifer, U.S.A.*, **Applied Geochemistry**.
- Szilagyi, J, F.E. Harvey, and J.F. Ayers. 2003. *Regional Estimation of Base Recharge to Ground Water Using Water Balance and a Base-Flow Index*, **Ground Water**, 41 (4), 504-513.
- Steele, G.V. and F.E. Harvey. 2002. *Use of Water Chemistry, Isotopes and Chlorofluorocarbons to Investigate the Source of Ground Water Beneath Loup City, Central Nebraska, 2000*, **United States Geological Survey, Water Resources Investigation Report**, 02-4049, 43 p.
- Gosselin, D.C., F.E. Harvey, and C. Frost. 2001. *Geochemical Evolution of Ground Water in the Great Plains (Dakota) Aquifer of Nebraska: Implications for the Management of a Regional Aquifer System*, **Ground Water**, 39 (1), 98-108.
- Harvey, F.E. 2001. *Use of NADP Archive Samples to Determine the Isotope Composition of Precipitation: Characterizing the Meteoric Input Function for Use in Ground Water Studies*, **Ground Water**, 39 (3), 380.
- Harvey, F.E. and S.S. Sibray. 2001. *Delineating Ground Water Recharge From Leaking Irrigation Canals Using Water Chemistry and Isotopes*, **Ground Water**, 39 (3), 408-421.
- Landon, M.K., D.L. Rus, and F.E. Harvey. 2001. *Comparison of In-Stream Methods of Measuring Hydraulic Conductivity in Sandy Streambeds*, **Ground Water**, 39 (6), 870-885.
- Harvey, F.E. and D.R. Lee. 2000. *Discussion of "The Effects of Bag Type and Meter Size on Seepage Meter Measurements" by S.A. Isiorho and J.H. Meyer*, **Ground Water**, 38 (3), 326-327.
- Harvey, F.E., D.L. Rudolph, and S.K. Frappe. 2000. *Estimating Groundwater Flux Into Large Lakes: Application in the Hamilton Harbor, Western Lake Ontario*, **Ground Water**, 38 (4), 550-565.
- Harvey, F.E. and J.M. Welker. 2000. *Stable Isotopic Composition of Precipitation in the Semi-Arid North-Central Portion of the U.S. Great Plains*, **Journal of Hydrology**, 238 (1-2), 90-109.

OTHER PROFESSIONAL ACTIVITIES

Associate Editor, Ground Water, Journal of the National Ground Water Association, 2000-present

Associate Editor, Hydrogeology Journal, International Association of Hydrogeologist, 2000-present

Newsletter Editor/Web Master, Geological Society of America [GSA] Hydrogeology Division, 2001-present

Chair, GSA Tech. Sess., The Terrestrial-Aqueous Interface: Multidisciplinary Research and Opportunities, 2002

Technical Program Committee, GSA Hydrogeology Division, 2000-2001

Technical Program Coordinator, GSA Environmental Geoscience, 2000-2001

Chair, Graduate Committee, UNL School of Natural Resources, 2000-present

Manuscript Reviewer, Water Resources Research, Journal of Hydrology, Applied Geochemistry, Geology, Wetlands.

Textbook Reviewer, Applied Hydrogeology (4th edition) by C.W. Fetter, Prentice Hall

Grant Reviewer, NSF, Natural Sciences and Engineering Research Council of Canada, USGS-NIWR, Sea Grant

Member, Hydrologic Science Specialization Formation Committee, Chair, SNRS, 2000-2001

Member, Water Science Curriculum Committee, Biological Systems Engineering, 2000-present

Member, University of Nebraska Water Center Scientific Advisory Committee, 2001-present

MICHAEL J. HAYES, Research Associate Professor, 60% Research, 40% Service

Areas of Interest: Precipitation indices; drought mitigation strategies and technology; drought impacts, vulnerability assessment, and risk analysis; water and hydrological issues; and remote sensing applications.

Contact: mhayes2@unl.edu, (402) 472-4271

EDUCATION

B.S. Meteorology, University of Wisconsin-Madison (1986)

M.S. Atmospheric Sciences, University of Missouri-Columbia (1989)

Ph.D. Atmospheric Sciences, University of Missouri-Columbia (1994)

PROFESSIONAL EXPERIENCE

2003-present Research Associate Professor, School of Natural Resources; Climate Impacts Specialist, National Drought Mitigation Center (NDMC), University of Nebraska-Lincoln (UNL)

1995-2003 Research Assistant Professor, School of Natural Resource Sciences; Climate Impacts Specialist, National Drought Mitigation Center, University of Nebraska-Lincoln

1995 Physical Scientist, AScl Corporation, Columbia, Missouri

RESEARCH

My research expertise can be broken down into three main areas: 1) drought monitoring techniques, including remote sensing technologies; 2) drought indices, including the Standardized Precipitation Index and the Palmer Drought Severity Index; and 3) drought risk, vulnerability, and impact analyses, leading to the development of appropriate drought mitigation strategies. Recent journal articles (three published in 2002 and two more in review) and research grants (\$3.16 million since 2001) highlight this expertise. The complexity of the drought issue allows me to collaborate with a wide range of scientists from UNL and around the world on each of these topics.

OUTREACH

I am one of eight authors creating the U.S. Drought Monitor map each week, which is available on the NDMC web site and has received about five million hits during 2002. The Drought Monitor has brought considerable media attention to the NDMC and UNL, and answering drought-related questions from the media is an important aspect of my position.

I also work closely with and advise a large number of policy makers and drought planners worldwide. The NDMC, myself included, has been involved in numerous workshops and conferences, and invitations to make drought-related presentations are common.

SELECTED GRANTS AND CONTRACTS

Risk Assessment and Exposure Analysis on the Agricultural Landscape: A Holistic Approach to Spatio-Temporal Models and Tools for Agricultural Risk Assessment and Exposure Analysis (with S. Goddard, D. Willhite, J. Deogun, K. Hubbard, H. Jose, S. Reichenbach, W. Waltman and M. Svoboda), USDA Risk Management Agency, \$1,086,623; 2002-2004.

Engaging Agricultural Communities in the Great Plains of the United States with the Applications and Developments of Climate Prediction and Information (with S. Hu, G. Lynne, D. Willhite and K. Hubbard), National Oceanic & Atmospheric Administration/Human Dimensions of Global Change Research Program, \$436,424; 2002-2004.

A Geospatial Decision Support System for Drought Risk Management (with S. Reichenbach, J. Deogun, S. Goddard, K. Hubbard, P. Revesz, M. Svoboda, W. Waltman and D. Willhite), National Science Foundation, \$1,153,576; 2001-2004.

Intelligent Joint Evolution of Data and Information: An Integrated Framework for Drought Monitoring (with A. Samal, L. Soh, W. Waltman, M. Svoboda, D. Willhite and K. Hubbard), National Science Foundation, \$499,438; 2002-2005.

Assessing Impacts of 'The Worst Drought in the History of Colorado' on the State's Ski Industry (with O. Wilhelmi and D. Thomas), Natural Hazards Center, \$2,360; 2003.

Improved Drought Monitoring Through the Integration of Climate and Satellite-Based Data (with D. Willhite and K. Hubbard), U.S. Geological Survey, \$241,095; 2002-2005.

Drought Risks and Mitigation on the Agricultural Landscape: A Series of Risk Analysis, Management, and Mitigation Workshops for Nebraska Farmers and Ranchers (with D. Willhite, H. Jose, W. Waltman, K. Hubbard, Q. Hu and M. Svoboda), USDA Risk Management Agency, \$95,198; 2002-2003.

SELECTED PUBLICATIONS

Peters, A.J., E.A. Walter-Shea, L. Ji, A. Viña, M. Hayes, and M.D. Svoboda. 2002. *Drought Monitoring with NDVI-Based Standardized Vegetation Index, Photogrammetric Engineering and Remote Sensing*, 68 (1), 71-76.

Seiler, R.A., M. Hayes, and L. Bressan. 2002. *Using the Standardized Precipitation Index for Flood Risk Monitoring, International Journal of Climatology*, 22, 1365-1376.

- Svoboda, M., M. Hayes, and D. Wilhite. 2002. *The Role of Integrated Drought Monitoring in Drought Mitigation Planning*, *Annals of Arid Zone*, 40 (1), 1-11.
- Svoboda, M., D. LeComte, M. Hayes, R. Heim, K. Gleason, J. Angel, B. Rippey, R. Tinker, M. Palecki, D. Stooksbury, D. Miskus, and S. Stevens. 2002. *An Introduction to the Drought Monitor*, *The Bulletin of the American Meteorological Society*, 83 (8), 1181-1190.
- Wu, H., M. Hayes, A. Weiss, and Q. Hu. 2001. *An Evaluation of the Standardized Precipitation Index, China-Z Index, and Statistical Z-Score*, *International Journal of Climatology*, 21, 745-758.
- Hayes, M., M. Svoboda, and D. Wilhite. 2000. *Monitoring Drought Using the Standardized Precipitation Index*, Chapter 12 in *Drought: A Global Assessment*, Vol. 1, (D. Wilhite, ed.), London, United Kingdom: Routledge, 168-180.
- Wilhite, D.A., M. Hayes, C. Knutson, and K.H. Smith. 2000. *Planning for Drought: Moving from Crisis to Risk Management*, *Journal of the American Water Resources Association*, 36 (4), 697-710.
- Wilhite, D.A., M.J. Hayes, and M.D. Svoboda. 2000. *Drought Monitoring and Assessment: Status and Trends in the United States*, in *Drought and Drought Mitigation in Europe* (J. Vogt and F. Somma, eds.), Dordrecht, The Netherlands: Kluwer Academic Publishers, 149-160.
- Yamoah, C.F., D.T. Walters, C.A. Shapiro, C.A. Francis, and M.J. Hayes. 2000. *Standardized Precipitation Index and Nitrogen Rate Effects on Yields and Risk Analysis of Maize in Dryland Cropping Systems*, *Agriculture, Ecosystems, & Environment*, 80, 113-120.
- Hayes, M., D. Wilhite, M. Svoboda, and O. Vanyarkho. 1999. *Monitoring the 1996 Drought Using the Standardized Precipitation Index*, *Bulletin of the American Meteorological Society*, 80 (3), 429-438.

OTHER PROFESSIONAL ACTIVITIES

Member, Web Site Development Subcommittee, Interim National Drought Council, 2001-present

Member, Monitoring and Prediction Subcommittee, Interim National Drought Council, 2001-present

Co-author, U.S. Drought Monitor (<http://drought.unl.edu/dm>), 1999-present

Member, Nebraska Risk Assessment Committee, 2000-present

NDMC Liaison, Nebraska Agriculture, Natural Resources, and Wildlife Subcommittee, 1998-present

NDMC Liaison, Nebraska Municipal Water Supply, Health, and Energy Subcommittee, 1998-present

Member, Nebraska Water Availability and Outlook Committee, 1996-present

GEOFFREY M. HENEBRY, Research Associate Professor, 15% Teaching, 75%
Research, 10% Extension/Outreach

Areas of Interest: Landscape Ecology, Ecological Remote Sensing, Ecological Modeling,
Grasslands

Contact: ghenebry@calmit.unl.edu, 402/472-6158

EDUCATION

B.A. Liberal Arts (Great Books) St. John's College, Santa Fe, NM (1982)

M.S. Environmental Sciences, University of Texas at Dallas (1986)

Ph.D. Environmental Sciences, University of Texas at Dallas (1989)

PROFESSIONAL EXPERIENCE

2000-present Research Associate Professor, School of Natural Resources, University
of Nebraska-Lincoln

1999-2003 Associate Geoscientist, Conservation and Survey Division, University of
Nebraska-Lincoln

1996-1999 Assistant Professor, Department of Biological Sciences, Rutgers University-
Newark

1989-1996 Research Associate & Research Assistant Professor, Division of Biology, Kansas
State University

HONORS AND AWARDS

Taylor & Francis Best Letter Award for best short research paper to appear during 1995
in the *International Journal of Remote Sensing* presented by The Remote Sensing
Society, U.K. (1996)

Fulbright Senior Research Fellowship, Instituto Nacional de Pesquisas Espaciais (INPE), São
José dos Campos, SP, Brazil, (9/1993-2/1994)

TEACHING (last five years)

Courses Taught (Fall, Spring, Summer)

NRES 810/HORT 812 Landscape Ecology (SO1, FO1, FO2)

NRES 896 Independent Research (SO2, SuO2, FO2, SO3)

Masters and Doctoral Students Advised

Kirsten M. de Beurs (Ph.D. Natural Resources, expected 2005) Dynamical Analysis of Land
Surface Phenology and Land Cover Change.

Ian C. Ratcliffe (M.A. Geography, expected 2004) *Observing Hailstreak Occurrence and Persistence Using AVHRR and MODIS.*

Weirong Chen (Ph.D. Geography, expected 2003) *Spatio-spectral Heterogeneity under Rescaling: Applications in Agricultural Remote Sensing.*

RESEARCH

My research focuses on the use of image time series to study ecological dynamics. I have worked with optical, thermal, and microwave data at a range of spatial and temporal resolutions. My study areas have included the grasslands of the North American Great Plains, in particular the tallgrass prairie, as well as the Kiskunság of Hungary, the Brazilian Pantanal, the Kazakh Steppe and Central Asian Deserts, and the mountains of eastern Africa.

SURVEY

My work with the Nebraska Gap Analysis Program (NE-GAP) has led to the development of new approaches to modeling species range distributions based on statistical models generated from recursive partitioning algorithms applied to occurrence data and geospatial environmental variables.

SELECTED GRANTS AND CONTRACTS

BDEI: Spatio-temporal Models of Biogeophysical Fields for Ecological Forecasting: A Cross-disciplinary Incubation Activity (with J. Chomicki, T. Fountain), National Science Foundation (NSF), \$100,000; 2001-2004.

Consequences of Institutional Change: Land Cover Dynamics in Kazakhstan 1960-2000 (with A. Gitelson), National Aeronautics and Space Administration (NASA) Land Cover Land Use Change program, \$538,686; 2001-2004.

Characterization of the Fluvial Geomorphology and Landscape Dynamics along the Platte River in Nebraska Using Optical and Microwave Remote Sensing (with R.M. Joeckel), NASA JPL/AASG Pilot Program, \$49,991; 2002-2003.

Spatio-temporal Change Detection and Quantification: Groundwork for Operational Environmental Monitoring and Comparative Landscape Dynamics (with F. Csillag, D. Goodin, D. Rundquist), European Space Agency ENVISAT AO, Data only; 2001-2005.

Integrating Biogeography and Evolutionary Ecology in the Mountains of Eastern Africa Using High Resolution DEMs (with E. Knox), DLR (German Aerospace Center) SRTM AO, Data only; 2000-2003.

- Aquatic Gap Analysis* (with J. Merchant), U.S. Geological Survey (USGS) National Gap Analysis Program, \$204,999, 2002-2003.
- Biocomplexity Incubation Activity: Spatio-temporal Coupling of Ecological and Geological Dynamics in the Nebraska Sand Hills* (with D. Wedin), NSF, \$100,000; 2000-2002.
- Assessment of Thermal-infrared Imaging as a Tool for Evaluation of Groundwater-lake Interactions in the Nebraska Sand Hills* (with V. Zlotnik), USGS/NE WRI, \$17,000; 2002-2003.
- 3-5 Micron Imaging Spectrometer for Measurement of Terrestrial Carbon Pools* (with A. Poulos, OptoMechanical Enterprises, Inc.), DOE-STTR, \$100,000; 2000-2001.

SELECTED PUBLICATIONS

- Henebry, G.M. 2003 (forthcoming). *Grasslands of the North American Great Plains*, Chapter 3.3 in *Phenology: An Integrative Environmental Science* (M.D. Schwartz, ed.), New York: Kluwer.
- Goodin, D.G. and G.M. Henebry. 2002. *The Effect of Rescaling on Fine Spatial Resolution NDVI Data: A Test Using Multi-Resolution Aircraft Data*, *International Journal of Remote Sensing*, 23, 3865-3871.
- Henebry, G.M. and J.W. Merchant. 2001. *Geospatial Data in Time: Limits and Prospects for Predicting Species Occurrences*, Chapter 23, in *Predicting Species Occurrences: Issues of Scale and Accuracy* (J.M. Scott, P.J. Heglund, M.L. Morrison, J.B. Hauffer, M.G. Raphael, W.A. Wall, and F.B. Samson, eds.), Covello, CA: Island Press, 291-302.
- Weishampel, J.F., J.R. Godin, and G.M. Henebry. 2001. *Pantropical Dynamics of Intact Rainforest Canopy Structure*, *Global Ecology and Biogeography*, 10, 389-397.
- Goodin, D.G. and G.M. Henebry. 1998. *Seasonality of Finely-Resolved Spatial Structure of NDVI and Its Component Reflectances in Tallgrass Prairie*, *International Journal of Remote Sensing*, 19, 3213-3220.
- Goodin, D.G. and G.M. Henebry. 1997. *Monitoring Ecological Disturbance in Tallgrass Prairie Using Seasonal NDVI Trajectories and a Discriminant Function Mixture Model*, *Remote Sensing of Environment*, 61, 270-278.
- Henebry, G.M. 1995. *Spatial Model Error Analysis Using Autocorrelation Indices*, *Ecological Modelling*, 82, 75-91.
- Henebry, G.M. and H.J.H. Kux. 1995. *Lacunarity as a Texture Measure for SAR Imagery*, *International Journal of Remote Sensing*, 16, 565-571.
- Henebry, G.M. 1993. *Detecting Change in Grasslands Using Measures of Spatial Dependence with Landsat TM Data*, *Remote Sensing of Environment*, 46, 223-234.

Henebry, G.M. and H. Su. 1993. *Using Landscape Trajectories to Assess the Effects of Radiometric Rectification*, *International Journal of Remote Sensing*, 14, 2417-2423.

OTHER PROFESSIONAL ACTIVITIES

Editorial Board Member for Sensing and Computation, BioScience, 2003-present
Program Chair, 17th Annual U.S. Landscape Ecology Symposium, International Association for Landscape Ecology -United States Regional Association (US-IALE), Lincoln, NE, April 23-27, 2002

Editorial Board Member, Ecology and Ecological Monographs, 2001-present
Executive Committee Member and Subject Editor, Conservation Ecology (www.consecol.org), 1995-present

Certified Senior Ecologist, Ecological Society of America, 2001-2005

Member, Ecological Society of America (ESA), Sections: International, Long Term Studies, Rangeland Ecology, Statistics, Theory

Member, International Association for Landscape Ecology (IALE)

Member, American Geophysical Union (AGU), Sections: Biogeoscience, Hydrology

Member, The Remote Sensing and Photogrammetry Society (RSPS, UK)

Member, IEEE, Geoscience and Remote Sensing Society (IEEE, GRSS)

KYLE D. HOAGLAND, Professor, 75% Research, 25% Teaching (60%
Administration currently)

Areas of Interest: Aquatic Ecology, Ecotoxicology, Lake Restoration, Periphyton Ecology
Contact: khoagland@unl.edu, 402/472-6266

EDUCATION

B.S. Zoology, Michigan State University (1973)
M.S. Aquatic Biology; Eastern Michigan University (1975)
Ph.D. Life Sciences (Phycology), University of Nebraska (1981)

PROFESSIONAL EXPERIENCE

2001-present Interim Director, School of Natural Resource Sciences, University of
Nebraska-Lincoln
2000-present Director, University of Nebraska Water Center (50% administration)
1990-present Professor, School of Natural Resource Sciences, University of Nebraska,
Lincoln (75% research/25% teaching appointment; tenured beginning 7/94;
Associate Professor 1990-95)
1996-1997 ESCOP/ACOP Leadership Development Program participant
1985- Limnology Instructor, Cedar Point Biological Station, University of Nebraska-
Lincoln. Five-week field course, emphasizing field and laboratory techniques
1983-1990 Associate Professor of Biology (Assistant Professor until 1988, when tenured
and promoted), Department of Biology, Texas Christian University, Fort
Worth, TX

TEACHING (last five years)

Courses Taught (Fall, Spring, Summer)

NRES 459/859 Limnology (with laboratory)
NRES 468/868 Wetlands (with laboratory; team taught)
NRES 866 Advanced Limnology (team taught)
NRES 404 Wildlife Seminar

Masters and Doctoral Students Advised

Wanli Wu (Ph.D. in Natural Resource Sciences 2003) Riverine Landscape of the Middle
Platte River: Hydrological Connectivity and Physicochemical Heterogeneity.
Jill Taylor (M.S. in Natural Resource Sciences 2001) Effects of Binary Combinations of
Herbicides on Freshwater Algae.

Kris Fischer (M.S. in Natural Resource Sciences 2000) *Effects of Reservoir Aging on Primary Productivity in Pawnee Reservoir.*

Christine King (M.S. in Natural Resource Sciences 2000) *Selective Atrazine Toxicity in Freshwater Algae.*

Tim Schmitt (M.S. in Natural Resource Sciences 1998) *Influence of Buffer Strip Width and Composition in Reduction of Agricultural Non-point Source Contaminants.*

RESEARCH

My laboratory has focused on the ecotoxicology of agrichemicals on algae in lakes and streams, with emphasis on the commonly used herbicides atrazine and alachlor. This research has been conducted at the population to community levels, at both chronic and acute exposures. In addition, the lab is addressing aquatic ecology issues including lake restoration, lake classification, and water quality assessment.

SELECTED GRANTS AND CONTRACTS (emphasis on last five years)

Development and Implementation of a Comprehensive Lake and Reservoir Strategy for Nebraska as a Model for Agriculturally Dominated Ecosystems (J. Holz, lead PI), U.S. Environmental Protection Agency, \$1,224,706; 2000-2003.

Oxygen Budget for Lake Ogallala (with J. Holz et al.), Nebraska Game & Parks Commission, \$93,084; 2000-2002.

Development of a Dissolved Oxygen Circulation Model for Lake Ogallala (J. Stansbury, Civil Engineering, lead PI), Nebraska Game & Parks Commission, \$123,368; 2000-2002.

Evaluating the Effects of Pesticide Mixtures to Aquatic Organisms (with B. Siegfried), U.S. Geological Survey, \$34,300; 1999-2001.

Nebraska Lake Classification and Assessment Program, Nebraska Department of Environmental Quality (with J. Holz), \$370,000; Nebraska Game & Parks Commission, \$45,000; 1998-2001.

Branched Oak Reservoir Evaluation (with E. Peters), Nebraska Game & Parks Commission, \$272,735; 1999-2001.

Changes in Primary Productivity in Pawnee Reservoir as a Result of Reservoir Aging, U.S. Army Corps of Engineers, \$49,772; 1997-1999.

Herbicide Effects on Water Quality in the Great Plains: Mechanisms of Selective Toxicity in Freshwater Algae (with B. Siegfried), U.S. Geological Survey, \$50,006; 1997-1999.

Diatom Attachment at Aquatic Interfaces: Molecular Interactions, Mechanisms and Physiology of Adhesion (with M. Gretz), Office of Naval Research, \$565,541 (includes \$67,905 of ASSERT fellowship funding); 1993-1996.

Biochemistry of the Fouling Marine Diatom Adhesives and the Effects of Substrate Preconditioning on Adhesion (with M. Gretz), Office of Naval Research, \$328,661; 1990-1993.

Impacts of Global Climate Change on Phytoplankton Productivity in Lakes along a Thermal Gradient (with S. Ernst), Department of Energy, NIGEC (Great Plains Regional Center), \$123,070; 1994-1996.

SELECTED PUBLICATIONS

Hoagland, K.D., S.A. Matteen, J.-X. Tang, and B.D. Siegfried. 2002. *Pesticide Effects on Diatom Communities: Differential Toxicity of Atrazine Metabolites*, **15th International Diatom Symposium**, 135-141.

Lewis, R.J., L.M. Johnson, and K.D. Hoagland. 2002. *Effects of Cell Density, Temperature, and Light Intensity on Growth and Stalk Production in the Biofouling Diatom *Achnanthes Longipes* (Bacillariophyceae)*, **Journal of Phycology**, 38, 1125-1131.

Holz, J.C. and K.D. Hoagland. 1999. *Effects of Phosphorus Reduction on Water Quality: Comparison of Alum-treated and Untreated Portions of a Hypereutrophic Lake*, **Journal of Lake and Reservoir Management**, 15, 70-82.

Nelson, K.J., K.D. Hoagland, and B.D. Siegfried. 1999. *Chronic Effects of Atrazine on Tolerance of a Benthic Diatom*, **Environmental Toxicology and Chemistry**, 18, 1038-1045.

Schmitt, T., M.G. Dosskey, and K.D. Hoagland. 1999. *Filter Strip Performance and Processes for Different Vegetation, Widths, and Contaminants*, **Journal of Environmental Quality**, 28, 1479-1489.

Tang, J.-X., K.D. Hoagland, and B.D. Siegfried. 1998. *Glutathione-S-transferase and in Vitro Metabolism of Atrazine in Freshwater Algae*, **Pesticide Biochemistry and Physiology**, 59, 155-161.

Holz, J.C., K.D. Hoagland, R.L. Spawn, A. Popp, and J.L. Anderson. 1997. *Phytoplankton Community Response to Reservoir Aging*, **Hydrobiologia**, 346, 183-192.

Lewis, R.J., S.I. Jensen, D.M. DeNicola, V.I. Miller, K.D. Hoagland, and S.G. Ernst. 1997. *Genetic Variation in the Diatom *Fragilaria Capucina* along a Latitudinal Gradient Across North America*, **Plant Systematics and Evolution**, 204, 99-108.

Tang, J.-X., K.D. Hoagland, and B.D. Siegfried. 1997. *Differential Toxicity of Atrazine to Selected Freshwater Algae*, **Bulletin of Environmental Contamination and Toxicology**, 59, 631-637.

Wustman, B.A., M.R. Gretz, and K.D. Hoagland. 1997. *Extracellular Matrix Assembly in Diatoms (Bacillariophyceae). I. A Model of Adhesives Based on Chemical*

Characterization and Localization of Polysaccharides from the Marine Diatom Achnanthes Longipes and Other Diatoms, Plant Physiology, 113, 1059-1069.

OTHER PROFESSIONAL ACTIVITIES

Treasurer, Phycological Society of America, 1998-2000

Editorial Boards, Biofouling (1987-93), Journal of Phycology (1988-90, as editorial board member), Journal of Phycology (1990-94, as Associate Editor)

Symposia Co-organizer, Phycological Society of America Symposium on "Algal Adhesion Mechanisms" 1995; International Biofouling Symposium, 1985

JOHN C. HOLZ, Research Assistant Professor, 50% Research, 35%
Extension/Outreach, 15% Teaching

Areas of Interest: Role and interaction of nutrient limitation and herbivory in structuring
freshwater plankton communities, surface water quality and management,
development of lake classification methodology, restoration of environmentally
degraded lakes

Contact: jholz@unl.edu, 402/472-6648

EDUCATION

B.S. Natural Resources, University of Nebraska-Lincoln (1991)

M.S. Forestry, Fisheries and Wildlife, University of Nebraska-Lincoln (1994)

Ph.D. Biological Sciences, University of Nebraska-Lincoln (1998)

PROFESSIONAL EXPERIENCE

1998-present Research Assistant Professor, School of Natural Resource Sciences,
University of Nebraska-Lincoln (UNL)

1994-98 Research Project Manager, School of Natural Resource Sciences,
University of Nebraska-Lincoln

HONORS AND AWARDS

Environmental Council of the States Program Innovation Award in recognition of the
accomplishments of the Community Lake Enhancement and Restoration Program
(2001)

North American Lake Management Society Technical Excellence Award in recognition for
Outstanding Research in Lake Restoration, Protection, and Management (1999)

Outstanding Water Resources Dissertation in the Field of Water Quality, Honorable Mention,
The Universities Council on Water Resources (1999)

Best Student Presentation, 17th International Symposium of the North American Lake
Management Society (1997)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 459/859 Limnology (SO1, SuO2, SO3)

NRES 496/896 Lake and Reservoir Ecology and Management (SO2)

NRES 404 Wildlife Seminar (FOO)

RESEARCH

Research activities focus on understanding the basic ecological principles structuring lake communities. Specific experimental and modeling efforts investigate the separate and interactive effects of phosphorus, nitrogen, and zooplankton herbivory in plankton communities, with particular focus on the phytoplankton. The application of this research has led to the development of an active research program in surface water quality and management in the areas of lake and watershed classification methodology development, remote-sensing of water quality, phosphorus inactivants, reservoir aging, biomanipulation, dissolved oxygen modeling, algal control by barley straw, aeration, and macrophyte control by bottom barriers.

EXTENSION

The UNL Lake Water Quality Extension Program seeks to improve the water quality of Nebraska's lakes and reservoirs through education, management technique research and development, and technical expertise through a variety of mechanisms including workshops, extension publications, presentations, field demonstrations of management techniques, and on-site and phone assessments of water quality concerns. Youth education activities include classroom instruction, developing student water quality monitoring programs, and workshops. Promising lake management techniques are experimentally tested and research results are transferred to stakeholders in the form of management recommendations. This program serves a broad audience including the Nebraska Department of Environmental Quality, Nebraska Game and Parks Commission, Natural Resource Districts, University of Nebraska faculty and staff, University of Nebraska County Extension Personnel, City Administrators, public power and irrigation districts, private consultants, lake owners, lake users, lake managers, and Nebraska's youth.

SELECTED GRANTS AND CONTRACTS

State Lakes Classification, Nebraska Department of Environmental Quality, \$350,000; 2002-2003.

States Lakes Classification, Nebraska Department of Environmental Quality, \$100,000; 2002.

Lake Ogallala Water Quality Project: Summer 2002, Nebraska Department of Environmental Quality, \$21,670; 2002.

Enhancement and Refinement of UNL's Hyperspectral Spectroradiometric Calibration System, University of Nebraska Water Center Equipment Grant, \$19,942; 2002.

States Lakes Classification 2001-02, Nebraska Department of Environmental Quality, \$183,880; 2001-2002.

Community Lakes Enhancement and Restoration Program, Nebraska Environmental Trust Fund and Nebraska Department of Environmental Quality, \$2,900,000; 2001-2004.

Development and Implementation of a Comprehensive Lake and Reservoir Strategy for Nebraska as a Model for Agriculturally Dominated Ecosystems (with J. Merchant, A. Gitelson, S. Fritz, K. Hoagland, I. Bogardi, and D. Rundquist), U.S. Environmental Protection Agency, \$1,224,706; 2001-2004.

States Lakes Classification, Nebraska Department of Environmental Quality, \$145,000; 2000-2001.

Oxygen Budget for Lake Ogallala (K. Hoagland, lead-PI), Nebraska Game and Parks Commission, \$93,084; 2000-2001.

Development of a Dissolved Oxygen Circulation Model for Lake Ogallala (J. Stansbury, lead-PI), Nebraska Game and Parks Commission, \$123,367; 2000-2001.

Demonstration of the Use of Barley Straw to Control Algae in Nebraska Lakes, Nebraska Department of Environmental Quality, \$14,980; 2000-2001.

Nebraska Lake Classification and Assessment Program (with K. Hoagland), Nebraska Department of Environmental Quality, \$370,000; 1998-2001.

Nebraska Lake Classification and Assessment Program (with K. Hoagland), Nebraska Game and Parks Commission, \$45,000; 1998-2001.

Assessment of the Fremont State Recreation Lake #2 Restoration (with K. Hoagland), Nebraska Department of Environmental Quality, \$101,374; 1996-1998.

SELECTED PUBLICATIONS

Holz, J.C., K.D. Hoagland, and A. Joern. 2000. *Aquatic Food Web Interactions: Microcosms as Lake Models*, *Proceedings of the 21st Conference of the Association for Biological Laboratory Education*, 21, 305-323.

Hoagland, K.D. and J.C. Holz. 1999. *Aquatic Food Web Interactions: Microcosms as Lake Models for Teaching*, *American Society of Limnology and Oceanography Bulletin*, 8, 24-25.

Holz, J.C. and K.D. Hoagland. 1999. *Effects of Phosphorus Reduction on Water Quality: Comparison of Alum-treated and Untreated Portions of a Hypereutrophic Lake*, *Journal of Lake and Reservoir Management*, 15, 70-82.

Holz, J.C., K.D. Hoagland, R.L. Spawn, A. Popp, and J.L. Anderson. 1997. *Phytoplankton Community Response to Reservoir Aging*, *Hydrobiologia*, 346, 183-192.

Holz, J.C. and K.D. Hoagland. 1996. *Experimental Microcosm Study of the Effects of Phosphorus Reduction on Plankton Community Structure*, *Canadian Journal of Fisheries and Aquatic Sciences*, 53, 1754-1764.

OTHER PROFESSIONAL ACTIVITIES

Member, Streams and Rivers Regional Technical Assistance Group, US EPA Region VII, 2002-present

Member, Lakes Regional Technical Assistance Group, US EPA Region VII, 1999-present

Member, Aquatic Habitat Fund Committee, Nebraska Game and Parks Commission, 1999-present

Board of Directors, North American Lake Management Society, 1999-2002

Member, Development of Aquatic Ecosystem Classification Reference Conditions Proposal

Review Panel, U.S. EPA, Washington, D.C., July, 2001

Session Chair, Use to Barley Straw to Control Pond Algae, 20th Annual International Symposium of the North American Lake Management Society, Miami, FL, November, 2000

QI STEVEN HU, Associate Professor, 10% Teaching, 55% Research, 35% Extension/Outreach

Areas of Interest: *Regional and Global Climate Variations, Climate Impacts on Natural Resources, Atmospheric Convection, Atmospheric Circulation and Modeling, Watershed Modeling*

Contact: *qhu2@unl.edu, 402/472-6642*

EDUCATION

B.S. *Meteorology, Lanzhou University, China (1982)*

M.S. *Atmospheric Science, Department of Atmospheric Science, Colorado State University (1986)*

Ph.D. *Atmospheric Science, Department of Atmospheric Science, Colorado State University (1992)*

PROFESSIONAL EXPERIENCE

2003-present *Associate Professor, School of Natural Resources, University of Nebraska-Lincoln (UNL); Tenured, 2003*

1999-2003 *Assistant Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln*

1995-1999 *Research Assistant Professor, Department of Soil and Atmospheric Sciences, University of Missouri-Columbia*

1995-1999 *Director, Missouri Climate Center, and Missouri State Climatologist, Columbia, MO*

1994-1995 *Research Scientist, Department of Environmental Sciences, Pacific Northwest National Laboratories, Richland, WA*

1992-1994 *Research Scientist, Atmospheric Sciences Research Center, State University of New York-Albany*

1987-1992 *Graduate Research Assistant, Department of Atmospheric Science, Colorado State University, Fort Collins, CO*

HONORS AND AWARDS

Junior Faculty Award, School of Natural Resource Sciences, University of Nebraska-Lincoln (2002)

TEACHING (last five years)

Courses Taught (Fall, Spring, Summer)

NRES 496/896 *Global Climate Change (F99, F00, F01, F02)*

NRES 907 *Agricultural Climatology (S99, S01, S03)*

Masters and Doctoral Students Advised

I served as the advisor of 2 M.S. and 2 Ph.D. degree programs and as a committee member of 3 M.S. and 3 Ph.D. degree programs.

RESEARCH

Developed a cumulus parameterization scheme for mesoscale models. Evaluated various drought indices in their way to represent drought conditions, and temperature effects on the popular Palmer Drought Severity Index. Studied alternating dry and wet periods in climate records and revealed a centennial scale variation in warm season precipitation in eastern China and western U.S. Analysed variations of summer rainfall in the Central United States and discovered a multidecadal variation in the teleconnection of ENSO with the summer rainfall. Also identified the role of the southerly low-level jet from the Gulf of Mexico in interfering the relationship between ENSO and the summer rainfall in the central U.S. Explored the connection in variations of the summer monsoon rainfall in the southwestern U.S. and the rainfall in the central U.S., and quantified the unsteady nature of the “land memory” and associated predictability of the monsoon rainfall in the southwestern U.S. Developed quality control methods/schemes and applied them and developed two high quality soil temperature datasets for USDA soil temperature network and for the U.S. Cooperative stations network. Exploring the cognitive perception of agricultural producers in the central U.S. on use of climate prediction and information in crop-related decisions.

EXTENSION

Interdisciplinary research on how to improve usage of current data and climate predictions for agricultural entities, both commercial and non-commercial (privately-owned) farms, ranches and businesses.

SURVEY

Currently working with Gary Lynne and William Waltman on a survey to determine what kind of information and training farmers, ranchers, and agricultural oriented businesses need to make informed decisions and reduce risks from drought and varying weather and climate conditions. Developing a web-based survey tool to repeat surveys and to monitor changes in decision-making habit and use of climate information in decision-making.

SELECTED GRANTS AND CONTRACTS

Soil Enthalpy Effect on Land Memory in the Western U.S. NOAA, \$40,000, July 2003–June 2004.

Using Integrated Techniques to Investigate the Hydrological Cycle in the Nebraska Sandhills – 3 Years, National Oceanic and Atmospheric Administration (NOAA), \$225,000; Aug. 2000–June 2003.

Missouri Climate Atlas, Missouri Department of Natural Resources, \$95,000; Jan. 2001–Oct. 2003.

Dynamical Diagnosis of Multi-decadal Variability in GCMs, Layman Fund, \$7,494; May 2001–May 2003.

Karst Aquifer Effect on Stream Discharge Variation in the Jacks Fork River Basin in the Ozark Highlands, U.S. Geological Survey, \$11,000; July 2001–Dec. 2002.

Engaging Agricultural Communities in the Great Plains of the U.S. with the Applications and Developments of Climate Prediction and Information, NOAA, \$432,916; Aug. 2002–July 2005.

SELECTED PUBLICATIONS

Hu, Q. and S. Feng. 2003 (in press). *A Daily Soil Temperature Dataset and Soil Temperature Climatology of the Contiguous United States*, **Journal of Applied Meteorology**.

Hu, Q. 2003. *A Multidecadal Variation in Summer Season Diurnal Rainfall in the Central United States*, **Journal of Climate**, 16, 174–178.

Qian, W., Q. Hu, Y. Zhu, and D. Lee. 2003. *Centennial-scale Dry-Wet Period Variability in East Asia and its Forcing*, **Climate Dynamics**, 21, 77–89.

Hu, Q. and S. Feng. 2002. *Interannual Rainfall Variations in the North American Summer Monsoon Region, 1900–1998*, **Journal of Climate**, 15, 1189–1202.

Hu, Q., S. Feng, and G. Shaefer. 2002. *Quality Control for USDA NRCS SM/ST Network Soil Temperatures: A Method and a Database*, **Journal of Applied Meteorology**, 41, 607–619.

Hu, Q. and S. Feng. 2001. *Variation of Teleconnection of ENSO and Interannual Variation of Summer Rainfall in the Central United States*, **Journal of Climate**, 14, 2469–2480.

Hu, Q. and S. Feng. 2001. *Southward Migration of Centennial Scale Variations of Drought/Flood in Eastern China and Western United States*, **Journal of Climate**, 14, 1323–1328.

- Wu, H., M.J. Hayes, A. Weiss, and Q. Hu. 2001. *An Evaluation of the Standardised Precipitation Index, the China-Z Index, and the Statistical Z-score*, *International Journal of Climatology*, 21, 745-758.
- Weiss, A., C.J. Hays, Q. Hu, and W.E. Easterling. 2001. *Incorporating an Estimate of Bias Error in Predicting Solar Irradiance and Implications for Yield Predictions*, *Agronomy Journal*, 93, 1321-1326.
- Hu, Q. and G.D. Wilson. 2000. *Temperature Effects on the Palmer Drought Severity Index*, *International Journal of Climatology*, 20, 1899-1911.

OTHER PROFESSIONAL ACTIVITIES

Fellow, Center for Great Plains Studies, University of Nebraska-Lincoln, 2003-present

Member, American Geophysical Union, 2001-present

Member, American Meteorological Society, 1992-present

Reviewer of proposals to NOAA Office of Global Programs, 1999-2002

Referee of articles submitted to:

Journal of Geophysical Research, 1990

Geophysical Research Letters, 2002

Journal of the Atmospheric Sciences, 1996, 1997

International Journal of Climatology, 2001-2002

Journal of Climate, 1995-2002

Advances in Atmospheric Sciences, 2002

Journal of Arid Environment, 2003

Applied Engineering in Agriculture, 2003

KENNETH G. HUBBARD, Professor, 10% Teaching, 50% Research, 40% Extension/Outreach

Areas of Interest: Weather Monitoring, Climate Modeling, Evapotranspiration, Sensor Performance

Contact: khubbard@unl.edu, 402/472-8294

EDUCATION

B.S. Math and Physics, Chadron State College (1971)

M.S. Meteorology, South Dakota School of Mines and Technology (1973)

Ph.D. Soil Science and Biometeorology, Utah State University (1982)

PROFESSIONAL EXPERIENCE

1997-Present Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln (UNL)

1987-Present Director, High Plains Regional Climate Center, University of Nebraska-Lincoln

1993-1997 Professor, Department of Agricultural Meteorology, University of Nebraska-Lincoln

1986-1993 Associate Professor, Department of Agricultural Meteorology, University of Nebraska-Lincoln

HONORS AND AWARDS

Who's Who in Science and Engineering (1994-1995)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 469/869 Bio-Atmospheric Instrumentation (F99, FO1)

Masters and Doctoral Students Advised

Dalziza de Oliveira (Ph.D. Agronomy 2002) A New Method to Estimate Crop Evapotranspiration from an Empirical Canopy Temperature and Energy Balance.

Donna L. Woudenberg (M.S. Natural Resource Sciences 2002) The Role of Climate in Modern Water Planning and Related Decisions: Nebraska Case Study.

Xiaomao Lin (Ph.D. Agronomy 1999) Microclimate Inside Air Temperature Radiation Shields.

RESEARCH

I have focused on weather network monitoring research issues. In particular, I have studied the spatial resolution of networks, the performance of sensors, and the micro-climate of temperature/RH shields. In addition, I have worked on canopy micro-climate issues with emphasis on leaf wetness, penetration of radiation, and surface water and energy budgets.

EXTENSION

Under my direction the High Plains Regional Climate Center's web resources have reached to nearly 10 Million accesses per year by clientele. In addition, I have participated in workshops and education programs where I served as a speaker and teacher.

SELECTED GRANTS AND CONTRACTS

Digital Government: A Decision Support System for Drought Risk Management (with S. Reichenbach, S. Goddard, W. Waltman, J. Deogun, D. Willhite, P. Revesz and M. Hayes), National Science Foundation, \$1,000,000; 2001-2004.

Sources of Uncertainty in the Calculation of Design Weather Conditions in the ASHRAE Handbook of Fundamentals (with K. Kunkel, A. DeGaetano and K. Redmond), American Society of Heating, Refrigeration and Air conditioning Engineers, \$119,000; 2000-2003.

A High Plains Climate Center. Funds to Operate a Regional Center That Functions in the Areas of Applied Climate Studies and Climate Services, U.S. Dept. of Commerce, \$407,000, 1999; \$438,302, 2000; \$440,000, 2001; \$440,000, 2002.

SELECTED PUBLICATIONS

Adegoke, J.O., R.A. Pielke, Sr., J. Eastman, R. Mahmood, and K.G. Hubbard. 2003. *Impact of Irrigation on Midsummer Surface Fluxes and Temperature under Dry Synoptic Conditions: a Regional Atmospheric Model Study of the U.S. High Plains*, **Monthly Weather Review**, 131 (3), 556-564.

Hubbard, K.G., R. Mahmood, and C. Carlson. 2003. *Estimating Daily Dew Point Temperature for the Northern Great Plains, USA*, **Journal of Applied Meteorology**, 95 (2), 323-328.

Hubbard, K.G. and X. Lin. 2002. *Realtime Data Filtering Models for Air Temperature Measurements*, **Geophysical Research Letters**, 29 (X), 1-4.

Mahmood, R. and K.G. Hubbard. 2002. *Effect of Time of Temperature Observations and Estimation on Daily Solar Radiation for the Northern Great Plains, USA*, **Agronomy Journal**, 94 (4), 723-733.

- Wilhelmi, O.V., K.G. Hubbard, and D.A. Wilhite. 2002. *Agroclimatological Factors Influencing Vulnerability to Agricultural Drought: a Nebraska Case Study*, *International Journal of Climatology*, 22, 1399-1414.
- Yuen, G., C. Jochum, L. Giesler, M. Shulski, E. Walter-Shea, K. Hubbard, and G. Horst. 2002. *UV-B Biodosimetry in Turfgrass Canopies*, *Crop Science*, 42, 859-868.
- Hubbard, K.G. 2001. *The History of Weather Observations in the Western United States*, *Journal of the West*, 40 (3), 26-30.
- Hubbard, K.G. and M.V.K. Sivakumar, eds. 2001. *Automated Weather Stations for Applications in Agriculture and Water Resources Management: Current Use and Future Perspectives*, World Meteorological Organization, Geneva, Switzerland: WMO/TD No. 1074, 248 p.
- Lin, X., K.G. Hubbard, and E.A. Walter-Shea. 2001. *Radiation Loading Model for Evaluating Air Temperature Errors with a Non-aspirated Radiation Shield*, *Transactions of the ASAE*, 44 (5), 1299-1306.
- Mahmood, R. and K.G. Hubbard. 2001. *Anthropogenic Land Use Change in the North American Tall Grass-Short Grass Transition and Modification of Near Surface Hydrologic Cycle*, *Climate Research*, 21, 83-90.

OTHER PROFESSIONAL ACTIVITIES

- Member, Technical Committee (4.2) on Weather Information, American Society of Heating, Refrigeration, and Airconditioning Engineers, 2002-present*
- Member, Agricultural Research Division Advisory Council, University of Nebraska, 1992*
- Rapporteur (Soya Crop), WMO Commission on Agricultural Meteorology, 1992*
- President, American Association of State Climatologists, 1985-86*
- Member, American Meteorological Society*
- Member, American Society of Agronomy*
- Member, American Association for the Advancement of Science*

SCOTT E. HYGSTROM, Professor, 70% Extension, 30% Teaching

Areas of Interest: Wildlife damage management, wildlife diseases, wildlife/agricultural interactions, human dimensions in wildlife. Ecology of ungulates, rodents, and predators.

Contact: shygstrom1@unl.edu, 402/472-6822

EDUCATION

B.S. Biology, Conservation, University of Wisconsin-River Falls (1980)

M.S. Natural Resources-Wildlife, University of Wisconsin-Stevens Point (1983)

Ph.D. Wildlife Ecology, University of Wisconsin-Madison (1988)

PROFESSIONAL EXPERIENCE

2000-present Professor, School of Natural Resources, University of Nebraska-Lincoln (UNL)

1994-2000 Associate Professor, School of Natural Resources, University of Nebraska-Lincoln

1999 Visiting Scientist, National Wildlife Research Center, USDA-APHIS-WS

1988-1994 Assistant Professor, Department of Forestry, Fisheries and Wildlife, University of Nebraska-Lincoln

1987 Staff Lecturer, Department of Biology, University of Wisconsin-River Falls

1983-1986 Wildlife Damage Program Coordinator, University of Wisconsin-Extension

HONORS AND AWARDS

Professor of the Month (January), UNL Mortar Board, The Black Masque Chapter (2003)

Undergraduate Creative Activities and Research Experiences Awards, UNL (2002, 2003)

Charles E. Bessey Award, UNL Center for Great Plains Studies, (2002)

Team Programming Awards, Nebraska Chapter of Epsilon Sigma Phi (2000, 1999, 1996)

Distinguished Service Award, Nebraska Cooperative Extension Association-Specialists Section (1999)

Early Career Award, Epsilon Sigma Phi (1997)

Certificates of Excellence, American Society of Agronomy (1997, 1995)

Communication Award, Berryman Institute for Wildlife Damage Management (1996)

Excellence in Team Programming Awards, UN Cooperative Extension (1996 (2), 1994, 1991)

Outstanding New Specialist Award, Nebraska Cooperative Extension Association-Specialists Section (1994)

Award of Merit, Council for the Advancement of Science Education (1993)

Team Effort Award, UN Institute of Agriculture and Natural Resources (1991)
Certified Wildlife Biologist, The Wildlife Society (1990)

TEACHING

Courses taught (Spring, Summer, Fall)

NRES 348 Wildlife Damage Management (S99, S00, S01, S02, S03)

NRES 448/848 Advanced Topics in Wildlife Damage Management (S99, S01, S03)

NRES 496 Independent Study (S98, F99, Su00, F00, F02, S03)

NRES 497 Career Experiences in Natural Resources Management (F00, S01, Su01, Su02, F02, S03)

Masters and Doctoral Students Advised

Jason M. Gilsdorf (M.S. Natural Resource Sciences 2002) Effectiveness of Frightening Devices for Reducing Deer Damage in Cornfields.

Michael A. Cover (M.S. Natural Resource Sciences 2000) Ecology of Elk in Northwestern Nebraska: Seasonal Distribution, Characteristics of Wintering Sites, and Herd Health.

Bruce A. Stillings (M.S. Natural Resource Sciences 1999) Ecology of Elk in Northwestern Nebraska: Demographics, Effects of Human Disturbance, and Characteristics of Calving Habitat.

R. Daniel Crank (M.S. Natural Resource Sciences 1998) Landowner and Tourist Attitudes Toward Elk Management in the Pine Ridge Region of Northwestern Nebraska.

Jeff J. Mach (M.S. Natural Resource Sciences 1998) Warfarin – A Forgotten Rodenticide: Primary and Secondary Effects of a Warfarin Bait for Black-tailed Prairie Dogs.

Kurt C. VerCauteren (Ph.D. Natural Resource Sciences 1998) Dispersal, Home Range Fidelity, and Vulnerability of White-tailed Deer in the Missouri River Valley.

EXTENSION

Goal – Provide current, cost-effective, research-based information to people dealing with wildlife damage problems. Specific activities included: distribution and revision of “Prevention and Control of Wildlife Damage,” development of the Internet Center for Wildlife Damage, presented 37 workshops, produced 100 extension publications, and made 175 presentations. Secured \$233,000 through 5 extension grants. Combined, our efforts influenced management on at least 170,000 acres and saved \$430 million in 2002.

RESEARCH

Goal – Conduct research/demonstration projects to examine the environmental factors associated with human-wildlife conflicts and their potential solutions. Published 14 peer-

reviewed papers and presented research results at 15 conferences. Secured \$578,000 through 6 research grants.

SELECTED GRANTS AND CONTRACTS

Mechanisms that Influence the Distribution of Deer in the Missouri River Valley—a Landscape Perspective (with K. VerCauteren), National Wildlife Research Center, US Fish and Wildlife Service, Nebraska Bowhunters Association, \$59,500; 2002-2004.

Revision of "Prevention and Control of Wildlife Damage" (with R. Timm, J. Green and D. Virchow), USDA-APHIS-Wildlife Services, \$92,000; 2001-2004.

IPM in Nebraska Schools (with C. Ogg, S. Kamble, S. Niemeyer, J. Sellentine, D. Heidelberg, T. Creger and W. Kramer), Nebraska Department of Agriculture, \$42,500; 2002.

Revision of Prairie Dogs and the Prairie Ecosystem (with D. Virchow), US Fish and Wildlife Service, US Forest Service, US Department of Defense, and Nebraska Game and Parks Commission, \$17,423; 2002.

Ecological Distribution of E. Coli O157:h7 Strains in Agricultural Environments (with J. Sargeant, D. Renter, L. Hengerford and J. Gillespie), USDA-CSREES-National Research Initiative, \$210,000; 1999-2001.

An Economic Assessment of Rodent Control in Swine Facilities (with R. Timm and R. Corrigan), National Pork Producers Council, \$38,500; 1999-2001.

Development of an Internet Center for Wildlife Damage Management (with P. Curtis, R. Schmidt and G. Yarrow), USDA-CSREES-Integrated Pest Management, \$42,600; 1997-2000.

Ecology of Elk in the Pine Ridge region of Nebraska, Nebraska Game and Parks Commission, US Forest Service, Rocky Mountain Elk Foundation, \$195,865; 1995-1999.

SELECTED PUBLICATIONS

VerCauteren, K., S. Hygnstrom, R. Timm, R. Corrigan, J. Beller, L. Bitney, M. Brumm, D. Meyer, D. Virchow, and R. Wills. 2002. *Development of a Model to Assess Rodent Control in Swine Facilities, Human-Wildlife Conflicts and Economic Considerations* (L. Clark, ed.), Ft Collins, CO: National Wildlife Research Center, 86-94.

Virchow, D. and S. Hygnstrom. 2002. *The Pre-settlement Black-tailed Prairie Dog in the Great Plains: Superabundance or Local Abundance?*, *Great Plains Research*, 12, 255-260.

Renter, D., J. Sargeant, S. Hygnstrom, J. Hoffman, and J. Gillespie. 2001. *Escherichia Coli O157:h7 in Free-ranging Deer in Nebraska*, *Journal of Wildlife Diseases*, 37, 755-760.

DeNicola, T., K. VerCauteren, P. Curtis, and S. Hygnstrom. 2000. *Managing Deer in Suburban Environments: a Technical Guide*, Ithaca, NY; Cornell University Press, 52 pp.

Hygnstrom, S. and K. VerCauteren. 2000. *Efficacy of Five Fumigants for Managing Black-tailed Prairie Dogs*, *International Biodeterioration and Biodegradation*, 45, 159-168.

Hygnstrom, S., K. VerCauteren, R. Hines, and C. Mansfield. 2000. *Efficacy of In-furrow Zinc Phosphide Pellets for Controlling Rodent Damage in No-till Corn*, **International Biodeterioration and Biodegradation**, 45, 215-222.

Hygnstrom, S., P. McDonald, and D. Virchow. 1998. *Efficacy of Three Formulations of Zinc Phosphide for Managing Black-tailed Prairie Dogs*, **International Biodeterioration and Biodegradation**, 41, 1-6.

VerCauteren, K. and S. Hygnstrom. 1998. *Effects of Agricultural Activities and Hunting on Home Ranges of Female White-tailed Deer*, **Journal of Wildlife Management**, 62, 280-285.

OTHER PROFESSIONAL ACTIVITIES

Vice-President, National Animal Damage Control Association, 2000-2003

President, Nebraska Cooperative Extension Association, Specialist Section, 1997-1998

Chair, The Wildlife Society, Wildlife Damage Management Working Group, 1996-1998

J. MICHAEL JESS, Senior Lecturer, 20% teaching, 25% survey and 55% administration

Areas of interest: Water resources law and policy, surface water hydrology

Contact: mjess3@unl.edu, 402/472-7570

EDUCATION

B.S. Civil Engineering, University of Nebraska-Lincoln (1968)

M.S. Civil Engineering, University of Nebraska-Lincoln (1969)

Certificate Organizational Management, Georgetown University, Washington, DC (1971)

Certificate Administrative Law, National Judicial College, Reno, NV (1989)

PROFESSIONAL EXPERIENCE

1999-present Associate Director, Conservation & Survey Division, School of Natural Resources, University of Nebraska-Lincoln (UNL)

2001-present Acting Director, Water Center, School of Natural Resources, UNL

2001-present University of Nebraska representative to Water Well Standards and Licensing Board

1981-1999 Director of Water Resources (State Engineer), Chairman of Interstate Boundary Commission, Chairman of Republican River Compact, South Platte River Compact, Big Blue River Compact and Chief of Commission on Enforcement for *Neb v Wyo* (1945), State of Nebraska

1975-1981 Deputy Director of Water Resources, State of Nebraska

1972-1975 Staff Hydrologist, Illinois State Water Survey, State of Illinois

1970-1972 First Lieutenant, U.S. Army Corps of Engineers (active duty)

HONORS AND AWARDS

Ditchrider Award, Four States Irrigation Council (2000)

Pioneer Award, Nebraska Water Conference Council (1999)

Untitled award for "Leadership, Professionalism and Integrity," presented jointly by Nebraska State Irrigation Association and Nebraska Water Resources Association (1998)

Gladys Forsyth Award, YWCA of Lincoln, NE (1990)

Honorary Membership in Chi Epsilon, National Civil Engineering Honor Society (1989)

TEACHING

Courses Taught (Fall, Spring, Summer)

CIVE 916, LAW 774 Natural Resources Law and Policy (FO0, FO1, FO2)
NRES 415, AGRO 481/881, FFWL 415/815, GEOG 481/881, GEOL 415/815 Water
and Natural Resources Seminar series (SO0, SO1, SO2, SO3)

SURVEY/EXTENSION

Besides contributions to Water Well Standards & Licensing Board, I make frequent water law and policy presentations to natural resources districts, irrigation districts, environmental organizations and community services clubs. Direct Water Center staff in producing annual 2-4 day Water & Natural Resources field trips and a 1½ day Water and Natural Resources conference.

SELECTED PUBLICATIONS

Jess, J. Michael. 2003. "Water Marketing," *Earth Science Notes No. 5*, Conservation & Survey Division, University of Nebraska, April 2003.

Jess, J. Michael. 2002. *Water Transfers and Marketing in Nebraska*, Water Law Institute, October 2002.

Jess, J. Michael. 2000. *Satisfying Contemporary Water Needs - Reflections on Market Driven Water Rights Exchanges*, Nebraska Tax Research Council, Inc.

OTHER PROFESSIONAL ACTIVITIES

Registered Professional Engineer, Illinois (inactive) and Nebraska
Past President of Nebraska Section, American Society of Civil Engineers
Current Board member, Nebraska State Irrigation Association
Past President, Association of Western States Engineers

ROBERT MATTHEW JOECKEL, Assistant Professor, 50% Service, 50%

Research

Areas of Interest: Regional Geology and Geologic Mapping, Pennsylvanian and Cretaceous Stratigraphy, Mineral Resources, Paleosols, Earth Surface Processes, Geomicrobiology, Paleontology

Contact: rjoeckel3@unl.edu, 402/472-7520

EDUCATION

B.S. Geology, University of Nebraska-Lincoln (1985)

M.S. Geology, University of Nebraska-Lincoln (1988)

Ph.D. Geology, University of Iowa (1993)

Also Graduate study at University of Kansas, University of Florida, Iowa State University

PROFESSIONAL EXPERIENCE

2003-present Research Geologist/Assistant Professor, School of Natural Resources, Conservation and Survey Division, University of Nebraska-Lincoln

2000-2003 Research Geologist/Assistant Professor, Conservation and Survey Division, University of Nebraska-Lincoln

1996-2000 Assistant Professor and Chair of Geology-Geography Program, Bellevue University

1994-1996 National Science Foundation Postdoctoral Research Fellow, Department of Geological Sciences, University of Tennessee-Knoxville

1994 Instructor, Department of Geosciences, University of Nebraska-Lincoln

HONORS AND AWARDS

Vice President for Academic Affairs Distinguished Professorship Bellevue University (1999)

Undergraduate Education

Served in two American Association of State Geologists Student Mentorship programs for undergraduates: Stephanie Thomas (2001) and Jamie Taylor (2002)

TEACHING

Masters Committees

Erik Weiss (M.S. Geosciences) Thesis title pending.

RESEARCH

Recent research emphasizes Cretaceous and Pennsylvanian stratigraphy and interpretation of depositional environments, sea-level change, and paleoclimate; additional recent research involves clarification of evolutionary issues in mammalian fossils from Nebraska, surrounding parts of North America, and Europe. Currently-active research involves geomicrobiology of acid rock drainage sites and saline-alkaline wetlands, diatomite resources, trace fossils, and weathering profiles on buried basement rocks.

EXTENSION

Long-term work with major cement producer in Nebraska, directed toward identifying and extracting new sources of high-quality limestone; work in management of sand, gravel, and aggregate resources; compilation of information about carbonatite resources (sources of rare-earth elements); regular scholarly service involving local groundwater, stratigraphy, and availability of basic materials.

SURVEY

Produced nine 7.5 minute quadrangle geologic maps in southeastern Nebraska since 2000; compiled directory of Nebraska pits, quarries, and mines; investigated and revised stratigraphy of Pennsylvanian and Cretaceous systems in eastern Nebraska; carried out research identifying acid rock drainage and sulfate salt deposition in soils and other near-surface environments.

SELECTED GRANTS AND CONTRACTS

STATEMAP Geologic Mapping Grant, U.S. Geological Survey, \$40,000; 2003-2004.

AASG/NASA Grant (with G. Henebry), \$50,000; 2002-2003.

UN-L Research Council Grant, \$6,000; 2002-2003.

STATEMAP Geologic Mapping Grant (with J. Mason), U.S. Geological Survey, \$45,000; 2002-2003.

STATEMAP Geologic Mapping Grant (with J. Mason), U.S. Geological Survey, \$40,000; 2001-2002.

UN-L Layman Grant, \$5,000; 2001.

National Geographic Research Grant, \$9,000; 1999.

SELECTED PUBLICATIONS

Driese, S.G., C.I. Mora, C.A. Stiles, R.M. Joeckel, and L.C. Nordt. 2002. *Mass-balance Reconstruction of Amodern Vertisol: Implications for Interpreting the Geochemistry and Burial Alteration of Paleo-Vertisols*, *Geoderma*, 95, 179-204.

- Joeckel, R.M., R.M. Hunt, Jr., S. Peigne, and R.I. Skolnick. 2002. *The Auditory Region and Nasal Cavity of Oligocene Nimravidae (Mammalia, Carnivora)*, *Journal of Vertebrate Paleontology*, 22, 830-847.
- Loope, D.B., C.M. Rowe, and R.M. Joeckel. 2001. *Annual Monsoon Rains Recorded by Jurassic Dunes*, *Nature*, 412, 64-66.
- Brenner, R.L., G.A. Ludvigson, B.J. Witzke, A.N. Zawistoski, E.P. Kvale, R.L. Ravn, and R.M. Joeckel. 2000. *Late Albian Kiowa-Skull Creek Marine Transgression, Lower Dakota Formation, Eastern Margin of Western Interior Seaway, U.S.A.*, *Journal of Sedimentary Research*, 70, 868-878.
- Joeckel, R.M. 1999. *Paleosol in Galesburg Formation (Kansas City Group, Upper Pennsylvanian), Northern Midcontinent, U.S.A.: Evidence for Climate Change and Mechanisms of Marine Transgression*, *Journal of Sedimentary Research*, 69, 720-737.
- Joeckel, R.M. and B.J. Ang-Clement. 1999. *Surface Features of the Salt Basin of Lancaster County, Nebraska: Reconnaissance of Inland Sabkhas at the Subhumid Eastern Margin of the Great Plains, USA*, *Catena*, 34, 243-275.
- Joeckel, R.M. 1998. *Unique Frontal Sinuses in Fossil and Living Hyaenidae (Mammalia, Carnivora): Description and Interpretation*, *Journal of Vertebrate Paleontology*, 18, 627-639.

RON J. JOHNSON, Professor, 69% Extension, 31% Research,
Extension/Outreach Coordinator

Areas of Interest: Avian conservation and function in managed landscapes, wildlife damage, youth development

Contact: rjohnson4@unl.edu, 402/472-6823

EDUCATION

B.S. Wildlife Management, The Ohio State University, with distinction (1968)

M.S. Wildlife Ecology, The Ohio State University (1973)

Ph.D. Wildlife Science; Minors: Behavioral Biology, Communication Arts, Cornell University (1979)

PROFESSIONAL EXPERIENCE

2000-present Professor, Extension Wildlife Specialist, & Extension/Outreach Coordinator, School of Natural Resources (merged from earlier units), University of Nebraska-Lincoln (UNL)

1993-2000 Professor & Extension Wildlife Specialist, School of Natural Resources, University of Nebraska-Lincoln (Associate Professor: 1985-1993; Assistant Professor: 1979-1985)

HONORS AND AWARDS

Distinguished Service Award for outstanding service to Cooperative Extension. Epsilon Sigma Phi, Nebraska (Extension Honorary) (1999)

Team Award – Earthbound Team for outstanding team (served as team co-chair). Epsilon Sigma Phi, Nebraska (Extension Honorary) (1996)

TEACHING

Masters and Doctoral Students Advised

Micah W. Perkins (M.S. Wildlife Ecology 2001) *Effects of Woody Cover in the Landscape on Riparian Avifauna and a Preliminary Nesting Assessment.*

Nancy A. Beecher (M.S. Wildlife Ecology 1998) *Birds and Agroecological Relationships in Organic and Nonorganic Farmland.*

RESEARCH

Research Division Project: Integrating Biological Diversity Into Managed Land-use Systems.

Focus: Avian conservation and function in managed landscapes, Avian habitat relationships, Agroecology, Ecological and behavioral aspects of wildlife damage

Graduate student advising: Major professor for 14 M.S. students, 5 of whom won 7 awards; 1 was option II, non-thesis. Co-chaired completion of 1 PhD committee (Jul 2001) and served on advisory committee for 10 other M.S. students.

Undergraduate research: Major advisor for three student research projects: one honors program (2000) and two environmental studies (1997, 2000).

EXTENSION

Co-chair, Team Leaders for CES Natural Resources and Environmental Management Action Team, (Co-chair: 2000-present; Team Leader: 1999-present)

Contribute to other action teams: Youth and Family Responsibility, Community and Residential Environment, Policy and Public Issues Education, and Integrated Crop Management.

Focus areas:

Wildlife stewardship in backyards, acreages, and farms

Songbirds, pest birds, & snakes

Natural resource public policy and education

Family outdoor activities; youth life skills development

SELECTED GRANTS AND CONTRACTS

Tern and Plover Conservation Partnership (extension & research) (with R. Johnson and R. Held), Nebraska State Wildlife Grants Program, 45,000 funded; Fiscal Year 2002.

Nongame Bird Conservation and Education Program (extension) (with J. Lackey and R. Johnson), Nebraska Environmental Trust, \$185,059 requested; 2003-2006 (outcome pending).

Bird Conservation and Education Partnership (extension) (with R. Johnson, J. Lackey), Nebraska Game and Parks Commission contract, \$123,555 funded; Sep 1, 2000-Aug 31, 2004.

Common Sense Conservation of Endangered Species (extension & research) [with R. Held (replaced J. Marcus), J. Dinan, R. Johnson]. Nebraska Environmental Trust, \$166,000 funded; 2002-2005.

Sandhills Pasture Management and Bird Communities (research) (with R. Johnson, M. Hack, E. Blankenship, T. Bragg and 8 cooperators), Project leadership transferred to new faculty member, \$25,000 funded; 2001-2002.

Tern and Plover Conservation Partnership, Education and Outreach (extension) (with J. Marcus, R. Johnson, J. Dinan), U.S. Fish and Wildlife Service, \$50,000 funded; Sep 26, 2001-Sep 30, 2003.

Tern and Plover Conservation Partnership (extension & research), (with J. Marcus, J. Dinan, R. Johnson), U.S. Fish and Wildlife Service, Section Six of the Endangered Species Act/Nebraska Game and Parks Commission, \$20,000 funded (\$32,643 requested); 2001-2002.

Tern and Plover Conservation Partnership (extension & research) (with J. Marcus, J. Dinan, R. Johnson), WCRP/Nebraska Game and Parks Commission, \$75,194 funded; Nov 2001-Nov 2002.

Tern and Plover Conservation Partnership Outreach (with R. Johnson, J. Dinan), Nebraska Game and Parks Commission contract, \$23,125; Dec 2001-Dec 2003.

Tern and Plover Conservation Partnership (extension & research) (with J. Dinan, R. Johnson), Nebraska Environmental Trust, National Fish and Wildlife Foundation, and Nebraska Game & Parks Commission, \$90,770; June 1999-Jan 2002.

Integrating Wildlife and Agriculture: Arthropods, Vegetation and Birds (with R. Johnson, N. Beecher), UNL Research Council, Research Grant-In-Aid, \$3,000; 1996-1997.

SELECTED PUBLICATIONS

Perkins, M.W., R.J. Johnson, and E.E. Blankenship. 2003 (in press). *Response of Riparian Avifauna to Percentage and Pattern of Woody Cover in an Agricultural Landscape*, *Wildlife Society Bulletin*, 31.

Beecher, N.A., R.J. Johnson, J.R. Brandle, R.M. Case, and L.J. Young. 2002. *Agroecology of Birds in Organic and Nonorganic Farmland*, *Conservation Biology*, 16, 1620-1631.

Blankenship, E.E., M.W. Perkins, and R.J. Johnson. 2002. *The Information-Theoretic Approach to Model Selection: Description and Case Study*, *Proceedings Annual Kansas State University Conference on Applied Statistics in Agriculture*, 14, 62-76.

Poague, K.L., R.J. Johnson, and L.J. Young. 2000. *Birds and Habitat Relationships along Rural and Urban Converted Railroad Corridors in Southeast Nebraska*, *Wildlife Society Bulletin*, 28, 852-864.

Extension:

Johnson, R.J. and J.L. Lackey. 2001. *Backyard Wildlife: Bird Houses and Shelves*, *NebGuide*, G01-1427-A, 4p.

Johnson, R.J. 1999. *Wild Bird Control*, 12-16 in *1999 Minnesota Poultry Service Workshop*, College of Veterinary Medicine, University of Minnesota, St. Paul. (Invited).

- Johnson, R.J., G.L. Heusel, and J. Woodland. 1999. *Building a Coalition for Environmental Education, Proceedings National Extension Wildlife, Fisheries, and Aquaculture Conference* (Portland, Maine, Sep 29–Oct 2, 1999), 9, 107–109.
- Johnson, R.J., J.R. Brandle, N.J. Sunderman, R.L. Fitzmaurice, N.A. Beecher, R.M. Case, M.E. Dix, L.J. Young, M.O. Harrell, R.J. Wright, and L. Hodges. 1998. *Wildlife as Natural Enemies of Crop Pests*, in *Educational Challenges for the 21st Century* (W.D. Edge, ed.), *Proceedings National Extension Wildlife and Fisheries Specialist Workshop*, Spec. Rep. 982, Oregon State Univ., Corvallis: 8, 112–116.
- Hall, D., R.J. Johnson, and C.D. Lee. 1997. *Wildlife Habitat Evaluation Handbook, Leader's Guide*, K-State Research and Extension, and Nebraska Cooperative Extension, MF-2265, 20p.
- Johnson, R.J. 1997. *Backyard Wildlife, Tips for Success*, *NebGuide*, G97-1332-A, 4p.
- Johnson, R.J. 1997 (revised). *Backyard Wildlife, Feeding Birds*, *NebGuide*, G83-669-A, 4p.
- Johnson, R.J. and D.H. Steinegger. 1997. *Backyard Wildlife, To Feed a Hummingbird*, *NebGuide*, G97-1331-A, 4p.
- Lee, C.D. (Kansas coordinator), R.J. Johnson (Nebraska coordinator), T. Ecoffey, T. Glick, D. Hall, F.R. Henderson, D. Hoover, T. LaGrange, B. Press, T. Seibert, D. Virchow, and J. Wilson. 1997. *Wildlife Habitat Evaluation Handbook, Participant's Manual*, K-State Research and Extension and Nebraska Cooperative Extension, MF-2266, 88p.
- Wallner-Pendleton, E., R.J. Johnson, and J. Dinan. 1997. *House Finch "Eye" Disease*, *NebFact*, NF97-355.

OTHER PROFESSIONAL ACTIVITIES

- Biometry Promotion and Tenure Committee*, Dec 2001–present.
- SNRS Outreach Committee, Ex Officio as Extension/Outreach Coordinator*, 2000–present.
- Temporary Acting Director, School of Natural Resource Sciences*, Nov/Dec 2002.
- CES Dean's Advisory Committee*, Dec 1998–Dec 2000.
- Minor in Environmental Education Development Committee* (minor approved), 2000–2001.
- IANR Marketing Advisory Committee*, May 1998–1999.
- Board member, Nebraska Sustainable Agriculture Society*, March 2000–2003.
- Senator Kerrey's Endangered Species Task Force*, April 1997–1998.
- Founding Co-chair, Nebraska Organizations for Environmental Education (NOFEE)* (Initiated, helped develop, 1996–1998), assisted with transition to unite with another group to form NACEE (Nebraska Alliance for Conservation and Environment Education).
- Board member, Epsilon Sigma Phi, Nebraska chapter*, Nov 1995–Nov 1998.

Patent for Magic Halo (repels House Sparrows from feeders), sold nationally via Wild Bird Habitat Stores, NE, patent received 1994.

SCOTT J. JOSIAH, Assistant Professor, 75% Extension, 25% Research

Areas of Interest: Integrated land use systems, agroforestry, alternative woody crops,
conservation practice adoption theory and practice

Contact: sjosiah2@unl.edu, 402/472-6511

EDUCATION

B.S. Forest Resource Management/Silviculture, State University of New York (1975)

M.S. Botany and Soil Science, Southern Illinois University (1986)

Ph.D. Forest Policy and Management, University of Minnesota (1996)

PROFESSIONAL EXPERIENCE

1998-Present Assistant Professor and State Extension Forester, School of Natural
Resource Sciences, University of Nebraska-Lincoln

1996-1998 Research Associate and Associate Program Director, Center for Integrated
Natural Resource and Agricultural Management, University of Minnesota

1982-1998 Consultant For: The World Bank; USAID; IUFRO; Pan American Development
Foundation; FAO; and others in Ghana; India; Bangladesh; Nepal; Philippines;
Costa Rica; India; Finland; Malaysia; Fiji; Minnesota; and Washington, DC

1991-1995 Research Assistant, Forest Policy and Administration, Department for
Research, University of Minnesota

1989-1992 Assistant Director for Agroforestry, Haiti Agroforestry Project - *Pwojé*
Pyebwa, Pan American Development Foundation, Port-au-Prince, Haiti

1986-1989 Nursery Specialist, Haiti Agroforestry Project - *Pwojé Pyebwa*, Pan American
Development Foundation, Port-au-Prince, Haiti

1986-1987 Forester/Nursery Manager, Operation Double Harvest, Cazeau, Haiti

1983-1986 Research Assistant, Southern Illinois University

1979-1984 Fire Protection Forester, Guam Department of Agriculture, Agana, Guam,
1980-1984

1976-1980 Property and Forest Manager, Ecumenical Camp Association, Cleveland, New
York

HONORS AND AWARDS

Award of Certified Forester designation by the Society of American Foresters (2002)

2002 Gold Award for authoring four Specialty Forest Product publications - best short
extension publication, National Association of Natural Resource Professionals
(ANREP) (2002)

University of Nebraska IANR 2002 Dinsdale Family Faculty Award (2002)

University of Nebraska IANR 2002 Layman Fund Award (2002)
2001 ANREP Silver Award for best short extension publication (2001)
National Innovation Merit Award, US Department of Transportation (2000)
WesMIN RC&D Best Project (Timberbelt) Award (1999)
Minnesota Department of Natural Resources Teamwork/Partnership Award, for MN Task Force on Living Snow Fences (1998)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 496F/896F Nebraska Forestry Shortcourse (Su99, 01, 03)

Masters and Doctoral Students Advised

Elizabeth Hammond (MS. Natural Resource Sciences, expected 2005) *Selecting Hybrid Hazelnut Cultivars for Commercial Production in the Midwest.*

Christine Meyer (MS Natural Resource Sciences, expected 2005) *Physiologic Indicators of Color Change in Woody Decorative Florals.*

Peter Skelton (Ph.D. Natural Resource Sciences, expected 2003) *Understanding the Agroforestry Adoption Process by Producers in Nebraska.*

RESEARCH

Design, develop, test and promote sustainable agroforestry and woody agriculture-based land use systems for agricultural, rangeland, and peri-urban systems. Product/market analysis, development and facilitation, and financial evaluation for specialty forest products. Design, evaluate effectiveness of alternative extension approaches, evaluate factors that affect landowner adoption of agroforestry systems.

EXTENSION

A highly collaborative, comprehensive, and interconnected approach to forestry extension programming programs use innovative concepts such as “market-driven or productive conservation”, “peer-to-peer extension”, alternative woody crops, and train-the-trainer approaches to expand outreach and impact in rural and community forestry, and natural resource-based rural development. Strengthened and developed institutional mechanisms for improved forestry extension.

SELECTED GRANTS AND CONTRACTS

From Nuts to Woody Florals: Cooperative Processing and Marketing of Woody Specialty Crops, Nebraska Department of Agriculture, \$15,000; 2002-2003.

Accelerating the Development of the Hazelnut as a Value-Added Crop for Nebraska, Institute of Agriculture and Natural Resources Layman Fund, University of Nebraska-Lincoln. \$10,000; 2002-2003.

Video Development: How to Establish and Maintain Grass and Riparian Forest Buffers, U.S. Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS), \$20,000; 2002-2003.

Evaluating Agroforestry Enterprise Opportunities for Specialty Forest Products: Decision Tools for Producers, U.S. Department of Agriculture-SARE, \$99,308; 2001-2003.

Accelerating Riparian Buffer Adoption to Enhance Water Quality and Farm Income, USDA, CSREES, \$225,000; 1999-2003.

Hybrid Hazelnut Alleycropping Silvopastoral Field Trial, St. Edward, NE, National Agroforestry Center (NAC), \$13,000; 2000-2003.

Specialty Forest Products Professional Development (with National Arbor Day Foundation), USDA SARE and National Agroforestry Center, \$41,610; 2000-2002.

Riparian Buffer Education to Improve Surface Water Quality & Producer Income in the Blue River Basin of Kansas & Nebraska, U.S. Environmental Protection Agency (USEPA), \$104,566; 1999-2001.

Establishing a Hybrid Hazelnut Cultivar Trial on UNL East Campus, UNL Research Council Faculty Grant, \$6,500; 1999-2000.

Evaluating Markets and Commercial Potential for Selected Non-Timber Forest Products Produced in Sustainable Agroforestry Systems in NE, SNRS Interdisciplinary Grant, \$18,000; 1999-2000.

Portable Displays to Improve Riparian Buffer Education, Nebraska Department of Agriculture, \$7,500; 1999.

Timberbelt Assessment Project, WesMin RC&D, \$8,000; 1999.

Assessing the Potential to Produce Special Forest Products from Living Snow Fences, Federal Emergency Management Agency, \$109,000; 1998-2000.

SELECTED PUBLICATIONS

Josiah, S.J., R. St. Pierre, H. Brott, and J. Brandle. 2003 (in press). *Productive Conservation: Diversifying Farm Enterprises by Producing Specialty Woody Products in Agroforestry Systems*, *Journal of Sustainable Agriculture*.

Skelton, P. and S.J. Josiah. 2003 (in press). *Improving Urban Tree Care in the Great Plains: Impacts of the Nebraska Tree Care Workshops*, *Journal of Extension*.

McCullough, M.C., S.J. Josiah, and T. Franti. 2002. *Guide to Buffers in the Blue River Basin*, University of Nebraska-Lincoln (UNL) Extension, 30 p.

- Josiah, S.J. 2001. *Approaches to Expand NGO Natural Resource Conservation Program Outreach*, *Journal of Society and Natural Resources*, 14, 609-618.
- Josiah, S.J. 2001. *Productive Conservation: Growing Specialty Forest Products in Agroforestry Plantings*, *UNL Extension*, 4 p.
- Josiah, S.J. 2001. *Marketing Specialty Forest Products*, *UNL Extension*, 4 p.
- Josiah, S.J. and J. Lackey. 2001. *Edible Landscapes for People and Wildlife*, *UNL Extension*, 4 p.
- Pulsipher, G. and S.J. Josiah, 2001. *Hybrid Hazelnuts: An Agroforestry Opportunity*, *UNL Extension*, 4 p.
- Josiah, S.J. 2000. *Discovering Profits in Unlikely Places: Agroforestry Opportunities for Added Income*, *University of Minnesota Extension*, 20 p.
- Kuhn, G. and S.J. Josiah. 1999. *Timberbelts: Windbreaks and Wood Products*, *Journal of Forestry*, 97 (7), 4-5.
- Gullickson, D. and S. Josiah. 1999. *Technical Guide to Living Snow Fence Design, Establishment and Management*, *University of Minnesota Extension, Minnesota Department of Transportation, and Minnesota Interagency Task Force on Living Snow Fences*, 89 p.

OTHER PROFESSIONAL ACTIVITIES

- Vice President, Nebraska Walnut Council, 2001-2003*
- Proposal reviewer, USDA/CSREES National Research Initiative, 2001*
- Board Member, Association For Temperate Agroforestry, 1999-2001*
- Midwest Region Advisory Council Representative, Association For Temperate Agroforestry, 1997-1999*

JOHANNES (JEAN) M. H. KNOPS, 20% Teaching in School of Natural Resources

Areas of Interest: ecosystem ecology, plant ecology, biogeochemistry, biological invasions and biodiversity

Contact: jknops2@unl.edu, 402/472-6449

EDUCATION

Ing. Horticulture, Higher Agricultural College (1982)

Drs. Plant Ecology, University of Utrecht (1989)

Ph.D. Botany, Arizona State University (1994)

PROFESSIONAL EXPERIENCE

1999-present Assistant professor, School of Biological Sciences, School of Natural Resources, and Department of Agronomy and Horticulture, University of Nebraska-Lincoln

1995-1999 Research Director, Long-Term Ecological Research program at the Cedar Creek Natural History Area, and Adjunct Assistant Professor, Department of Ecology, Evolution and Behavior; University of Minnesota

1994-1995 Postdoctoral Research Fellow, Museum of Vertebrate Zoology, University of California, Berkeley (Sponsor: Dr. Walter D. Koenig)

TEACHING

Courses Taught (Fall, Spring, Summer)

BIOS 829 Ecological Principles (S 03)

BIOS 809 Professionalism (S 02, S 03)

BIOS 457/857 Ecosystem Ecology (S 01, S 03)

BIOS 320 Principles of Ecology (F 00, F 01, F 02)

BIOS 322 Principles of Ecology Lab (F 99, F 00, F 01, F 02)

Masters and Doctoral Students Advised

Kate Bradley (Ph.D. Biology 2000-ongoing) Feedbacks on Nitrogen Cycling Induced by Changes in Soil Microbes.

Heidi Hillhouse (M.S. Biology 2001-ongoing) Litter Decomposition Dynamics.

Amy Kochsiek. (Ph D. Biology 2002-ongoing) Biological Invasions.

SELECTED GRANTS AND CONTRACTS

Carbon sequestration in dryland and irrigated agroecosystems; Quantification at different scales for improved prediction (with S.B. Verma, K.G. Cassman, T.J. Arkebauer, A. Dobermann, J.W. Doran, K.G. Hubbard, D.L. Martin and D.T. Walters), U.S. Department of Energy, \$900,000; 2003-2006 (pending).

Carbon sequestration and global climate change (with S.B. Verma, K.G. Cassman, T.J. Arkebauer, A. Dobermann, J.W. Doran, K.G. Hubbard, D.L. Martin and D.T. Walters), Nebraska EPSCoR-DOE, Research implementation program: Renewal application; U.S. Department of Energy, \$1,992,066; 2003-2006 (pending).

Mechanisms of species impacts on ecosystem carbon and nitrogen cycling (with S. Naeem and C. de Mazancourt), National Science Foundation, ecosystem panel, \$850,000; 2003-2008 (pending).

Photosynthetic plasticity and eutrophication as factors driving wetland plant species invasions (with H. Hager), U.S. Department of Agriculture, National Research Initiative, Managed Ecosystems, \$299,378; 2003-2006 (pending).

Consortium for Agricultural Soils Mitigation of Greenhouse Gases (with S.B. Verma, T.J. Arkebauer, K.G. Hubbard, G. Lynne, D.T. Walters and A. Dobermann), U.S. Environmental Protection Agency, \$621,762 (\$33,300 allocated to J. Knops); 2002-2004.

RET Supplement, National Science Foundation, \$10,700; 2002.

REU Supplement, National Science Foundation, \$12,000; 2002.

Interaction between photosynthetic plasticity and nutrient levels as a factor driving wetland plant invasions (with H. Hager), Center for Invasive Plant Management, \$5,000; 2002.

Comparison of invasive and native plant photosynthetic characteristics, Layman Trust, \$10,000; 2002-2003.

Long-term nitrogen fertilization and legume impacts on soil microbial communities (with K. Bradley), Faculty Fellowship of the Research Council of the University of Nebraska, \$10,000; 2001-2002.

Multi-user and multi-disciplinary ion and element analyzers (with S.C. Fritz, A. Joern, D.A. Wedin and A.J. Zera), National Science Foundation, DBI, \$63,618 + \$27,072 University of Nebraska match; 2001.

The impact of species tissue quality differences on nitrogen release from decomposing litter, Layman Trust, \$7,500; 2001.

Collaborative Research: Effects of different-sized grazers on nitrogen cycling across a grassland productivity gradient (with M. Ritchie, D. Milchunas and H. Olf), National Science Foundation, LTER panel, \$300,000 (\$137,245 allocated to J. Knops); 2000-2004.

Carbon sequestration in dryland and irrigated agroecosystems: Quantification at different scales for improved prediction (with S.B. Verma, K.G. Cassman, T.J. Arkebauer, A. Dobermann, J.W. Doran, K.G. Hubbard, D.L. Martin and D.T. Walters), U.S. Department of Energy, \$900,000; 2000-2003.

Biodiversity, disturbance and ecosystem functioning at the prairie-forest border (with D. Tilman, S. Hobbie, P. Reich, M. Davis, S. Naeem, M. Ritchie, D. Wedin and C. Lehman), National Science Foundation, \$4,200,000 (\$29,700 allocated annually to J. Knops); 2000-2006.

The impact of global change on ecosystem nitrogen cycling, Layman Trust, \$7,500; 2000-2001.

Mechanisms of vegetation change, Faculty Fellowship of the Research Council of the University of Nebraska, \$9,717; 2000.

Interaction of biodiversity, CO₂ and nitrogen on ecosystem functioning (with P. Reich, D. Tilman, D. Wedin, S. Naeem and D. Ellsworth), U.S. Department of Energy, Total grant \$1,500,000, Subcontract J. Knops and D. Wedin \$70,243; 1999-2002.

SELECTED PUBLICATIONS

Bradley, K.L., E.I. Damschen, L.M. Young, S. Went, G. Wray, D. Kuefler, N.M. Haddad, J.M.H. Knops, and S.M. Louda. 2003 (in press). *The Herbivory Uncertainty Principle Revisited*, *Ecology*.

Craine, J.M., D.G. Tilman, D.A. Wedin, P.B. Reich, M.J. Tjoelker, and J.M.H. Knops. 2002. *Functional Traits, Productivity and Effects on Nitrogen Cycling of 33 Grasslands Species*, *Functional Ecology*, 16, 563-574.

Kennedy, T., S. Naeem, K. Howe, J.M.H. Knops, D. Tilman, and P. Reich. 2002. *Biodiversity as a Barrier to Ecological Invasion*, *Nature*, 417, 636-639.

Knops, J.M.H., K.L. Bradley, and D.A. Wedin. 2002. *Mechanisms of Species Impacts on Ecosystem Nitrogen Cycling*, *Ecology Letters*, 5, 454-466.

Haddad, N.M., D. Tilman, J. Haarstad, M. Ritchie, and J.M.H. Knops. 2001. *Contrasting Effects of Plant Diversity and Composition on Insect Communities: a Field Experiment*, *American Naturalist*, 158, 17-35.

Haddad, N.M., D. Tilman, and J.M.H. Knops. 2001. *Long-term Oscillations in Grassland Productivity Induced by Drought*, *Ecology Letters*, 5, 110-120.

Knops, J.M.H., D. Wedin, and D. Tilman. 2001. *Biodiversity and Decomposition in Experimental Grassland Ecosystems*, *Oecologia*, 126, 429-433.

Koenig, W.D. and J.M.H. Knops. 2001. *Seed-crop Size and Eruptions of North American Boreal Seed-eating Birds*, *Journal of Animal Ecology*, 70, 609-620.

- Reich, P., J. Knops, D. Tilman, J. Craine, D. Ellsworth, M. Tjoelker, T. Lee, D. Wedin, S. Naeem, D. Behaiddin, G. Hendrey, S. Jose, K. Wrage, J. Goth, and W. Bengston. 2001. *Plant Diversity Enhances Ecosystem Responses to Elevated CO₂ and Nitrogen Deposition*, *Nature*, 410, 809–812.
- Tilman, D., P. Reich, J. Knops, D. Wedin, T. Mielke, and C. Lehman. 2001. *Diversity and Productivity in a Long-term Grassland Experiment*, *Science*, 294, 843–845.

OTHER PROFESSIONAL ACTIVITIES

Editorial board Ecology Letters, 2002–present

Reviewed papers for American Midland Naturalist, American Naturalist, Biogeochemistry, Bioscience, Biotropica, Climatic Change, Conservation Biology, Ecological Applications, Ecological Monographs, Ecology, Ecology Letters, Environmental Management, Functional Ecology, Journal of Applied Ecology, Journal of Ecology, Journal of Tropical Forest Science, Madroño, New Phytologist, Oecologia, Plant Ecology, Plant and Soil, Science, Soil Science Society of America Journal and Soil and Tillage Research

Reviewed proposals for the Great Plains Regional Center of the National Institute for Global Environmental Change, National Science Foundation, Netherlands Organization for Scientific Research, Sand County Foundation and USDA National Research Initiative

ROBERT D. KUZELKA, Associate Professor, 35% Teaching, 15%

Extension/Outreach, 50% Director/Chief Undergraduate Advisor

University of Nebraska-Lincoln (UNL) Environmental Studies Program

Areas of Interest: Natural Resources and Water Planning, Management, and Policy; Land Use Planning; Community and Regional Planning; Missouri River Ecosystem, Nebraska Natural Resources Districts

Contact: rkuzelka1@unl.edu, 402/472-7527

EDUCATION

B.ARCH. University of Nebraska-Lincoln (UNL) (1962)

MCRP University of Texas at Austin (1967)

PROFESSIONAL EXPERIENCE

2001-present Director/Chief Undergraduate Advisor UNL Environmental Studies Program

1997-present Associate Professor, School of Natural Resources, University of Nebraska-Lincoln

1993-present Courtesy Appointment as Associate Professor, UNL Department of Community and Regional Planning

1989-2001 Assistant to the Director, University of Nebraska Water Center

1989-1992 Assistant to the Director, UNL Conservation and Survey Division

1979-1989 Water Resources Planner, UNL Conservation and Survey Division

1969-1979 Comprehensive Planning Coordinator, Nebraska State Office of Planning and Programming

1963-1965 Officer, U.S. Army

HONORS AND AWARDS

Fulbright Postgraduate Fellowship, Department of Town and Country Planning, University of Sydney (Australia) (1967-1968)

Soil and Water Conservation Steward designation by Governor of Nebraska (1986)

Groundwater Guardian designation by The Groundwater Foundation (1994)

Bruce Baugh Memorial Award presented by Lincoln/Lancaster County Health Department (1996)

Certificate of Recognition for Contributions to Students from UNL Parents Association and Teaching Council (1991)

UNL Cooperative Extension Team Award for “earth wellness festival” (1999)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 323 Natural Resources Policy (F98-02, S99-03)
NRES 281 Hydrogeography, Introduction to Water Science (S99-01)
NRES 415/815 Water Resources Seminar (S99-03)
NRES 475/875 Water Quality Strategy (S02 & 03)
ENVR 496 Environmental Studies Seminar (S01-03)
ENVR 499 Senior Thesis (F98-02, S98-02, Su98-02)
ENVR 499A Senior Thesis Preparation (S03)
ENVR 499B Senior Thesis Completion (S03, Su03)

Masters Students Advised

Rick Leonard (MCRP, expected 2004) *Climate Change, Communities and Water – Citizen’s Information Manual. (Professional Project Report)*

Meghan Sittler (M.S. Natural Resources 2003) *Non-Thesis Option*

Bonnie L. Hilger (MCRP 2002) *The Missouri River Basin: Planning to Improve the Management of an Endangered Ecosystem.*

Jonathan D. Mohr (MCRP 2002) *Draft Wellhead Protection Plan Holdrege, Nebraska. (Professional Project Report)*

James M. Sank (MCRP 2002) *Common Ground: Community Participation and Competition for Central Platte Resources.*

Rebecca Horner (MCRP 2000) *Salt Valley Reservoirs Integrated Management Strategy 2000-2010. (Professional Project Report)*

Travis Langford (M.S. Natural Resources 2000) *Non-Thesis Option*

Brock Hoegh (MCRP 1999) *“Does Involvement in a Community-Based Program Result in Differing Concepts of Natural Resources Stewardship? (Professional Project Report)*

RESEARCH

1) *Relationship between climate change and groundwater through participation as a member of the Water Sector Assessment Team of the National Assessment of the Potential Consequences of Climate Variability and Change for the U. S. Global Change Research Program (1999-2000); 2) Organizational changes in the management of the Missouri River basin ecosystem; and 3) Structure, operation, and success of Nebraska natural resources districts.*

EXTENSION

Coordinating committee for annual “earth wellness festival” for 5th grade students in Lancaster County, NE (1998-2002).

SELECTED GRANTS AND CONTRACTS

Consultation to the Groundwater Foundation on Community-based Groundwater Protection Program, \$90,000; July 1998-June 2003.

Representation for The Groundwater Foundation on the Water Assessment Team, \$20,000; August 1999-December 2000.

SELECTED PUBLICATIONS

Kuzelka, R. et al. (Water Sector Assessment Team). September 2000. *Water: The Potential Consequences of Climate Variability and Change for the Water Resources of the United States*, Oakland, CA: Pacific Institute.

Kuzelka, R., R. Leonard, and S. Seacrest. April 2000. *Global Climate Change and Public Perception: The Challenge of Translation*, *Journal of the American Water Resources Association*, 36 (2), 253-263.

OTHER PROFESSIONAL ACTIVITIES

Presentation at 4th Annual Missouri River Natural Resources Conference “The 1944 Flood Control Act as an Educational Tool for Teaching Natural Resources Policy”, Bismark, ND, May 2000

Invited keynote speaker, 2001 Idaho Groundwater Conference, Boise, ID, October 2001

Presentation at 2002 Groundwater Foundation Annual Conference “When is Groundwater Protected?”, Eugene, OR, November 2002.

Member, American Institute of Certified Planner, 1985-present

Member, Nebraska Chapter American Planning Association, 1979-present

Program Vice President, Environic Foundation International, 2003 (Trustee since 1979)

MARK S. KUZILA, Professor, 100% Administration

Areas of Interest: Soil Survey, Soil Genesis, Soil Geomorphology, Wetlands

Contact: mkuzila1@unl.edu, 402/472-7537

EDUCATION

B.S. Agronomy - Soil Science, Kansas State University (1973)

M.S. Agronomy - Soil Genesis and Morphology, Kansas State University (1976)

Ph.D. Agronomy - Soil Genesis and Morphology, University of Nebraska-Lincoln (1988)

PROFESSIONAL EXPERIENCE

1998-present Director, Conservation and Survey Division, University of Nebraska-Lincoln (UNL)

1983-1998 Principle Soil Scientist, Conservation and Survey Division, University of Nebraska-Lincoln

1977-1983 Asst. Principle Soil Scientist, Conservation and Survey Division, University of Nebraska-Lincoln

1975-1977 Soil Scientist, Conservation and Survey Division, University of Nebraska-Lincoln

SURVEY

Principal administrative officer and State Geologist. Responsibilities include addressing the mission of the Conservation and Survey Division in research, scholarly service, education, and publication; and the facilitation of projects and activities pertaining to geology, soils, water, and remote sensing.

SELECTED GRANTS AND CONTRACTS

Nebraska Cooperative Soil Survey, Nebraska Department of Natural Resources, \$750,000; July 1998-June 2003.

Kimball County, Nebraska Soil Survey, South Platte Natural Resources District, \$60,000; July 1998-June 2003.

Kimball County, Nebraska Soil Survey, Kimball County Commissioners, \$60,000; July 1998-June 2003.

SELECTED PUBLICATIONS

Stolpe, N.B. and M.S. Kuzila. 2002. *Relative Mobility of Atrazine, 2, 4-D and Dicamba in Volcanic Soils of South-central Chile*, **Soil Science**, 167 (5), 338-345.

Mason, J.A. and M.S. Kuzila. 2000. *Episodic Holocene Loess Deposition in Central Nebraska*, *Quaternary International*, 67, 119-131.

Stolpe, N.B., M.S. Kuzila, and P.J. Shea. 1998. *Importance of Taxonomic Variability in Using Soil Maps to Predict Pesticide Mobility*, *Soil Science*, 163 (5), 394-403.

OTHER PROFESSIONAL ACTIVITIES

Liaison Committee, Association of American State Geologists (AASG), 2002-present

STATEMAP Review Committee, Association of American State Geologist (AASG), 2002-present

Registered Professional Geologist, 2000-present

Soil Science Society of America, 1985-present

Soil and Water Conservation Society, 1980-present

Nebraska Society of Professional Soil Scientists, 1978-present

SUSAN OLAFSEN LACKEY, Associate Geoscientist, 75% Scholarly Service,
25% Research

Areas of Interest: Hydrogeology of Northeast and North-central Nebraska, Well Design,
Construction, and Development, and Groundwater Quality and Quantity Monitoring
Systems

Contact: slackey1@unl.edu, 402/370-4007

EDUCATION

Practical Approaches to Groundwater Hydrology and Contamination, Oklahoma State
University, 9 graduate credit hours, GPA 3.66 (Summer 1990)

B.S. Geological Engineering, South Dakota School of Mines and Technology, GPA 3.02

Graduate level courses: Remote Sensing, Groundwater, Well Logging (May 1982)

Earthwatch, Peru: Huari and Chanca Expedition (July 1981)

Opendoor, Exchange Student: Lima, Peru (Summer 1976)

PROFESSIONAL EXPERIENCE

2003-Present Geoscientist, Conservation and Survey Division, Norfolk, Nebraska,
University of Nebraska-Lincoln (UNL)

1997-2003 Associate Geoscientist, Conservation and Survey Division, Norfolk, Nebraska,
UNL

1991-1997 Assistant Geoscientist, Conservation and Survey Division, Norfolk, Nebraska,
UNL

1987-1991 Project Manager/Scientist, BCI Geonetics, Inc., Laconia, New Hampshire

1984-1987 Construction Engineer, Department of Transportation, Custer, South Dakota

1982-1983 Radiation Tester, Batelle Northwest Laboratory, Edgemont, South Dakota

Summer 1982 Teaching Assistant, Black Hills Field Station, Rapid city, South Dakota

PROFESSIONAL COURSES

Environmental Data Management Using MS Access, SQL Server, and the Internet: NGWA,
Denver, CO (March 2002)

Advances in Site Characterization for Environmental Engineering Projects at Glaciated
Sites: University of Minnesota, Minneapolis (October 2000)

Mastering Microsoft Access: Rockhurst University, Lincoln, NE (April 2000)

Well Construction and Development Techniques: Nebraska Well Drillers Association, Grand
Island, NE (April 1998)

Drilling and Boring Fluids: Baroid, Houston, TX (January 1996)

Aqueous Geochemistry: Course Coordinator, D.L. Parkhurst; USGS, Denver, CO (February 1993)

Ground-water/surface Water Relationships: Course Coordinator, T.C. Winter; USGS, Denver, CO (May 1992)

Environmental Drilling Technology: Keynote, Fletcher Driscoll; University of Wisconsin, Milwaukee (June 1989)

Drilling and Blasting Techniques: Albert Teller, Institute of Explosive Specialists, Salt Lake City, UT (December 1986)

RESEARCH – SURVEY

In order to characterize the groundwater flow system substantial time and money must be allotted to obtain quality data to evaluate this system. First the nature of the materials that the water flows through must be defined. By drilling test holes, catching samples at discrete intervals or coring, and running downhole geophysical surveys the lithology can be determined. In the last five years I have logged 104 test holes and 19,300 feet of samples have been described and archived for future determination of additional characteristics of the geologic material. Since the groundwater flow system is dynamic, an access point must be provided to monitor changes in the groundwater over time. In the past five years I have designed, constructed, and developed 148 wells for long-term monitoring of groundwater quality and quantity. The cost to define the geologic framework, provide access to the groundwater, and monitor water quality and quantity was more than \$500,000. By working with federal, state, and local agencies these funds were provided under their program budgets and no direct costs were incurred by CSD.

SCHOLARLY SERVICE – SURVEY

In the past five years I have written or coauthored six CSD test-hole reports, eight contract/grant reports, one Cooperative Extension publication, and the first combined CSD/CES educational circular. I have designed and presented 15 technical talks, and developed and presented 22 educational session or field trips in the last five years. Each year I have received and answered about 50 to 150 general public service calls, which are highly variable in frequency and nature. Questions range from irrigation well potential, well interference concerns, water quality issues ranging from health concerns to effect on livestock and crops, surface drainage issues, where to get information from state agencies, requests for completed registered well forms, educational materials available, case studies available, water level changes, and type of geologic materials in site-specific areas. I have worked with a number of state agencies, local natural resources districts, county boards, municipalities, rural water systems, and sanitary irrigation districts. By providing existing

subsurface data and analysis of these data, or obtaining additional subsurface data I am able to assist these agencies with exploration, development, and management of the state's natural resources. I have assisted high school and undergraduate students with natural resource data collection, correlation, and reference sources. I have also designed and demonstrated geologic and groundwater issues at groundwater festivals for elementary through high school students across Nebraska. In this position public information and education is a matter of communication and respect. Whether it is serving on the Nebraska Well Drillers subcommittees, having an impromptu discussion of groundwater issues over the hood of the pickup, educating a landowner who wants to find the "vein of water" underground, or answering the phone with a positive attitude.

SELECTED GRANTS AND CONTRACTS

Test-hole Coring and Monitoring Well Installation, U.S. Geological Survey, \$57,000; May–November 2002.

Nebraska Grout Task Force; Preliminary Site Investigations, Nebraska Department of Health and Human Services, \$11,700; March–June 2002.

Hydrogeology of the Lower Elkhorn Natural Resources District, Lower Elkhorn NRD, \$326,500; 1997–2005.

Hydrogeology of the Upper Elkhorn Natural Resources District, Upper Elkhorn NRD, \$102,400; 1997–2005.

East Branch Verdigre Creek Study, Upper Elkhorn NRD, \$7,100; 2001.

Northern Holt County Monitoring Well Network, Lower Niobrara NRD, \$4,300; 2001.

Holt County Groundwater Education Program, Nebraska Department of Environmental Quality–EPA 319, \$7,200; 1999–2002.

SELECTED PUBLICATIONS

Olafsen–Lackey, S., W. Kranz, and C. Shapiro. 2002. Agricultural Management Practices and the Groundwater System of Northern Holt County, Nebraska, CSD Educational Circular 15 and Cooperative Extension Circular ECO2-799-X.

Olafsen–Lackey, S. and J. Roberts. 2002. USGS Agricultural Land–Use Study – Test-hole Coring and Monitoring Well Installation, Field Summary Report.

Shapiro, C., W. Kranz, S. Olafsen–Lackey, and R. Kulm. 2001. Holt County Groundwater Education Program Final Report, CES MP 77.

Olafsen–Lackey, S., F.A. Smith, and L.C. Boryca. 2000. Rock County Test-Hole Report, Nebraska Water Survey Test-hole Report No. 75.

Olafsen–Lackey, S., F.A. Smith, and R.R. Burchett. 2000. Pierce County Test-Hole Report, Nebraska Water Survey Test-hole Report No. 70.

- Olafsen-Lackey, S., F.A. Smith, and R.R. Burchett. 1999. Wayne County Test-Hole Report, Nebraska Water Survey Test-hole Report No. 90.*
- Olafsen-Lackey, S., F.A. Smith, and R.R. Burchett. 1999. Stanton County Test-Hole Report, Nebraska Water Survey Test-hole Report No. 84.*
- Olafsen-Lackey, S., F.A. Smith, and R.F. Diffendal, Jr. 1998. Holt County Test-Hole Report, Nebraska Water Survey Test-hole Report No. 45.*
- Olafsen-Lackey, S., F.A. Smith, and R.F. Diffendal, Jr. 1998. Antelope County Test-Hole Report, Nebraska Water Survey Test-hole Report No. 2.*
- Wigley, P. and S. Olafsen-Lackey. 1997. Independent Groundwater Characterization and Monitoring in Boyd County, Project Completion Report.*

OTHER PROFESSIONAL ACTIVITIES

- Member, National Groundwater Association, 1988-2003*
- Nebraska Drilling/Pump Installation Contractors License, Lic#: 39390, 1997-2003*
- Nebraska Licensed Professional Geologist #0176, 1999-2003*
- Appointee, Nebraska Well Drillers Association, Chapter 12 Technical Subcommittee, 1998-2003*
- Appointee, Nebraska Well Drillers Association, Chapter 12 Examination Subcommittee, 2001-2003*
- Nebraska Grout Task Force, 2001-2003*

HANNAN E. LAGARRY, Assistant Geoscientist, 100% Research

Areas of Interest: Cenozoic Stratigraphy of Great Plains, Paleopedology, Vertebrate Paleontology and Paleoecology

Contact: hlagarry@unlnotes.unl.edu, 402/472-5439

EDUCATION

B.S. Geology, State University of New York, Potsdam (1985)

M.S. Geology, Fort Hays State University, Hays KS (1988)

Ph.D. Geology, University of Nebraska-Lincoln (1997)

PROFESSIONAL EXPERIENCE

1998-present Assistant Geoscientist, Conservation & Survey Division, University of Nebraska-Lincoln (UNL)

1997-1998 Research Geoscientist, Conservation & Survey Division, University of Nebraska-Lincoln

1996-1997 Research Assistant, Conservation & Survey Division, University of Nebraska-Lincoln

1995-1997 Physical Science Technician, USDA Natural Resources Conservation Service (NRCS), National Soil Survey Laboratory

HONORS AND AWARDS

Extra Effort Cash Award, USDA NRCS, National Soil Survey Laboratory (1997)

TEACHING

Courses Taught (Fall, Spring, Summer)

GSCI 469/869 Regional Field Geology (FOO, FO1, FO2)

RESEARCH

Lithostratigraphic revision, redescription, and redefinition, basal part of the Eocene-Oligocene White River Group (*Trunk Butte Member of the Chadron Formation*)

Lithostratigraphic revision, redescription, and redefinition, upper part of the Eocene-Oligocene White River Group (*Sharps Member of the Brule Formation*)

Lithostratigraphic revision, redescription, and redefinition, basal part of the Oligocene-Miocene Arikaree Group (*West Ash Creek Formation*)

Lithostratigraphic revision, redescription, and redefinition, middle part of the Oligocene-Miocene Arikaree Group (*Fort Robinson Formation; Monroe Creek, Harrison, Coffee Mill Butte members*)

Lithostratigraphic revision, redescription, and redefinition, upper part of the Oligocene-Miocene Arikaree Group (Carnegie Hill and Van Tassell members of the Anderson Ranch Formation)

Lithostratigraphic revision, redescription, and redefinition, basal part of the Miocene Ogallala (Starvation Gulch and Rushville members of the Runningwater Formation)

Vertebrate fossil inventories of the Nebraska National Forest (Pine Ridge Ranger District)

SURVEY

Mapped surficial geology of eight (8) new 1:24,000 quadrangles in northwestern Nebraska (Alliance 1 x 2 New Mapping Subproject) 2002a.

Supervised production of twelve (12) new digital geologic quadrangles in northwestern Nebraska (Alliance 1 x 2 Digital Compilation Subproject) 2002b.

Mapped surficial geology of eight (8) new 1:24,000 quadrangles in northwestern Nebraska (Alliance 1 x 2 New Mapping Subproject) 2001a.

Supervised production of sixteen (16) new digital geologic quadrangles in northwestern Nebraska (Alliance 1 x 2 Digital Compilation subproject) 2001b.

Mapped surficial geology of eight (8) new 1:24,000 quadrangles in northwestern Nebraska (Alliance 1 x 2 New Mapping Subproject) 2000.

Mapped surficial geology of eight (8) new 1:24,000 quadrangles in northwestern Nebraska (Alliance 1 x 2 New Mapping Subproject) 1999.

Mapped surficial geology of ten (10) new 1:24,000 quadrangles in northwestern Nebraska (Alliance 1 x 2 New Mapping Subproject) 1998a.

Mapped surficial geology of sixteen (16) new 1:24,000 quadrangles in north-central Nebraska (O'Neill 1 x 2 New Mapping Subproject) 1998b.

SELECTED GRANTS AND CONTRACTS

Geologic Mapping in Northwestern Nebraska, U.S. Geological Survey STATEMAP Program, \$240,000; 2003.

Geologic Mapping in Northwestern Nebraska, U.S. Geological Survey STATEMAP Program, \$236,000; 2002.

Geologic Mapping in Northwestern Nebraska, U.S. Geological Survey STATEMAP Program, \$220,000; 2001.

Geologic Mapping in Northwestern Nebraska, U.S. Geological Survey STATEMAP Program, \$192,000; 2000.

Geologic Mapping in Northwestern Nebraska, U.S. Geological Survey STATEMAP Program, \$180,000; 1999.

SELECTED PUBLICATIONS

- Wysocki, D.A., P.J. Schoeneberger, and H.E. LaGarry. 1999. *Geomorphology of Soil Landscapes*, Chapter 1 in *Handbook of Soil Science* (M. Sumner and L. Wilder, eds.), Chicago IL: Chemical Rubber Company Press, E5-E39.
- LaGarry, H.E. 1998. *Lithostratigraphic Revision and Redescription of the Brule Formation (White River Group), Northwestern Nebraska*, 63-92 in *Depositional Environments, Lithostratigraphy, and Biostratigraphy of the White River and Arikaree Groups (Late Eocene to Early Miocene, North America)* (D.O. Terry, Jr., H.E. LaGarry, and R.M. Hunt, Jr., eds.), *Geological Society of America, Special Paper 325*, 216 p.
- LaGarry, H.E., W.B. Wells, D.O. Terry, Jr., and D.A. Nixon. 1998. *The Toadstool Park Trackway Site, Oglala National Grassland, Nebraska*, 92-107 in *Proceedings of the 5th Conference on Fossil Resources* (J.E. Martin, J.W. Hoganson, and R.C. Benton, eds.), *Dakoterra 5*, 143 p.
- Terry, D.O., Jr. and H.E. LaGarry. 1998. *The Big Cottonwood Creek Member: a New Member of the Chadron Formation in Northwestern Nebraska*, 63-92 in *Depositional Environments, Lithostratigraphy, and Biostratigraphy of the White River and Arikaree Groups (Late Eocene to Early Miocene, North America)* (D.O. Terry, Jr., H.E. LaGarry, and R.M. Hunt, Jr., eds.), *Geological Society of America, Special Paper 325*, 216 p.
- Terry, D.O., Jr., H.E. LaGarry, and R.M. Hunt, Jr. (eds.). 1998. *Depositional Environments, Lithostratigraphy, and Biostratigraphy of the White River and Arikaree Groups (Late Eocene to Early Miocene, North America)*, *Geological Society of America, Special Paper 325*, 216 p.

OTHER PROFESSIONAL ACTIVITIES

- Member, Science Language and Technical Terms Committee (Surficial Deposits Subcommittee) USGS National Cooperative Geologic Mapping Program, 2001-present
- Co-Chair, Symposium on Nebraska Stratigraphy, 110th Annual Meeting of the Nebraska Academy of Science, Nebraska Wesleyan University, Lincoln NE, 2001
- Co-Chair, Earth Science Section, 109th Annual Meeting of the Nebraska Academy of Science, Nebraska Wesleyan University, Lincoln NE, 2000
- Co-Chair, Earth Science Section, 109th Annual Meeting of the Nebraska Academy of Science, Nebraska Wesleyan University, Lincoln NE, 1999
- Field Trip Co-Leader, *Hayden's Lakes Revisited: the Origin, and New Stratigraphic Interpretations of the White River Sequence, South Dakota, Nebraska, and Wyoming*; 1996 Annual meeting of the Geological Society of America, Boulder CO (1998)

XIAOMAO LIN, Research Assistant Professor, 80% Research, 20% Extension

Areas of Interest: *Automated weather station network monitoring and network*

accuracy/uncertainty, and the performance of various atmospheric sensors, Bio-

Atmospheric instrumentation, and Biological Environmental Micrometeorology

Contact: xlin2@unl.edu, 402/472/8768

EDUCATION

BS Electrical Engineering, Chendu University of Information and Technology, China (1986)

MS Bio-Environment Instrumentation and Control, China Agricultural University (1991)

Ph.D. Agricultural Meteorology, University of Nebraska-Lincoln (UNL) (1999)

PROFESSIONAL EXPERIENCE

Sept. 2001-present Research Assistant Professor, University of Nebraska-Lincoln (UNL)

May 1999-Sept. 2001 Research Associate, University of Nebraska-Lincoln and University of Missouri-Columbia

Aug. 1995-May 1999 Research Assistant, University of Nebraska-Lincoln

1991-1995 Lecturer, School of Natural Resources and Environment, China Agricultural University

1986-1988 Electrical Engineer, Beijing Institute of Automation and Control, China

RESEARCH

Investigated air temperature bias existing in the U.S. weather station networks and climate data bases. Evaluated the air humidity measurements for the National Weather Service (NWS) and National Climate Data Center (NCDC).

EXTENSION

Identified atmospheric sensor's performance and developed instrument/sensor calibration procedures in which the sensors/instruments are used in the High Plains Regional Climate Center.

SELECTED GRANTS AND CONTRACTS

Performance Study of Air Humidity/Water Vapor Monitoring Systems for the U.S. Climate Reference Network (CRN), National Oceanic and Atmospheric Administration (NOAA) and National Climate Data Center (NCDC), \$150,000; Dec. 2001-March 2002.

Continuation of *Performance Study of Air Humidity/Water Vapor Monitoring Systems for the U.S. Climate Reference Network (CRN)*, National Oceanic and Atmospheric Administration (NOAA) and National Climate Data Center (NCDC), \$115,000; April 2003-Aug. 2004.

SELECTED PUBLICATIONS

Hubbard, K.G., Y. Xie, and X. Lin. 2003 (accepted). *Estimated Effect of Measurement Error on Derived Psychrometric Variables*, **ASHRAE Transactions**.

Hubbard, K.G. and X. Lin. 2003 (in press). *Air Filter and Conduction Effects on Hmp45c Air Temperature Measurements Inside the Gill Radiation Shield*, **Transactions of the ASAE**.

Hubbard, K.G. and X. Lin. 2002. *Realtime Data Filtering Models for Air Temperature Measurements*, **Geophysical Research Letters**, 29 (10), 67-1-4.

Lin, X., K.G. Hubbard, and E.A. Walter-Shea. 2002. *Radiation Loading Model for Evaluating Air Temperature Errors with a Non-aspirated Radiation Shield*, **Transactions of the ASAE**, 44 (5), 1299-1306.

Hubbard, K.G., S.E. Hollinger, and X. Lin. 2001. *Standard Meteorological Measurements*, **WMO Publications AGM-3, WMO/TD No.1074**, World Meteorological Organization, Geneva, Switzerland, 93-107.

- Hubbard, K.G., X. Lin, and E.A. Walter-Shea. 2001. *The Effectiveness of the MMTS, Gill, CRS, and ASOS Air Temperature Radiation Shields*, *Journal of Atmospheric and Oceanic Technology*, 18 (6), 851-863.
- Lin, X., and K.G. Hubbard. 2001. *Relating Temperature Errors to Underlying Surface Characteristics*, *WMO Publications AGM-3, WMO/TD No. 1074*, World Meteorological Organization, Geneva, Switzerland, 93-107.
- Lin, X., K.G. Hubbard, and G.E. Meyer. 2001. *Air Flow Characteristics of Commonly Used Temperature Radiation Shields*, *Journal of Atmospheric and Oceanic Technology*, 18 (3), 329-339.
- Lin, X., K.G. Hubbard, E.A. Walter-Shea, J.R. Brandle, and G.E. Meyer. 2001. *Some Perspectives on Recent In-situ Air Temperature Observations: Modeling the Microclimate Inside the Radiation Shields*, *Journal of Atmospheric and Oceanic Technology*, 18 (9), 1470-1483.

OTHER PROFESSIONAL ACTIVITIES

- Member, The Institute of Electrical and Electronics Engineers (IEEE) (member # 402777721), 1998-present*
- Member, The American Meteorological Society (AMS) (member # 306562), 1998-present*
- Member, The American Society of Agricultural Engineers (ASAE) (member # 0323160), 1999-present*
- Journal Reviewer, Journal of Atmospheric and Oceanic Technology, American Meteorological Society, 2002-present*
- Journal Reviewer, Transactions of the ASAE, American Society of Agricultural Engineers, 2001-present*
- Journal Reviewer, International Journal of Food Properties, 2001*
- Journal Reviewer, Journal of Agricultural Meteorology*

JAMES W. MERCHANT, Professor, 35% Teaching, 65% Research

Areas of Interest: Remote Sensing, Geographic Information Systems, Landscape Ecology

Contact: jmerchant1@unl.edu, 402/472-7531

EDUCATION

B.S. Geography, Towson State University (1969)

M.A. Geography, University of Kansas (1973)

Ph.D. Geography, University of Kansas (1984)

PROFESSIONAL EXPERIENCE

2002-present Research Coordinator, School of Natural Resources, University of
Nebraska-Lincoln

1998-present Professor and Associate Director, Center for Advanced Land
Management Information Technologies, Conservation & Survey Division and
School of Natural Resource Sciences, University of Nebraska-Lincoln

1989-1998 Associate Professor and Associate Director, Center for Advanced Land
Management Information Technologies, Conservation & Survey Division,
University of Nebraska-Lincoln

1986-1989 Assistant Professor, Department of Geography, University of Kansas

1979-1986 Remote Sensing Specialist, Kansas Applied Remote Sensing Program,
University of Kansas

HONORS AND AWARDS

Outstanding Contributions Award, Nebraska GIS/LIS Association (1999)

Outstanding Contributions Award, Association of American Geographers' Remote Sensing
Specialty Group (1998)

John Wesley Powell Award, for research contributions to the U.S. Geological Survey (1997)

Elected a Fellow of the American Society for Photogrammetry and Remote Sensing (1996)

ERDAS Award for best scientific paper in remote sensing, American Society for
Photogrammetry and Remote Sensing (1994)

Alan Gordon Award for career achievements in remote sensing, American Society for
Photogrammetry and Remote Sensing (1991)

TEACHING (last five years)

Courses Taught (Fall, Spring, Summer)

GEOG/NRES 412/812 Geographic Information Systems (F98, F99, F00, F01, F02)

GEOG/NRES 418/818 Introduction to Remote Sensing (S98, F99, F00, F01, F02)

Masters and Doctoral Students Advised (since 1998)

Jeffrey Arnold (Ph.D. Geography, expected 2005) GIS and Emergency Management Assessment.

Roberto Bonifaz (Ph.D. Geography, expected 2005) Estimating Biophysical Parameters from AVHRR Data.

Michael Bullerman (M.S. Natural Resource Sciences, expected 2004) Landsat Remote Sensing of Pine Savanna.

Henry Bulley (Ph.D. Geography, expected 2004) Using GIS for Watershed Classification.

Ian Ratcliffe (M.A. Geography, expected 2004) Remote Sensing of Hail Occurrence.

Cullen Robbins (M.S. Natural Resource Sciences, expected 2004) Hyperspectral Remote Sensing of Ponderosa Pine.

Jason Felton (M.A. Geography, expected 2003) Non-thesis Option.

Brian Putz (M.A. Geography 2003) Non-thesis Option.

Tiffany Spaulding (M.A. Geography, expected 2003) Non-thesis Option.

Jill Wolf (M.A. Geography, expected 2003) Non-thesis Option.

Justin Fischer (M.S. Natural Resource Sciences 2002) A Regional GIS-Based Analysis of Elk Habitat Suitability in Northwestern Nebraska.

Manillas Flagella (M.A. Geography 2001) Non-thesis Option.

Kyle Forbes (M.A. Geography 2001) GIS Assessment of Big Horn Sheep Habitat in the Pine Ridge of Nebraska.

Christopher Busskohl (M.A. Geography 2000) Non-thesis Option.

Holly Hampton (M.A. Geography 2000) Non-thesis Option.

Chad Kudym (M.A. Geography 2000) Non-thesis Option.

Thomas O'Toole (M.A. Geography 2000) Non-thesis Option.

Scott Hatten (M.A. Geography 1999) Non-thesis Option.

David Mather (M.A. Geography 1999) Using Laboratory Pedon Data to Enhance Interpretation of Digital Soil Surveys in GIS.

Franz Mora (Ph.D. Geography, 1999) Interannual Variation in Vegetation Activity at Continental Scales: Analysis of Patterns, Processes and Changes.

Michael Daggy (M.A. Geography 1998) Non-thesis Option.

Julie Giandinoto (M.A. Geography 1998) Examining Spatial and Temporal Variability in Wetlands.

John Schmit (M.A. Geography 1998) Non-thesis Option.

RESEARCH

My research focuses on (1) development of strategies for large-area land cover characterization using digital multispectral satellite data, (2) spatial and contextual analysis of digital images, and (3) application of geospatial information technologies in biodiversity analysis, lake classification and weather forecast modeling.

Recent projects of my team have involved global land cover database development, land cover mapping for the Platte River watershed in Nebraska and the Niobrara River watershed, GIS-based classification of watersheds and conservation planning using “gap” analysis methods.

SELECTED GRANTS AND CONTRACTS

Implementation of the AmericaView Program in Nebraska, U.S. Geological Survey, \$145,319; Sept. 2002–Aug. 2003.

Aquatic Gap Analysis (with G. Henebry), U.S. Geological Survey, \$204,999; Sept. 2002–July 2003.

Land Use Change for the Platte River Cooperative Hydrology Study (with P. Dappen), Nebraska Department of Natural Resources, \$153,906; Dec. 2001–May 2003.

GIS Database Development for Norton and Lovewell Reservoirs, KS (with P. Dappen), U.S. Bureau of Reclamation, \$26,235; May 2001–Sept. 2003.

Land Use Delineation for the Platte River Cooperative Hydrology Study (with P. Dappen), Nebraska Department of Natural Resources, \$160,137; July 2001–Dec. 2002.

Development and Implementation of a Comprehensive Lake and Reservoir Strategy for Nebraska as a Model for Agriculturally-Dominated Ecosystems (with J. Holz and five collaborators), U.S. Environmental Protection Agency, \$1,224,706; Jan. 2001–Dec. 2003.

Land Cover Inventory of the Niobrara River Watershed (with P. Dappen), Nebraska Game and Parks Commission, \$49,335; Nov. 2000–Oct. 2001.

GIS Database Development for the Rainwater Basin (with P. Dappen), U.S. Bureau of Reclamation, \$250,000; Sept. 1999–Sept. 2001.

Geospatial Data Integration for Decision Support (Co-PI with 8 other NU faculty), University of Nebraska–Nebraska Research Initiative; \$1,346,100; July 1998–July 2004.

Using Satellite-Derived Land Use and Land Cover Data to Improve Numerical Weather Prediction Models (with D. Stensrud), National Science Foundation; \$311,708; July 1998–June 2001.

Characterization of Landsat-7 Geometry and Radiometry for Land Cover Analyses, National Aeronautics and Space Administration, \$93,293; Oct. 1996–Dec. 2000.

Nebraska Terrestrial Gap Analysis Program, USGS/Biological Resources Division, \$755,900; October 1995–September 2003.

SELECTED PUBLICATIONS

- Henebry, G. and J.W. Merchant. 2002. *Geospatial Data in Time: Limits and Prospects for Predicting Species Occurrences*, Chapter 23 in *Predicting Species Occurrences* (J. Scott and P. Heglund, eds.), Covelo, CA: Island Press, 291–302.
- Crawford, T.M., D.J. Stensrud, F. Mora, J.W. Merchant, and P.J. Wetzell. 2001. *The Insertion of a High-resolution Land Cover Dataset into MMS/PLACE*, *Journal of Hydrometeorology*, 2 (5), 453–468.
- Loveland, T., B. Reed, J. Brown, D. Ohlen, Z. Zhu, L. Yang, and J. Merchant. 2001. *Development of a Global Land Cover Characteristics Database and IGBP DISCover from 1-km AVHRR Data*, *International Journal of Remote Sensing*, 21, 1303–1330.
- Vogelmann, D. Helder, R. Morfitt, M. Choate, J. Merchant, and H. Bulley. 2001. *Effects of Landsat-5 TM and Landsat-7 ETM+ Radiometric and Geometric Calibrations on Landscape Characterization*, *Remote Sensing of Environment*, 78 (1-2), 55–70.
- Yang, W. and J.W. Merchant. 1997. *Impacts of Upscaling Techniques on Land Cover Representation in Nebraska, USA*. *GeoCarto International*, 12 (1), 27–39.
- Yang, W., L. Yang, and J.W. Merchant. 1997. *An Assessment of AVHRR/NDVI–Ecoclimatological Relationships in Nebraska, USA*. *International Journal of Remote Sensing*, 18 (10), 2161–2180.
- Loveland, T.R., J.W. Merchant, J.F. Brown, D.O. Ohlen, B. Reed, and P. Olsen. 1995. *Seasonal Land Cover Regions of the United States*, *Annals of the Association of American Geographers*, 85 (2), 339–355.
- Merchant, J.W. 1994. *GIS-Based Groundwater Pollution Hazard Assessment: A Critical Review of the DRASTIC Model*, *Photogrammetric Engineering and Remote Sensing*, 60 (9), 1117–1127.

OTHER PROFESSIONAL ACTIVITIES

- Editor, Photogrammetric Engineering and Remote Sensing, American Society for Photogrammetry and Remote Sensing (2002–present; Associate Editor 2001–2002, 1987–1998)*
- Co-Chair, 17th Annual Symposium, International Association for Landscape Ecology – United States Regional Association, Lincoln, NE, April 23–27, 2002*
- Keynote speaker, 2001 Iowa GIS Symposium, University of Iowa, Iowa City, IA, October 4–5, 2001*

SUNIL NARUMALANI, Associate Professor, 30% Teaching, 50% Research, 20% Service

Areas of Interest: Remote Sensing, Geographic Information Systems, Environmental Management

Contact: sunil@calmit.unl.edu, 402/472-9842

EDUCATION

M.A. Geography, University of Georgia (1989)

Ph.D. Geography, University of South Carolina (1993)

PROFESSIONAL EXPERIENCE

1998-present Associate Professor, School of Natural Resources, University of Nebraska-Lincoln (UNL)

1993-1998 Assistant Professor, Department of Geography, University of Nebraska-Lincoln

HONORS AND AWARDS

Autometric Award for Outstanding Paper on Photographic or Imagery Interpretation, American Society for Photogrammetry & Remote Sensing (1996)

Certificate of Recognition for Contributions to Students University of Nebraska-Lincoln (1995)

Best Poster Paper Award, International Society for Photogrammetry & Remote Sensing, Commission VI (1992)

Paul Lovingood Award for Excellence in Research Department of Geography (1992)

Sigma Xi for First Place paper presented at the South Carolina Academy of Sciences Meeting (1992)

TEACHING

Courses Taught (Fall, Spring, Summer)

GEOG 420/820 Digital Image Analysis (S98, S99, S00, S01, S02, S03)

GEOG 422/822 Advanced Geographic Information Systems (S98, S99, S00, S01, S02, S03)

GEOG 898 Proseminar in Remote Sensing and GIS Research Methods (F99, F00, F01)

GEOG 898 Seminar in Geographic Information Systems (F98)

Masters and Doctoral Students Advised

Joseph Hlady (M.S. Geography 2001) *The Distribution and Characteristics of Hydrologic Sinks in the Elysium Region of Mars.*

Michaela Johnson (M.S. Geography 2001) *Historical Change in Woody Riparian Vegetation in the Republican River Basin and Impact on Evapotranspiration.*

Murat Karbulut (Ph.D. Geography 2001) *An Assessment of Vegetation Response to Different Moisture Conditions at Multiple Resolutions.*

Jill Maeder (M.S. Geography 2001) *Close-Range Hyperspectral and Broad Band Satellite Remote Sensing of Coral Reef Structures.*

Darcy Boellstroff (M.S. Geography 2000) *Using DEM Data for Updating Soil Surveys.*

Abu-elgassim Gadem (M.S. Geography 2000) *An Approach for Evaluating Soil Productivity and Riparian Ecosystems Using Remote Sensing and GIS.*

Kurtis Kroll (M.S. Geography 2000) *Application of Multi-Resolution Imagery for Vegetation Change Detection at the Pinon Canyon Maneuver Site.*

Nicole Albright (M.S. Geosciences 1999) *Digital Change Detection of Barrier Islands Along the South Carolina Coast Using Landsat TM Data.*

Forest Frost (M.S. Geography 1999) *Using Geographic Information Systems to Determine Potential Function of Prehistoric Sites in Indiana Dunes National Lakeshore, Indiana.*

Amy Richert (Ph.D. Geography 1999) *Multiple Scale Analyses of Whooping Crane Habitat in Nebraska.*

Yingchun Zhou (Ph.D. Geography 1999) *A GIS-Based Spatial Pattern Analysis Model for Ecoregion Mapping and Characterization.*

Nihal Ceylan (M.S. Geography 1998) *Non-thesis Option.*

RESEARCH

Research has focused on the application of geographic information systems (GIS) and remote sensing toward various physical processes, landscape ecology, environmental and natural resources management issues. Some projects include development of ecoregions and agroecozones for climatic global change studies, assessment of biodiversity in the central Platte River valley, implementation of habitat management policies along the Iowa River, development of multi-temporal classification strategies for land cover in the Black Hills, South Dakota, assessing habitat suitability for whooping cranes (an endangered species), military and homeland security applications of remote sensing and GIS, and developing integrated natural resources management plans, as well as GIS databases for the Army National Guard.

SELECTED GRANTS AND CONTRACTS

Flora and Fauna Inventory and Survey at Three Nebraska Army National Guard Sites, Nebraska Military Department, \$93,000; Jan. 2003–Dec. 2003.

Geographic Information System Support for the Nebraska Army National Guard, Nebraska Military Department, \$54,564; Oct. 2002–Sept. 2003.

Noxious Weeds Inventory and Mapping at Capulin Volcano National Monument, Fort Union National Monument, and Lake Meredith National Recreation Area (with G. Wilson), National Park Service, \$53,472/2 years; Jan. 2002–July 2004.

Land Use/Land Cover Interpretation and Analysis for Three National Monuments, National Park Service, \$33,626; Aug. 2001–April 2003.

Environmental Geographic Information Systems (GIS) for Three Nebraska Army National Guard Sites, Nebraska Military Department, \$92,419; Apr. 2000–Mar. 2001.

Integrated Natural Resources Management Plans for Four Nebraska Army National Guard Sites (with J. Mason), Nebraska Military Department, \$91,110; July 1999–Jan. 2001.

Integrating GIS and Traffic Modeling Operations, Nebraska Department of Roads, \$50,782; Aug. 1998–Dec. 2000.

Geospatial Data Integration for Decision Support (w/S.E. Reichenbach, PI), Nebraska Research Initiative, \$1,346,100; Jul. 1998–Jun. 2004.

Assistance in Applications of Arc/Info and Review for Development of Natural Resource Assessment on the Standing Rock Reservation and Nebraska, USDA–Natural Resources Conservation Service (NRCS), \$6,000; Jul.–Sep. 1998.

Addendum to Land Cover Mapping for Select Major Land Resource Areas Using Remote Sensing and GIS (with M. Palecki), USDA–NRCS, \$7,983; Jul.–Dec. 1998.

SELECTED PUBLICATIONS

Zhou, Y., S. Narumalani, W. Waltman, S. Waltman, and M. Palecki. 2003 (in press). *A GIS-Based Spatial Pattern Analysis Model for Ecoregion Mapping and Characterization, International Journal of Geographical Information Systems.*

Maeder, J., S. Narumalani, J. Schalles, D. Rundquist, and K. Hutchins. 2001 (in press). *Remote Sensing of Coral Reefs Using High-Resolution Satellite Data, International Coral Reef Symposium, Refereed Proceedings.*

Schalles, J., J. Maeder, D. Rundquist, J. Keck, and S. Narumalani. 2001 (in press). *Spectral Reflectance Measurements of Corals and Other Reef Substrates at Close Range and Near the Surface, International Coral Reef Symposium, Refereed Proceedings.*

Maeder, J., S. Narumalani, D. Rundquist, R. Perk, J. Schalles, K. Hutchins, and J. Keck. 2002. *Classifying and Mapping Coral-Reef Structure Using IKONOS Data, Photogrammetric Engineering and Remote Sensing, 68 (12), 1297–1305.*

- Narumalani, S., J. Hlady, and J.R. Jensen. 2002. *Information Extraction from Remotely Sensed Data*, Chapter 19 in *Manual of Geospatial Science and Technology*, (J.D. Bossler, ed.), New York, NY: Taylor and Francis, 298-324.
- Rundquist, D., S. Narumalani, and R. Narayanan. 2001. *Remote Sensing of Wetlands: New Considerations*, *Remote Sensing Reviews*, 20 (3), 207-226.
- Jensen, J.R., D.J. Cowen, J.D. Althausen, S. Narumalani, and O. Weatherbee. 1999. *An Evaluation of the CoastWatch Change Detection Protocol in South Carolina*, Chapter 5 in *Remote Sensing Change Detection: Environmental Monitoring Methods and Applications* (R.S. Lunetta and C.D. Elvidge, eds.), Ann Arbor, MI: Ann Arbor Press, 75-88.
- Narumalani, S., Y. Zhou, and D.E. Jelinski. 1998. *Utilizing Geometric Attributes of Spatial Information to Improve Digital Image Classification*, *Remote Sensing Reviews*, 16, 233-253.

OTHER PROFESSIONAL ACTIVITIES

- Member, Organizing Committee, Map Asia 2003 Conference in Kuala Lumpur, Malaysia, 2002-present.*
- Member, Editorial Board, Asian Journal of Geoinformatics, 2002-present.*
- Book Review Editor, Photogrammetric Engineering & Remote Sensing, 2002-present.*
- Member, SNRS Facilities Committee, March 2002-present.*
- Vice-Chair, Graduate Committee, School of Natural Resource Sciences, July 2000-present.*
- Member, NASA EO-1 Proposal Review Panel, Washington, DC, 17-19 August 1999.*

JAMES E. PARHAM, Postdoctoral Research Associate, 100% Research
Areas of Interest: Fisheries Biology, Ichthyology, Instream Flow Modeling,, Geographic
Information Systems
Contact: jparham2@unl.edu, 402/472-2931

EDUCATION

B.S. Fisheries and Wildlife Management, Virginia Tech (1989)
M.S. Biology, University of Guam (1995)
Ph.D. Biological Sciences, Louisiana State University (2002)

PROFESSIONAL EXPERIENCE

2002-present Postdoctoral Research Associate, School of Natural Resources,
University of Nebraska-Lincoln
1996-2002 Graduate Research Associate, Museum of Natural Science, Louisiana State
University

TEACHING (last five years)

Courses Taught (Fall, Spring, Summer)

NRES 464/864 Fisheries Biology (S 03)
NRES 404 Natural Resources Seminar (S 02)

RESEARCH

One area of my research focuses on the ecology and management of island stream fishes throughout the islands of the Pacific. My doctoral research focused on the development of habitat-based models for the conservation of native Hawaiian stream fishes. Additionally, I am interested in threatened and endangered fish species with a focus on the Platte River Pallid Sturgeon and Sturgeon Chub. My research includes the development of a GIS database and multi-spatial habitat models to aid in the conservation of these fishes.

SELECTED GRANTS AND CONTRACTS

GIS Habitat Modeling of Native Hawaiian Stream Fishes, State of Hawai'i Division of Aquatic Resources, \$23,126; 2001.
An Integrated GIS Survey of Kahana Stream, Oahu, HI (with J.M. Fitzsimons, L.K. Benson, and M. McRae), Research Corporation of the University of Hawai'i, \$99,926; 2001.
The Use of Geographic Information Systems (GIS) in Water Resources Planning, Management and Allocation Issues in the Hawaiian Islands (with J.M. Fitzsimons), Research Corporation of the University of Hawai'i, \$450,000; 1998.

SELECTED PUBLICATIONS

- Parham, J.E. 2003 (in review). *Aquatic Survey Techniques on Oceanic Islands: Important Design Considerations for the PABITRA Methodology*, **Pacific Science**.
- Fitzsimons, J.M., J.E. Parham, L.K. Benson, M.G. McRae, and R.T. Nishimoto. 2003 (in review). *Biological Assessment of Kahana Stream, Island of O'ahu, Hawai'i, With the Use of Procedures from the PABITRA Manual for Interactive Ecology and Management*, **Pacific Science**.
- Fitzsimons, J.M., R.T. Nishimoto, and J.E. Parham. 2003 (in press). *Methods for Analyzing Stream Ecosystems*, Chapter 7 in **Biodiversity Assessment of Tropical Island Ecosystems: PABITRA Manual for Interactive Ecology and Management** (D. Mueller-Dombois, K.W. Bridges, and C.C. Daehler, eds.).
- Fitzsimons, J.M., J.E. Parham, and R.T. Nishimoto. 2002. *Similarities in Behavioral Ecology among Amphidromous and Catadromous Fishes on the Oceanic Islands of Hawai'i and Guam*, **Environmental Biology of Fishes**, 65, 123-129.
- Nelson, S.G., J.E. Parham, R.B. Tibbatts, F.A. Camacho, T.A. Leberer, and B.D. Smith. 1997. *Distributions and Microhabitats of the Amphidromous Gobies in Streams of Micronesia*, **Micronesica**, 83-91.

ALBERT J. PETERS, Associate Research Professor, 100% Research

Areas of Interest: Coarse resolution remote sensing of terrestrial vegetation, links between spectral data and climatic parameters, agricultural applications of remote sensing, physical geography and Geographic Information Systems

Contact: apeters@calmit.unl.edu, 402/472-4893

EDUCATION

B.A. Geography, San Jose State University (1968)

M.A. Geography, San Jose State University (1971)

Ph.D. Geography, University of Nebraska (1989)

PROFESSIONAL EXPERIENCE

1997-Present Associate Research Professor, Center for Advanced Land Management Information (CALMIT), University of Nebraska-Lincoln (UNL)

1989-1997 Assistant Professor, Department of Geography, New Mexico State

1987-1989 Research Assistant, (CALMIT), University of Nebraska-Lincoln

1982-1987 Self-Employed Energy Planning Consultant, Portland, Oregon

1980-1982 Senior Planner, Willdan Associates, Portland, Oregon

1978-1980 Environmental Division Manager, VTN, Portland, Oregon

1974-1978 Environmental Coordinator, Basin Electric Power Cooperative, North Dakota

1971-1974 Teaching Assistant, Geography Department, University of Nebraska-Lincoln

1970-1971 Cartography Teaching Assistant, Geography Department, San Jose State University

TEACHING

Courses Taught

GEOG 898 Research Seminar in Agricultural Applications of Remote Sensing/On line with Purdue, Mississippi State and Indiana State Universities

Masters and Doctoral Students Advised

Lei Ji (Ph.D. Geography 2003) Modeling Relationships Between a Satellite-Derived Vegetation Index and Precipitation in the Northern Great Plains.

Hong Wu (Ph.D. Natural Resource Sciences 2002) Agricultural Drought Risk Assessment: An Operational Model for Nebraska.

Andres Viña (M.A. Geography 2000) Analysis of the Spatial and Temporal Patterns of Forest Fragmentation in the Columbia-Ecuador Border.

- Damian Francis Kessler (M.A. Geography 1997) *A Spatial Filtering Technique for Removal of Atmospheric Path Radiance in Meteorological Satellite Imagery.*
- Marlen David Eve, (Ph.D. Interdisciplinary Program, Biology, Geography, Range Science 1995) *High Temporal Resolution Analysis of Land Degradation in the Northern Chihuahuan Desert Using Satellite Imagery.*
- Donald G. Vickrey (M.A. Geography 1995) *Mapping Plains-Mesa Grasslands of New Mexico Using High Temporal Resolution Satellite Data.*
- Robert Mark Weber (M.A. Geography 1994) *Improving Landsat Classification Results using Digital Elevation Model Data.*
- Julie Eggerton (M.A. Geography 1993) *Identification of Riparian Areas and Associated Springs with the Aid of Satellite Imagery, Concentrating in the Mountainous Regions of White Sands Missile Range.*
- Janet C. Greenlee (M.A. Geography 1993) *Spatial Characteristics of Montane Forest Communities in the Organ Mountains, New Mexico.*
- Dallas W. Bash (M.A. Geography 1992) *A Classification of Canopy Architecture Types in Desert Rangeland Using Satellite Imagery.*
- John Muir Kipp, Jr. (M.A. Geography 1992) *Lithologic Discrimination Using Side-Looking Airborne Radar in the Organ Mountains, New Mexico.*
- James Barry Mason (M.A. Geography 1992) *Remote Sensing of Vegetation in Arid Rangeland Using Coarse Resolution Satellite Imagery.*
- Marlen David Eve (M.A. Geography 1991) *Assessing Drought Impact on Native Plant Communities of New Mexico Using AVHRR Data.*
- Michael Scott Kelley (M.A. Geography 1991) *Coarse Spatial Resolution Satellite Remote Sensing of Drought Conditions in New Mexico: 1987-1989.*

SELECTED GRANTS AND CONTRACTS

- An Initiative to Create an Affiliated Research Center Program at the University of Nebraska-Lincoln* (program coordinator), National Aeronautics and Space Administration (NASA), \$600,000; 1998.
- America View* (co-PI), U.S. Geological Survey, \$144,000; 2002.

SELECTED PUBLICATIONS

- Ji, L. and A.J. Peters. (in review). *Forecasting Vegetation Greenness with Satellite and Climate Data*, *Journal of Geophysical Research*.
- Ji, L. and A.J. Peters. (submitted). *Lag and Seasonality Considerations in Estimating Vegetation Response to Precipitation with Satellite Data*, *Photogrammetric Engineering and Remote Sensing*.

- Ji, L. and A.J Peters. (accepted). *Assessing Vegetation Response to Drought in the Northern Great Plains Using Vegetation and Drought Indices*, **Remote Sensing of Environment**.
- Ji, L. and A.J. Peters. 2003 (in press). *A Spatial Regression Procedure for Evaluating the Relationship between AVHRR-NDVI and Climate in the Northern Great Plains*, **International Journal of Remote Sensing**.
- Peters, A.J., L. Ji, and E. Walter-Shea. September 2003 (in press). *Southeastern U.S. Vegetation Response to ENSO Events (1989-99)*, Special issue **Journal of Climatic Change**.
- Viña, A., A.J. Peters, and L. Ji. 2003. *Use of Multi-Spectral IKONOS Imagery for Discriminating between Conventional and Conservation Agricultural Tillage Practices*, **Photogrammetric Engineering & Remote Sensing**, 69, 537-544.
- Peters, A.J., E. Walter-Shea, L. Ji, A. Viña, M. Hayes, and M.D. Svoboda. 2002. *Drought Monitoring with NDVI-Based Standardized Vegetation Index*, **Photogrammetric Engineering & Remote Sensing**, 68, 71-75.
- Peters, A.J., S.C. Griffin, A. Viña, and L. Ji. 2000. *Use of Remotely Sensed Data for Assessing Crop Hail Damage*, Focus Issue **Photogrammetric Engineering & Remote Sensing**, 66, 1349-1355.
- Peters, A.J., M.D. Eve, and W.G. Whitford. 1997. *Analysis of Desert Plant Community Growth Patterns with Coarse Resolution Satellite Spectra*, **Journal of Applied Ecology**, 34, 418-432.
- Peters, A.J. and M.D. Eve. 1995. *Satellite Monitoring of Desert Plant Community Response to Moisture Availability*, **Environmental Monitoring and Assessment**, 37, 1-15.

EDWARD J. PETERS, Professor-Fisheries, 75% Teaching, 25% Research

Areas of Interest: Ecology and distribution of stream and river fishes in relation to habitat conditions, Management of lake, stream and reservoir fisheries

Contact: epeters2@unl.edu, 402/472-6824

EDUCATION

B.S. Biology and Conservation, Wisconsin State University-Stevens Point (1967)

M.S. Zoology, Brigham Young University (1970)

Ph.D. Zoology, Brigham Young University (1974)

PROFESSIONAL EXPERIENCE

1998-present Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln (UNL)

1996-1998 Associate Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln

1980-1998 Associate Professor, Department of Forestry, Fisheries and Wildlife, University of Nebraska-Lincoln

1978-1980 Assistant Professor, Department of Forestry, Fisheries and Wildlife, University of Nebraska-Lincoln

1975-1978 Assistant Professor, Department of Poultry and Wildlife Science, University of Nebraska-Lincoln

1974-1975 Assistant Professor, Department of Biology, Mount Mercy College

1972-1974 Instructor, Department of Biology, Mount Mercy College

1970-1971 Instructor, Department of Zoology, Brigham Young University

HONORS AND AWARDS

Distinguished Teaching Award, College of Agricultural Sciences and Natural Resources, University of Nebraska-Lincoln (1993)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 463/863 Fisheries Science (F98, F99, F00, F01, F02)

NRES 464/864 Fisheries Biology (S99, S01)

NRES 489/889 Ichthyology (S98, S99, S00, S01, S02, Su03)

NRES 404 Wildlife Seminar (S98, F99, F01, F02)

NRES 896 Fish Ecology (S00, S02)

NRES 901 Graduate Seminar (F98)

Masters Students Advised

- Stacey Wirka (M.S. Natural Resources, expected December 2003) Thesis Title: TBD.
- Dane Shuman (M.S. Natural Resources 2003) The Age and Size Distribution, Condition, and Diet of the Shovelnose Sturgeon in the lower Platte River, Nebraska.
- Ben Swigle (M.S. Natural Resources 2003) Movements and Habitat Use by Pallid and Shovelnose Sturgeon in the lower Platte River, Nebraska.
- Cara Ewell-Hodkin (M.S. Natural Resources 2001) Population Characteristics and Food Habits of White Perch in Branched Oak Lake, Nebraska.
- Corey M. Huxoll (M.S. Natural Resources 2001) Movement of Rainbow Trout and Brown Trout in Relation to Water Quality and Food Availability in Lake Ogallala, Nebraska.
- Vaughn A. Snook (M.S. Natural Resources 2001) Movements and Habitat Use by Hatchery-reared Pallid Sturgeon in the lower Platte River, Nebraska.
- Tyler J. Pearson (M.S. Natural Resources 2000) The Use of Benthic Macroinvertebrates by Rainbow Trout in Lake Ogallala, Nebraska.
- Cory N. Reade (M.S. Natural Resources 2000) Larval Fish Drift in the lower Platte River, Nebraska.
- Tadd M. Barrow (M.S. Natural Resources 1998) Factors Affecting the Movements of Rainbow Trout (*Oncorhynchus mykiss*) in Lake Ogallala, Nebraska.

RESEARCH

Platte River pallid sturgeon, sturgeon chub study (2000-2005). This five year study is designed to evaluate the effects of changes in Platte River discharge on the habitat available for pallid sturgeon, sturgeon chub and associated species. The study uses radio telemetry, food habits analysis, and age and growth studies to evaluate sturgeon populations in the lower Platte River. Its objectives also include studies of larval fishes, habitat availability, composition of associated fish assemblages and evaluation of the harvest of shovelnose sturgeon in the river. Its goal is to provide management recommendations for maintenance habitats suitable for the pallid sturgeon and sturgeon chub in the Platte River. The current study is an expansion of the larval fish study and hatchery reared pallid sturgeon radio telemetry study in the lower Platte River during the years 1998 to 2000. It is the culmination of work that began in 1986 to develop habitat suitability criteria for Platte River fishes.

Lake Ogallala study (1994-2001). This study was designed to evaluate the influence of alewife and other non-game fish species on the trout fishery in Lake Ogallala. It consisted of

a pre-renovation study from 1994-1997 and a post-renovation study from 1998-2000. It demonstrated that environmental conditions, particularly dissolved oxygen concentrations and temperature regime, in the lake were probably as responsible for poor growth and survival of trout than the non-game species populations. The conclusions of this study led to the development of other studies that developed management approaches to alleviate the water chemistry problems in Lake Ogallala.

Branched Oak Lake study (1998-2001). This study was designed to evaluate the effects of habitat alterations and the invasion of white perch on Branched Oak Reservoir. The study included a detailed analysis of white perch population dynamics that pointed out potential population control measures. It also evaluated the ability of one predator species, the flathead catfish, to control white perch populations and found them to be of limited utility. This research also led to management recommendations for stabilizing shoreline erosion in Nebraska warm water reservoirs.

SELECTED GRANTS AND CONTRACTS

Water Chemistry Monitoring in the lower Platte River, U.S. Fish and Wildlife Service, \$102,167; 2000-2005.

Ecology and Management of Pallid Sturgeon and Sturgeon Chub in the lower Platte River, Pallid Sturgeon, Sturgeon Chub Task Force, \$550,000; 2000-2005.

Ecology and Management of Sturgeons in the lower Platte River, Nebraska Game and Parks Commission, \$730,000; 2000-2005.

Branched Oak Reservoir Evaluation Project, Nebraska Game and Parks Commission, \$260,000; 1998-2001.

The Relationship Between Flows and Use of the lower Platte River by Endangered Fish Species, U.S. Fish and Wildlife Service, \$76,560; 1997-1999.

Alewife and Trout Studies in Lake Ogallala, Nebraska Game and Parks Commission, \$270,010; 1996-2001.

SELECTED PUBLICATIONS

Peters, E.J. 2003. *Nebraska's Threatened and Endangered Species, Part 2: Threatened and Endangered Fishes, Museum Notes*, Number 114, University of Nebraska State Museum, Lincoln, Nebraska.

Snook, V.A., E.J. Peters, and L.J. Young. 2002. *Movements and Habitat Use by Hatchery-reared Pallid Sturgeon in the lower Platte River, Nebraska, American Fisheries Society Symposium*, 28, 161-174.

- Yu, S-L. and E.J. Peters. 2002. *Diel and Seasonal Habitat Use by Red Shiner*, **Zoological Studies**, 41, 229-235.
- Barrow, T.M. and E.J. Peters. 2001. *Movements of Rainbow Trout in Response to Dissolved Oxygen and Food Availability in Lake Ogallala, Nebraska*, **Journal of Freshwater Ecology**, 16, 321-329.
- Messaad, I.A., E.J. Peters, and L. Young. 2000. *Thermal Tolerance of Red Shiner after Exposure to Atrazine, Terbufos and Their Mixtures*, **Bulletin of Environmental Contamination and Toxicology**, 64, 748-754.
- Porath, M.T. and E.J. Peters. 1997. *Use of Walleye Relative Weights (Wr) to Assess Prey Availability*, **North American Journal of Fisheries Management**, 17 (3), 628-637.
- Porath, M.T. and E.J. Peters. 1997. *Walleye Prey Selection in Lake McConaughy, Nebraska: A Comparison Between Stomach Content Analysis and Feeding Experiments*, **Journal of Freshwater Ecology**, 12 (4), 511-520.
- Yu, S-L. and E.J. Peters. 1997. *Use of Froude Numbers to Determine Habitat Selection by Fishes*, **Rivers**, 6 (1), 10-18.

LARKIN A. POWELL, Assistant Professor, 60% Teaching, 40% Research
Areas of Interest: Population Ecology, Avian Ecology, Landscape Ecology, Geographic Information Systems

Contact: lpowell3@unl.edu, 402/472-6825

EDUCATION

B.S. Biology, Graceland University (1990)

M.S. Ecology and Evolutionary Biology, Iowa State University (1992)

Ph.D. Ecology, University of Georgia (1998)

PROFESSIONAL EXPERIENCE

2001-present Assistant Professor, School of Natural Resources, University of Nebraska-Lincoln (UNL)

1998-2001 Assistant Professor, Environmental Science Program, University of Dubuque

1998 Postdoctoral Research Assistant, Warnell School of Forest Resources, University of Georgia

HONORS AND AWARDS

Nominated, CASNR Outstanding Teaching Award, University of Nebraska-Lincoln (student selected, 2003)

Faculty of the Year, University of Dubuque (student selected, 2000)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 862 Conservation Biology (SO2)

NRES 350 Wildlife Management Techniques (FO2, FO3)

NRES 311 Wildlife Ecology and Management (SO3)

NRES 399 Intro to Geospatial Information Sciences (SO3)

NRES 315 SE Alaska Marine Biology (SuO3)

Masters and Doctoral Students Advised

Max Post van der Burg (Ph.D. Natural Resource Sciences, expected 2006) Avian Dispersal in Rainwater Basin Wetlands.

Silka L. Finkbeiner (M.S. Wildlife Ecology, expected 2004) Avian Response to Grazing in the Nebraska Sandhills.

Christina J. Kocer (M.S. Wildlife Ecology, expected 2003) Mammal Use of Rainwater Basin Wetlands.

RESEARCH (since coming to UNL)

Avian dispersal research: I have worked with wood thrush adult and fledgling dispersal, which has translated into a project with red-winged blackbirds in Nebraska's Rainwater Basins. I am looking at the mechanisms behind movement decisions by blackbirds in this landscape, including landscape patterns and nest predator influences. I am collaborating with Richard Bischof, Nebraska Game and Parks Commission on the furbearer portion of this research.

Grazing effects on avian demography: I am working in the Nebraska Sandhills on private ranches to determine the influence of various grazing regimes on density, species richness, and productivity of grassland birds. I am collaborating with Walt Schacht, University of Nebraska, to determine the mechanistic role of vegetation structure in the responses we are observing.

Stable isotope analyses: I am beginning research using stable isotope analyses to determine the locations of birds during a previous breeding season from feather samples collected in Georgia and the midwestern US. I am collaborating with Keith Hobson, Canadian Wildlife Service.

Wood thrush forest habitat research: I am collaborating with David Krementz, University of Arkansas on a project isolating the effects of forest management on wood thrush movements, density and productivity in Louisiana.

SELECTED GRANTS AND CONTRACTS (since coming to UNL)

Use of Managed and Mature Hardwood Stands by Wood Thrushes in the Atchafalaya Basin, Louisiana, Louisiana Department of Wildlife and Fisheries, \$89,100; June 2003–Dec. 2005.

Comparing Sustainability of Grazing in the Nebraska Sandhills: Which Regime Is Best for Cattle and Wildlife?, U.S. Department of Agriculture (USDA), A Sustainable Agriculture Research and Education Graduate Student Award, North Central Region, \$10,000; May 2002–June 2003.

Integrating Geospatial Information Technologies into Natural Resources Curricula, University of Nebraska Teaching and Learning Technology Roundtable, \$5,100; May 2002–May 2003.

Breeding Bird and Mammalian Predator Populations in Rainwater Basin Wetlands: Can Landscape Factors Predict Abundance, Productivity, and Movement Dynamics?, Layman Fund, University of Nebraska, \$10,000; May 2002–June 2003.

Comparing Sustainability of Grazing in Nebraska's Sandhills: Which Regime Is Best for Wildlife?, Nebraska Game and Parks Commission, \$18,000; 2002.

- Wildlife Ecology and Analytical Chemistry: Establishing Fidelity of Wood Thrushes to a Georgia Breeding Site Through Evaluation of Stable Isotopes in Tail Feathers*, UNL Research Council (John C. and Nettie V. David Memorial Trust Fund), \$6,891; Jan.-Dec. 2002.
- Breeding Bird and Mammalian Predator Populations in Rainwater Basin Wetlands: Can Landscape Factors Predict Abundance, Productivity, and Movement Dynamics?*, UNL Research Council, \$9,800; Jan. 2002-Dec. 2002.
- Comparing Sustainability of Grazing in Nebraska's Sandhills: Which Regime Is Best for Wildlife?* Sampson Range and Pasture Management Endowment (written by Dr. Ron Johnson), \$10,000; Jan. 2002-Dec. 2002.
- Comparing Sustainability of Grazing in Nebraska's Sandhills: Which Regime Is Best for Wildlife?* Sandhills Task Force, \$45,000; 2001.

SELECTED PUBLICATIONS

- Lang, J.D., L.A. Powell, D.G. Krementz, and M.J. Conroy. 2002. *Wood Thrush Movements, Habitat Use, and Effects of Forest Management for Red-cockaded Woodpeckers*, *Auk*, 119, 109-124.
- Powell, L.A., D.J. Calvert, I.M. Barry, and L. Washburn. 2002. *Dispersal and Survival of Juvenile Peregrine Falcons During a Restoration Project*, *Journal of Raptor Research*, 36, 176-182.
- Beck, C.W. and L.A. Powell. 2000. *Evolution of Female Mate Choice Based on Male Age: Are Older Males Better Mates?*, *Evolutionary Ecology Research*, 2, 107-118.
- Krementz, D.G. and L.A. Powell. 2000. *Breeding Season Demography and Movements of Eastern Towhees at the Savannah River Site, South Carolina*, *Wilson Bulletin*, 112, 243-248.
- Powell, L.A., M.J. Conroy, J.E. Hines, J.D. Nichols, and D.G. Krementz. 2000. *Simultaneous Use of Mark-recapture and Radio Telemetry to Estimate Survival, Movement, and Capture Rates*, *Journal of Wildlife Management*, 64, 302-313.
- Powell, L.A. and L.L. Frasch. 2000. *Can Nest Predation and Predator Type Explain Some Variation in Avian Breeding Season Dispersal Distances?*, *Behavioral Ecology*, 11, 437-443.
- Powell, L.A., J.D. Lang, M.J. Conroy, and D.G. Krementz. 2000. *Effects of Forest Management on Density, Survival, and Population Growth of Wood Thrushes*. *Journal of Wildlife Management*, 64, 11-23.
- Powell, L.A., M.J. Conroy, D.G. Krementz, and J.D. Lang. 1999. *A Model to Predict Breeding-season Productivity for Multibrooded Songbirds*, *The Auk*, 116, 1001-1008.

Powell, L.A., W.R. Clark, and E.E. Klaas. 1998. *Distribution and Derivation of Mallard Band Recoveries on the Upper Mississippi River, 1961-89*, *North American Bird Bander*, 23, 1-12.

Powell, L.A., D.G. Krementz, J.D. Lang, and M.J. Conroy. 1998. *Effects of Radio Transmitters on Migrating Wood Thrushes*, *Journal of Field Ornithology*, 69, 306-315.

OTHER PROFESSIONAL ACTIVITIES

Manuscript reviewer, *Conservation Biology*, *Journal of Wildlife Management*, *Ecology*, *Applied Ecology*, *Condor*, *Wilson Bulletin*, *North American Bird Bander*, 2001-present

Book reviewer, *Iowa State University Press*, 2003.

KARL J. REINHARD, Associate Professor, 40% Teaching, 40% Research, 20%
Extension/Outreach

Areas of Interest: Medical Anthropology, Pathoecology, Parasitology, Pathogen Evolution,
Emergence of Diabetes

Contact: kreinhard1@unl.edu, 402/472-6858, 472-9873

EDUCATION

B.A. Anthropology, University of Arizona (1977)

M.S. Ecology, Northern Arizona University (1985)

Ph.D. Anthropology, Texas A&M University (1989)

PROFESSIONAL EXPERIENCE

1999-present Associate Professor, School of Natural Resource Sciences, University of
Nebraska-Lincoln

1994-1999 Associate Professor, Department of Anthropology, University of Nebraska-
Lincoln

1989-1994 Assistant Professor, Department of Anthropology, University of Nebraska-
Lincoln

1988-1989 Lecturer, Department of Anthropology, Texas A&M University

HONORS AND AWARDS

Fulbright Scholar, Brazil, U.S. State Department (2001)

TEACHING

Courses Taught (Fall, Spring, Summer)

ANTH 110 Introduction to Anthropology (F98, F99)

ANTH 242 Physical Anthropology (F98, F99)

ANTH 442/842 Advanced Physical Anthropology (S98, S99)

ANTH/GEOL 446/846 Palynology (S98, S99, S00, S02, S03)

ANTH/GEOL 996 Palynology Techniques (S98, S99)

NRES 491/891 Natural Resources Seminar (F01, S02)

INTERNATIONAL TEACHING, BRAZIL (IN PORTUGUESE)

Universidade Federal do Rio de Janeiro, Lecture (S2001)

Universidade do Estado do Rio de Janeiro, Lecture (F2002)

Escola Nacional do Saúde Pública; Fundação Oswaldo Cruz, Workshop (S2001)

Museu Nacional, Workshop (F2002)
Universidade São Paulo, Workshop (S2001)
Universidade Federal do Piauí, Workshop (F2001)
Universidade Federal do Rio Grande do Sul, Lecture (F2001)
Universidade Luterana do Rio Grande do Sul, Lecture (F2001)

RESEARCH

During the last five years I have focused my research energies into describing helminth and arthropod parasite emergence in the Americas. Summaries of ten years of funded research in Peru, Chile, and Brazil were prepared and published. From 1998-2003, 23 journal articles and 13 book chapters have been published on which I am senior or co-author. This year, I began preparing proposals to analyze the evolutionary basis for Native American diabetes by studying ancestral dietary patterns.

EXTENSION

I have worked in Forensic Science Education for law enforcement and academic community through Nebraska Wesleyan University. I have participated in K-12 science education through NESEN and the Lincoln Public High School Science Focus Program. I worked with the Omaha Tribe in diabetes education.

SELECTED GRANTS AND CONTRACTS

Evaluating the Floral Base of Chinchorro, National Science Foundation (NSF), \$220,000;
Proposal submitted 2003, in review.

*Evaluating the Role of Diet and Parasitism as Causal Factors for Anasazi Porotic
Hyperostosis*, National Science Foundation, \$566,000; Proposal submitted 2002, in
review.

Fulbright: to teach at medical schools on Brazil, 2001-2002.

To Support Undergraduate Research in Dietary Cause of Dental Wear, UCARE; 2000-
2002.

To Support Joint Work with K-12 Science Teachers in Research Experience, NSF-NESEN,
Chilean Research Council, 2000.

To Support Research and Teaching with the Fundação Oswaldo Cruz, Rio de Janeiro, CNPq,
1997-1998.

SELECTED PUBLICATIONS

Iñiguez, A.M., A. Araújo, A.C.P. Vicente, L.F. Ferreira, and K.J. Reinhard. 2003 (in press).

Enterobius vermicularis: Specific Detection by Amplification of an Internal Region of

5S Ribosomal RNA Intergenic Spacer and Trans-splicing Leader RNA Analysis,
Experimental Parasitology.

- Reinhard, K., T.M. Fink, and J. Skiles. 2003. *A Case of Megacolon in Rio Grande Valley as a Possible Case of Chagas Disease, Memorias do Instituto do Oswaldo Cruz*, 98, 165-172.
- Rick, F., G.C. Rocha, K. Dittmar, C.E.A. Coimbra, Jr., K. Reinhard, F. Bouchet, L.F. Ferreira, and A. Araújo. 2003. *Crab Louse Infestation in Pre-Columbian America, Journal of Parasitology*, 88, 1266-1267.
- Carvalho Gonçalves, M.L., A. Araújo, R. Duarte, J. Pereira da Silva, K. Reinhard, F. Bouchet, and L.F. Ferreira. 2002. *Detection of Giardia Duodenalis Antigen in Coprolites Using a Commercially Available Enzyme Immunoassay, The Transactions of the Royal Society of Tropical Medicine and Hygiene*, 96 (6), 640-643.
- Reinhard, K.J., A. Araújo, L.F. Ferreira, and C. Coimbra. 2001. *American Hookworm Antiquity, Medical Anthropology*, 20, 96-101.
- Reinhard, K.J., S.M.F. de Souza, C.D. Rodrigues, E. Kimmerle, and S. Dorsey-Vinton. 2001. *Microfossils in Dental Calculus: A New Perspective on Diet and Dental Disease, in Human Remains: Conservation, Retrieval, and Analysis British Archaeology Research Council (E. Williams, ed.), London*, 113-118.
- Hugot, J.P., K.J. Reinhard, S.L. Gardner, and S. Morand. 1999. *Human Enterobiasis in Evolution: Origin, Specificity and Transmission, Parasite* 6, 201-208.
- Myers, J., L. Okoye, E. Kimmerle, and K.J. Reinhard. 1999. *Three-dimensional (3-D) Imaging in Post-mortem Examinations: Elucidation and Identification of Cranial and Facial Fractures in Victims of Homicide Utilizing 3-D Computerized Imaging Reconstruction Techniques, International Journal of Legal Medicine*, 113, 33-37.
- Okoye, M., E. Kimmerle, and K.J. Reinhard. 1999. *An Analysis and Report of Custodial Deaths in Nebraska, USA, Journal of Clinical Forensic Medicine*, 6, 77-84.
- Danielson, D.R. and K.J. Reinhard. 1998. *Human Dental Microwear Caused by Calcium Oxalate Phytoliths in Prehistoric Diet of the Lower Pecos Region, Texas, American Journal of Physical Anthropology*, 107, 297-304.

OTHER PROFESSIONAL ACTIVITIES

- Board Member of the Paleopathology Association, 1999-present*
- Reviewer for Journal of Parasitology, American Journal of Physical Anthropology, Comparative Parasitology, Paleopathology Newsletter, American Antiquity, National Science Foundation, and Canadian Research Council*

Invited participant in various symposia at meetings of the American Association of Physical Anthropologists, Brazilian Association of Parasitologists, Paleopathology Association, International Mummy Congress, and World Archaeology Congress

Co-editor of special edition concerning parasite origins published by the Memorias do Instituto Oswaldo Cruz (<http://memorias.ioc.fiocruz.br/98sup/98sup.html>)

DONALD C. RUNDQUIST, Professor, 35% Teaching, 35% Research, 30% Administration

Areas of Interest: Field techniques in remote sensing, high spatial and spectral remote sensing as they relate to cropland agriculture, inland water quality, and coastal systems

Contact: drundquist1@unl.edu, 402/472-7536

EDUCATION

B.S. Geography, University of Wisconsin-Whitewater (1967)

M.A. Geography, University of Nebraska-Omaha (1971)

Ph.D. Geography, University of Nebraska-Lincoln (1977)

PROFESSIONAL EXPERIENCE

1998-present Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln (UNL)

1986-present Director, Center for Advanced Land Management Information Technologies (CALMIT), UNL

1989-present Professor, Conservation and Survey Division (CSD), UNL

1987-1990 Branch Chief, Geographic Information Systems, CSD, UNL

1984-1987 Program Manager, Land Resources, CSD, UNL

1982-1989 Assistant and Associate Professor, CSD, UNL

1975-1981 Assistant Professor of Geography and Director of Remote Sensing Applications Laboratory, University of Nebraska at Omaha

HONORS AND AWARDS

John I. Davidson Practical Paper Awards, American Society for Photogrammetry and Remote Sensing (1989, 1990)

President, Remote Sensing Specialty Group, Association of American Geographers (1987-1988)

Commendation for meritorious service and dedication to improving the quality of the University, University of Nebraska Board of Regents (1979)

Charles A. Lindbergh Award/Grant in Aerospace and Aeronautics, personally presented by the Honorable Stuart Symington and General James H. Doolittle at the Plaza Hotel, New York City (1978)

Invited presentations to University of Nebraska Board of Regents (1989, 1995, 1998, 2000)

TEACHING (last five years)

Courses Taught (Fall, Spring, Summer)

- GEOG/GEOS/AGRO/NRES 419/819 Practical Applications of Remote Sensing in Agriculture and Natural Resources (F98, F99, F00, F01, F02)
- GEOG 498/898 Field Techniques in Remote Sensing (S98, S99, S00, S01, S02, S03)
- GEOG 996 Non-Thesis Research (S98, S99, S00, S01, S02)

Masters and Doctoral Students Advised

- Jared Burkholder (M.A. Geography 2002) Non-thesis Option.
- Deborah DeMarey (Ph.D. Geography 2002) Discrimination of Wetland Vegetation Using Remote Sensing.
- Jeff Moon (M.A. Geography 2002) Non-thesis Option.
- Aaron Schepers (M.A. Geography 2002) Comparison of GIS Approaches to Delineate Management Zones.
- Ann Hodgson (Ph.D. Agronomy 2001) Characterizing Wetland Plant Communities.
- Steve Payton (Ph.D. Geography 2001) Remote Sensing of Biomass of Selected Emergent Aquatics.
- David Derry (M.A. Geography 2000) Monitoring Corn Development Via Remote Sensing.
- Stuart McFeeters (Ph.D. Geography 2000) Remote Sensing of Vegetation-Water Interfaces.
- Juan Ramirez (M.A. Geography 2000) Close-Range and Aircraft Remote Sensing of Crop Phenology.
- Asad Ullah (Ph.D. Geography 2000) Remote Sensing of Aquatic Macrophytes.
- Andres Viña (M.A. Geography 2000) Remote Detection of Biophysical Properties of Plant Canopies.
- Eric Wilson (M.A. Geography 1999) Close-Range and Satellite Remote Sensing of Algal Biomass.
- Mahtab Lodhi (Ph.D. Geography 1998) Close-Range Hyperspectral Remote Sensing of the Water Column.

RESEARCH (last five years)

Research has focused on high spatial and spectral resolution sensing of agricultural crops, inland waters, and coastal systems (emphasis on coral communities). Field techniques and airborne hyperspectral remote sensing.

EXTENSION (last five years)

Many guest lectures and presentations to diverse groups.

SURVEY (last five years)

Used remote sensing as part of numerous mapping/monitoring projects.

SELECTED GRANTS AND CONTRACTS (last five years)

Animal Health GIS (D. Rundquist, PI), Nebraska Department of Agriculture, \$25,000; 2003.

AmericaView (J. Merchant, PI), U.S. Geological Survey, \$150,000; 2003.

Airborne Remote Sensing (R. Narayanan and D. Rundquist, Co-PIs), NASA-EPSCoR, \$492,000; 2002-2004.

Lake Classification in Agricultural Settings (J. Holz, PI), Environmental Protection Agency, \$1,200,000; 2001-03.

Coastal Monitoring (J. Schalles, PI), National Oceanic and Atmospheric Administration, \$100,000; 2002-2003.

Purchase of Aircraft for Remote Sensing (R. Narayanan, PI), NSF-EPSCoR, \$450,000; 2000.

Remote Sensing of Soil Crusting (D. Rundquist, PI on subcontract), U.S./Israeli BSF, \$19,000; 2000.

America's Farm (D. Rundquist, PI), NASA, \$700,000; 1999-2001.

Affiliated Research Center (D. Rundquist, PI), NASA, \$625,000; 1998-2002.

Remote Sensing of Crops (D. Rundquist, PI on subcontract), NASA Space Grant, \$65,000; 1998-2002.

Geospatial Information for Decision-Making (S. Reichenbach, PI), Nebraska Research Initiative, approx. \$1,000,000; 1998-2002.

SELECTED PUBLICATIONS (last five years)

Gitelson, A., S. Verma, A. Viña, D. Rundquist, G. Keydan, and T. Arkebauer. 2003 (in press). *Technique for Remote Estimation of Canopy CO₂ Fluxes*, **Geophysical Research Letters**.

Gitelson, A., A. Viña, T. Arkebauer, D. Rundquist, G. Keydan, B. Leavitt, and S. Verma. 2003 (in press). *Remote Estimation of Leaf Area Index in Maize Canopies*, **Geophysical Research Letters**.

Gitelson, A., Y. Kaufman, R. Stark, and D. Rundquist. 2002. *Novel Algorithms for Remote Estimation of Vegetation Fraction*, **Remote Sensing of Environment**, 80, 76-87.

- Gitelson, A., R. Stark, U. Grits, D. Rundquist, Y. Kaufman, and D. Derry. 2002. *Vegetation and Soil Lines in Visible Spectral Space: a Concept and Technique for Remote Estimation of Vegetation Fraction*, *International Journal of Remote Sensing*, 23 (13), 2537-2562.
- Rundquist, D., J. Jensen, M. Nyquist, and T. Owens. 2002. *Selected Examples of Remote Sensing Projects*, Chapter 22 in *Manual of Geospatial Science and Technology* (J. Bosler, ed.), Taylor & Francis, 364-388.
- Streck, N., D. Rundquist, and J. Connot. 2002. *Estimating Residual Wheat Dry Matter from Remote Sensing Measurements*, *Photogrammetric Engineering and Remote Sensing*, 68 (11), 1193-1201.
- Lodhi, M. and D. Rundquist. 2001. *A Spectral Analysis of Bottom-induced Variation in the Colour of Sand Hills Lakes, USA*, *International Journal of Remote Sensing*, 22 (9), 1665-1682.
- Rundquist, D. 2001. *Field Techniques in Remote Sensing: Learning by Doing*, *GeoCarto International*, 16 (1), 83-88.
- Rundquist, D., S. Narumalani, and R. Narayanan. 2001. *A Review of Wetlands Remote Sensing and Defining New Considerations*, *Remote Sensing Reviews*, 20 (3), 207-226.
- Schalles, J., D. Rundquist, and F. Schiebe. 2001. *The Influence of Suspended Clays on Phytoplankton Reflectance Signatures and the Remote Estimation of Chlorophyll*, *Verh. International Verein. Limnology*, 27, 3619-3625.

SELECTED OTHER PROFESSIONAL ACTIVITIES

- Member, Vice-Chancellor's Research Advisory Committee, UNL, 2002-2003*
- Member, NASA Space Grant and EPSCoR Technical Advisory Committee, 1998-present*
- Member, Agricultural Research and Development Center, Advisory Committee, 1998-present*
- Member, SNRS Director's Advisory Committee, 2000-2002*
- Member, UNL Water Center Advisory Committee, 2003*
- Member, Vice-Chancellor's Facilities and Administration Rate Committee, 2002*

PATRICK J. SHEA, Professor, 80% Research, 10% Teaching, 10% Extension

Areas of Interest: Environmental Chemistry, Xenobiotics in Soil-Water-Plant Systems, Remediation/Detoxification

Contact: pshea1@unl.edu, 402/472-1533

EDUCATION

B.S. Biology, Fordham University (1975)

M.S. Plant Science, University of Connecticut (1979)

Ph.D. Crop Science (Soil Science Minor), North Carolina State University (1981)

PROFESSIONAL EXPERIENCE

1997-present Professor, School of Natural Resource Sciences (SNRS), University of Nebraska-Lincoln (UNL)

2000-2001 Associate Director and Research Coordinator, SNRS, University of Nebraska-Lincoln

1993-1997 Professor, Department of Agronomy, University of Nebraska-Lincoln

1986-1993 Associate Professor, Department of Agronomy, University of Nebraska-Lincoln

1981-1986 Assistant Professor, Department of Agronomy, University of Nebraska-Lincoln

HONORS AND AWARDS

Twenty-Year Service Award, University of Nebraska-Lincoln (2001)

Distinguished Achievement Award for Research, North Central Weed Science Society (1991)

Team Effort Award, Institute of Agriculture and Natural Resources (IANR), University of Nebraska-Lincoln (1991)

TEACHING

Courses Taught (Fall, Spring, Summer)

AGRON 486 Advanced Technologies in Weed Science (S98)

NRES/AGRON/ENT 920 Pesticide Dissipation in Soils and Plants (F98)

AGRON 821 Herbicide Mode of Action (S00)

NRES 896 Herbicide Chemistry, Metabolism and Mode of Action (S02)

NRES 491/891 Natural Resource Sciences Seminar with K. Reinhard (F01, S02)

Masters and Doctoral Students Advised

Tunlawit Satapanajaru (Ph.D. Natural Resource Sciences 2002) Remediating Chloroacetanilide-contaminated Water Using Zerovalent Iron.

Byung-Taek Oh (Ph.D. Agronomy 1999) Transformation and Detoxification of 2,4,6-trinitrotoluene by a *Pseudomonas aeruginosa* Strain.

RESEARCH

Isolated TNT-degrading bacteria and determined grass species tolerance in munitions-contaminated soil, demonstrated enhanced TNT degradation in rhizosphere soil and with activated carbon; developed Fenton oxidation for destruction of TNT and RDX in water and soil slurries; developed zerovalent iron technology for destruction of munitions, chlorinated

and nitrogenated pesticides; completed pilot-scale remediation of Los Alamos National Laboratory soil, removed RDX from Massachusetts Military Reservation soil in treatability tests using iron with soil washing, conducted field-scale remediation of pesticide-contaminated soil at two Nebraska sites.

EXTENSION

Kuzila, M.S., A.R. Martin, F.W. Roeth, P.J. Shea, N.B. Stolpe, and S.D. Comfort. 2002.

Pesticides and Groundwater: An Applicator's Map and Guide to Prevent Groundwater Contamination, Land Use Maps, Conservation and Survey Division, University of Nebraska-Lincoln.

Shea, P.J. and S.D. Comfort. 2002, 2003. *Environmental Considerations When Applying Herbicides*, in *Guide for Weed Management in Nebraska* (Martin, A.R., et al.), University of Nebraska-Lincoln.

I gave an invited lecture on pesticides in turfgrass for the applicator recertification program at the 1998 Washington Turf and Landscape Show and two invited talks on pesticide fate in crop production systems at the 1999 Ag Fertilizer and Chemical Institute Conference, Omaha, NE. I am currently providing an evaluation of the WINPST Natural Resources Conservation Service pesticide leaching and runoff software for potential inclusion in WeedSoft for the northcentral region.

SELECTED GRANTS AND CONTRACTS

Managing Soil and Water Contamination Using Novel Predictive and Remediative Treatment Technologies (with P. Burrow, S. Comfort, and T. Zhang), EPA/EPSCoR, \$410,000; Aug. 2002-Aug. 2004.

Building Surface Analysis into a New University Infrastructure in Environmental Science (with M. Langell, P. Burrow, S. Comfort, and T. Zhang), Nebraska Research Initiative, \$390,000; July 2002-June 2004.

Predicting Contaminant Dehalogenation Rates from Electron Scattering Studies (with S. Comfort and P. Burrow), USDA-NRICGP, \$150,000; Nov. 2001-Oct. 2003.

Laboratory Treatability Studies for In-Situ Treatment of a RDX-Contaminated Aquifer (with S. Comfort), Sandia National Laboratories, \$75,000; 2001-02. SNL also funded synthesis of ^{14}C -RDX and ^{15}N -RDX (\$27,000).

Innovative Remediation of Pesticide-Contaminated Soil (with S. Comfort), Nebraska Environmental Trust (via Nebraska Fertilizer and Ag-Chemical Institute), \$50,000; May 2001-Dec. 2002.

Chemical Oxidation/Reduction Innovative Technology Evaluation for the Massachusetts Military Reservation (with S. Comfort), Brice Environmental Services Corporation/AMEC, \$61,280; 2001.

Remediating HMX-Contaminated Soil from the Los Alamos National Laboratory: Laboratory-Scale Investigations Using Zerovalent Iron (with S. Comfort), Sandia National Laboratories, \$21,750; Aug. 2000-Oct. 2000.

A Test of Permeable Zero-Valent Iron Barriers for In-Situ Containment and Remediation of Pesticide Contamination in Unsaturated Soils (with S. Comfort), U.S. Geological Survey (USGS), \$29,055; Mar. 1999-Feb. 2001.

Simultaneous Transformation of Atrazine and Nitrate in Contaminated Water, Sediment and Soil by Zero-Valent Iron-Promoted Processes (with T. Zhang and S. Comfort), U.S. EPA/Hazardous Substance Research Center, \$155,515; May 1996-Sept. 2000.

Environmental Processes for Accelerated Bioremediation of Xenobiotics in Soil and Water (with S. Comfort, T. Zhang, G. Horst, R. Drijber, et al.) NSF-EPSCoR, \$657,591; July 1996-Dec. 1998.

SELECTED PUBLICATIONS

Gaber, H., S.D. Comfort, P.J. Shea, and T.A. Machacek. 2002. *Metolachlor Dechlorination by Zerovalent Iron During Unsaturated Transport*, **Journal of Environmental Quality**, 31, 962-969.

Vasilyeva, G.K., V.D. Kreslavski, and P.J. Shea. 2002. *Catalytic Oxidation of TNT by Activated Carbon*, **Chemosphere**, 47, 311-317.

Comfort, S.D., P.J. Shea, T.A. Machacek, H. Gaber, and B.-T. Oh. 2001. *Field-scale Remediation of a Metolachlor-Contaminated Field Site Using Zerovalent Iron*, **Journal of Environmental Quality**, 30, 1636-1643.

Oh, B.-T., G. Sarath, and P.J. Shea. 2001. *TNT Nitroreductase from a Pseudomonas aeruginosa Strain Isolated from TNT-Contaminated Soil*, **Soil Biology and Biochemistry**, 33, 875-881.

Vasilyeva, G.K., V.D. Kreslavski, B.-T. Oh, and P.J. Shea. 2001. *Potential of Activated Carbon to Decrease 2,4,6-Trinitrotoluene Toxicity and Accelerate Soil Decontamination*, **Journal of Environmental Toxicology and Chemistry**, 20, 965-971.

Bier, E., Z. Li, J. Singh, S.D. Comfort, and P.J. Shea. 1999. *Remediating Hexahydro-1,3,5-trinitro-1,3,5-triazine-Contaminated Water and Soil by Fenton Oxidation*, **Journal of Environmental Toxicology and Chemistry**, 18, 1078-1084.

- Singh, J., S.D. Comfort, and P.J. Shea. 1999. *Iron-Mediated Remediation of RDX-Contaminated Water and Soil Under Controlled Eh-pH*, **Environmental Science and Technology**, 33, 1488-1494.
- Singh, J., S.D. Comfort, and P.J. Shea. 1998. *Remediating RDX-Contaminated Water and Soil Using Zero-Valent Iron*, **Journal of Environmental Quality**, 27, 1240-1245.
- Singh, J., P.J. Shea, L.S. Hundal, S.D. Comfort, T.C. Zhang, and D.S. Hage. 1998. *Iron-enhanced Remediation of Water and Soil Containing Atrazine*. **Weed Science**, 46, 381-88.
- Stolpe, N.B., M.S. Kuzila, and P.J. Shea. 1998. *Importance of Soil Map Detail in Predicting Pesticide Mobility in Terrace Soils*, **Soil Science**, 163, 394-403.

OTHER PROFESSIONAL ACTIVITIES

Coordinator, Soil Science Specialization, Ph.D. major in Natural Resource Sciences, approved April 2003

Member, Board of Scientific Advisors, American Council on Science and Health, on-going

Member, Environmental Quality Committee, Weed Science Society of America, 1998-2003

Coordinator and primary proposal author, Ph.D. Major in Natural Resource Sciences, implemented January 2002

Reviewer, J. Environmental Quality, Environmental Science & Technology, J. Agricultural and Food Chemistry, Weed Science, Pesticide Science, Weed Technology, Soil Science Society of America J., Soil Science, J. Association Official Analytical Chemists, Chemosphere, Environmental Pollution, and other journals

Reviewer, NRI-CGP, DOD-SERDP, SBIR, and other national and regional grant programs

STEVEN S. SIBRAY, Associate Geoscientist, 90% Scholarly Service, 10% Research

Areas of Interest: Geochemistry of groundwater, groundwater and surface water interaction, groundwater management and geologic framework of Nebraska Panhandle aquifers

Contact: ssibray1@unl.edu, 308/632-1382

EDUCATION

B.S. Geology, University of California at Davis (1972)

M.S. Geology, University of New Mexico (1977)

PROFESSIONAL EXPERIENCE

1989-present Associate Geoscientist, Conservation and Survey Division, University of Nebraska-Lincoln

1981-1989 Senior Reservoir Technology Geologist, Exxon

1976-1981 Uranium Exploration Geologist, Pathfinder Mines

RESEARCH

Interpreted water chemistry data to delineate groundwater recharge from the Interstate canal in the North Platte Valley. Results indicated that leakage from unlined irrigation canals were a major source of recharge to the shallow unconfined aquifer. Provided scientists, engineers, modelers, landowners, and policy makers information and interpretation of the geologic framework of aquifers in the Nebraska Panhandle. Currently investigating the availability of groundwater and groundwater quality in the Sidney area.

SURVEY

Logged and interpreted 300 plus borehole geophysical logs for monitoring wells in the Nebraska Panhandle. Monitoring wells will be used to monitor water quality and quantity. Co-authored test hole logbook for Scotts Bluff County. Interpreted hydrographs and stream flow data and worked with Natural Resource Districts to establish controls on groundwater pumping in critical areas such as Pumpkin Creek. Routinely interpreted oil and gas borehole geophysical logs for well drillers looking for sources of water in deeper aquifers.

SELECTED GRANTS AND CONTRACTS

Groundwater Quality Assessment Program (with North Platte NRD), Environmental Trust Fund Grant \$262,000; 2000.

Western Nebraska Hydrogeology, Upper Niobrara White NRD, \$11,035; 1998.
Groundwater Information Program (with North Platte NRD), Environmental Trust Fund Grant, \$604,000; 1997.

SELECTED PUBLICATIONS

- Dreeszen, V., S. Sibray, and F. Smith. 2002. *Scotts Bluff County Test-Hole Logs: Nebraska Water Survey, Test-Hole Report*, No. 79, 279.
- Steele, G., J. Cannia, and S. Sibray. 2002. *Ground-water Quality and Age in Pumpkin Creek Valley, Western Nebraska [abs.]*, *Geological Society of America, Abstracts with Programs*, 34 (6), 97.
- Harvey, F. and S. Sibray. 2001. *Delineating Ground Water Recharge from Leaking Irrigation Canals Using Water Chemistry and Isotopes*, *Ground Water*, May-June, 39 (3), 408-421.
- Sibray, S. and F. Smith. 2000. *Scotts Bluff County Test-Hole Logs: Nebraska Water Survey, Test-Hole Report*, No. 79, 49.
- Sibray, S. and F. Harvey. 1997. *Determining Recharge Sources and the Impact of Unlined Irrigation Canals in Western Nebraska, Using Stable Isotope and Major Ion Chemistry and Tritium and Carbon 14 Dating [abs.]*, *Geological Society of America, Abstracts with Programs* 29 (6).

OTHER PROFESSIONAL ACTIVITIES

- Member, National Groundwater Association*
- Member, American Association of Petroleum Geologists*
- Registered Professional Geologist, Wyoming*
- Certified Petroleum Geologist (American Association of Petroleum Geologists)*

JOSEPH SKOPP, Associate Professor, 50% Teaching, 50% Research

Areas of Interest: Soil Physics, Transport of Chemicals/Organisms, Soil Hydraulic Properties

Contact: jskopp1@unl.edu, 402/472-6304

EDUCATION

B.S. Chemistry, University of California, Davis (1971)

M.S. Soil Physics, University of Arizona (1975)

Ph.D. Soil Physics, University of Wisconsin, Madison (1980)

PROFESSIONAL EXPERIENCE

1997-present Associate Professor, School of Natural Resources, University of Nebraska-Lincoln (UNL)

1986-1997 Associate Professor, Department of Agronomy, University of Nebraska-Lincoln

1980-1986 Assistant Professor, Department of Agronomy, University of Nebraska-Lincoln

Courtesy Appointment, Department Biological Systems Engineering

TEACHING

Courses Taught (Fall, Spring, Summer)

AGRO 461/861 Soil Physics (F98, F99, F00, F01, F02)

SOIL 361 Soils, Environment and Water Quality (S99, S00, S01, S02, S03)

WATS 281 Introduction to Water Science (S02, S03)

AGRO 961 Advanced Soil Physics (F99)

Courses with Partial Responsibility

NRES 103 Recitation for Introduction to Agricultural and Natural Resource Systems (F01, F02)

AGRO 424/824 Plant Nutrition and Nutrition Management (F98, F00) Presented soil nutrient movement to root.

Masters and Doctoral Students Advised

Roger R. Renken (M.S. Agronomy 2000) Retardation of Potassium in Porous Media as Influenced by Velocity.

Pedagogy and Recruiting

Teaching emphasis is on developing introductory water science courses as both service and recruiting courses. Teaching pedagogy focuses on use of active learning techniques. Additional recruiting activity includes programs to introduce Soils to under-represented groups.

RESEARCH

Emphasis is on fundamental processes in solute transport and determination of hydraulic properties. Methods for rapid estimation of soil hydraulic properties (hydraulic conductivity, infiltration and moisture release characteristics) in the field and lab are being developed. Work on solute transport is being extended to movement of organic chemicals and microbes through sediments. This work is intended to meet future needs of public water suppliers with respect to removal of *Cryptosporidium Oocysts*.

SELECTED GRANTS AND CONTRACTS

Bank Removal Efficacy for Removal of Cryptosporidium Oocysts Within the Lincoln, NE City Well Fields, Lincoln Water System, \$44,000; 2002-2003.

SELECTED PUBLICATIONS

Troyer, W. and J. Skopp. 2003. *Rapid Water Flow Instrumentation, Soil Science Society of America Journal*, 67, 107-111.

Skopp, J. 2002. *Physical Properties of Primary Particles, Chapter 1 in Soil Physics Companion, CRC Press, 1-16.*

Skopp, J. 2000. *Sieving/Screening, Article in Vol 4 Encyclopedia of Separation Science, Academic Press, 1826-1830.*

Skopp, J. 1999. *Physical Properties of Primary Particles, Chapter 1 in Handbook of Soil Science, CRC Press, A3-A17.*

Skopp, J. 1999. *Review of Physical and Chemical Hydrogeology, published in Journal of Environmental Quality, 28, 2032.*

Aslan, M., J. Skopp, and W. Powers. 1998. *Characterization of the Time Dependence of Sieving, Soil Science, 163, 472-481.*

DANIEL D. SNOW, Research Assistant Professor, 10% Teaching, 45%
Research, 45% Service

Areas of Interest: Environmental Analytical Chemistry, Isotope Analysis, Microbiology and
Bioremediation

Contact: dsnow1@unl.edu, 402/472-7539

EDUCATION

B.S. Geology, Southwest Missouri State University (1982)

M.S. Geochemistry, Louisiana State University (1988)

Ph.D. Geochemistry, University of Nebraska-Lincoln (1996)

PROFESSIONAL EXPERIENCE

1998-present Research Assistant Professor, Water Sciences Laboratory, University of
Nebraska-Lincoln (UNL)

1990-1998 Laboratory Manager, Water Center/Water Sciences Laboratory, University of
Nebraska-Lincoln

1986-1989 Graduate Research Assistant, Conservation and Survey Division, University of
Nebraska-Lincoln

1982-1985 Graduate Research Assistant, Geology Dept., Louisiana State University

HONORS AND AWARDS

Certificate of Merit, National Meeting Presentation, American Chemical Society (2002)

Graduate Faculty Member, Institute of Agriculture and Natural Resources (IANR), UNL
(2000)

IANR Team Effort Award, MSEA Water Quality Project (1997)

Research Fellowship, Association of Ground Water Scientists and Engineers (1995)

Graduate Research Fellowship, Governor's Research Initiative (1988)

TEACHING

Guest Lecturer for the Following Courses (Fall, Spring, Summer)

GEOL 442/842

GEOL 816

NRES 481/881

NRES 419/819

SOIL 361

UNK Chemistry Department Seminar

Masters and Doctoral Students Advised

Dean Brame – (M.S. Agronomy/Horticulture, expected 2004) Thesis title pending.

RESEARCH

I have developed and published analytical methods for determination of explosives, antibiotics, gasoline oxygenate compounds, and their transformation products using state-of-the-art extraction and instrumental technologies. These methods have been applied to field research studies to investigate the fate and transport of specific synthetic organics in the environment.

SERVICE

Served as manager for the UNL Water Sciences Laboratory for the last 13 years, providing technical support and supervising all analyses conducted at the facility. Developed and implemented extensive quality assurance program. Conducted tours of the facility, and answered a wide variety of water quality questions from the public and educators.

SELECTED GRANTS AND CONTRACTS

Control of Agrichemical Loading to Streams Using Grassed Buffers in Great Plains Watersheds (with Dean Eisenhauer, Roy Spalding, Tom Franti, and Mike Dosskey), U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service (CSREES) Competitive Grants Program, \$564,954; Oct. 2001–Sept. 2004.

Biodegradation of Dual-Contaminant Mixtures in Groundwater: Chlorinated Solvents and High Explosives (with Matthew Morley), U.S. Geological Survey, \$15,000; May 2003–May 2004.

Control of Agrichemical Loading to Streams Using Grassed Buffers (with Roy Spalding, Dean Eisenhauer, and Tom Franti), Central Platte Natural Resources District, \$60,000; July 2001–July 2002.

Determination of Trace Concentrations of Ethanol in Ground Water (with Roy Spalding), National Water Research Institute and the Nebraska Ethanol Board, \$20,000; July 1999–July 2001.

SELECTED PUBLICATIONS

Snow, D.D., D.A. Cassada, S.J. Monson, J. Zhu, and R.F. Spalding. 2003. *Tetracycline and Macrolide Antibiotics: Trace Analysis in Water and Wastewater Using Solid Phase Extraction and Liquid Chromatography–tandem Mass Spectrometry*, Chapter 10 in

- Liquid Chromatography/Mass Spectrometry (MS/MS), and Time of Flight MS Analysis of Emerging Contaminants* (I.M. Ferrer and E.M. Thurman, eds.), ACS Symposium Series 850, American Chemical Society, 161-174.
- Spalding, R.F., M.E. Exner, D.D. Snow, D.A. Cassada, M.E. Burbach, and S.J. Monson. 2003. *Herbicides in Ground Water Beneath Nebraska's Management Systems Evaluation Area*, *Journal of Environmental Quality*, 32, 92-99.
- Zhu, J., D.D. Snow, D.A. Cassada, S.J. Monson, and R.F. Spalding. 2001. *Analysis of Oxytetracycline, Tetracycline, and Chlortetracycline in Water Using Solid Phase Extraction and Liquid Chromatography-tandem Mass Spectrometry*, *Journal of Chromatography A*, 928, 177-186.
- Cassada, D.A., Y. Zhang, D.D. Snow, and R.F. Spalding. 2000. *Trace Analysis of Ethanol, MTBE, and Related Oxygenate Compounds by Solid Phase Microextraction and Gas Chromatography/mass Spectrometry*, *Analytical Chemistry*, 72 (19), 4654-4658.
- Cassada, D.A., S.J. Monson, D.D. Snow, and R.F. Spalding. 1999. *Sensitive Determination of RDX, Nitroso-RDX Metabolites, and Other Munitions in Ground Water by Solid-phase Extraction and Isotope Dilution Liquid Chromatography-atmospheric Pressure Electro-spray Ionization Mass Spectrometry*, *Journal of Chromatography A*, 844, 87-95.
- Snow, D.D. and R.F. Spalding. 1997. *Short-term Aquifer Residence Times Estimated from ²²²Rn Disequilibrium in Artificially-recharged Ground Water*, *Journal of Environmental Radioactivity*, 33 (7), 307-325.
- Martin, G.E., D.D. Snow, E. Kim, and R.F. Spalding. 1995. *Simultaneous Determination of Argon and Nitrogen*, *Ground Water*, 33 (5), 781-785.
- Snow, D.D. and R.F. Spalding. 1994. *Uranium Isotopes in the Platte River Drainage Basin of the North American High Plains Region*, *Applied Geochemistry*, 9, 271-278.
- Spalding, R.F., D.D. Snow, D.A. Cassada, and M.E. Burbach. 1994. *Study of Pesticide Occurrence in Two Closely-spaced Lakes in Northeastern Nebraska*, *Journal of Environmental Quality*, 23 (3), 571-578.
- Spalding, R.F., M.E. Exner, G.E. Martin, and D.D. Snow. 1993. *Effects of Sludge Disposal on Ground Water Nitrate Concentrations*, *Journal of Hydrology*, 142, 213-228.

OTHER PROFESSIONAL ACTIVITIES

Reviewer, Analytical Chemistry, Talanta, The Analyst, Environmental Science and Technology, Journal of Chromatography A, Journal of Soils and Sediment Contamination, Chemosphere, Journal of Environmental Quality.

Member, American Chemical Society, American Geophysical Union, Association of Ground Water Scientists and Engineers, International Association of Geochemistry and Cosmochemistry.

Certification and Training, Hazardous Waste Site Worker Protection and Supervisor's Training (complies with OSHA 1910.120(e), Hazardous Waste Site Worker Protection Training annual certification, Supervisor's Training, UNL Environmental Health and Safety Authorized Radioactive Materials User, UNL Radiation Safety Office - 40 hours, Supervisor's Training, UNL Human Resources Department.

MARY EXNER SPALDING, Professor and Research Chemist, 60% Service,
40% Research

Areas of Interest: Water quality, agrichemical contamination of ground water, effects of mitigation practices on ground-water quality, relationship between agrochemical concentrations in ground water and certain cancers

Contact: mspalding1@unl.edu, 402/472-7547

EDUCATION

B.S. Chemistry, Chestnut Hill College, Philadelphia, PA (1970)

M.S. Oceanography, Texas A&M University, College Station, Texas (1972)

PROFESSIONAL EXPERIENCE

1997-present Professor & Research Chemist, School of Natural Resources Sciences,
University of Nebraska-Lincoln (UNL)

1994-1997 Professor & Research Chemist, Conservation & Survey Division, University of
Nebraska-Lincoln

1983-1994 Associate Professor & Research Chemist, Conservation & Survey Division,
University of Nebraska-Lincoln

1976-1983 Assistant Professor & Research Chemist, Conservation & Survey Division,
University of Nebraska-Lincoln

1974-1976 Chemist, Conservation & Survey Division, University of Nebraska-Lincoln

1973-1974 Research Associate, Department of Environmental Chemistry & Engineering,
Texas A&M University

1973 Chemist, Ichthyological Associates, Drumore, PA

HONORS AND AWARDS

*Outstanding contributions to ground-water research in Nebraska, Lower Platte South
Natural Resources District (1992)*

Special Merit Award, Nebraska Groundwater Foundation (1991)

*Meritorious Service to Conservation Award, Central Platte Natural Resources District
(1977)*

SERVICE

Coordinating and assessing the quality of the data entered into the Quality-assessed
Agrichemical Contaminant Database for Nebraska Ground Water has resulted in a
comprehensive database of more than 132,000 nitrate and pesticide concentrations for

13,500 wells. The quality assessment of each nitrate and pesticide concentration provides the user with detailed knowledge of the quality assurance effort expended during the sampling and analysis and makes the database unique. Nebraska is the only state to have a water-quality database available on the world wide web.

RESEARCH

The results of field-scale investigations have shown that better management practices can counter the deterioration of ground-water quality. Sprinkler irrigation and N fertigation significantly reduced N leaching with only minor reductions in crop yield. Focused recharge of pesticide-contaminated storm runoff in road ditches, field drainage ditches and in end rows where the soils are altered or eliminated is a major mechanism for vertical transport. Sprinkler irrigation limited focused recharge and also promoted significantly more soil microbial degradation of atrazine.

SELECTED GRANTS AND CONTRACTS

Ground Water Nitrate Management Through the Statewide Clearinghouse, Nebraska
Department of Environmental Quality, \$6,116; April 2003-Dec. 2003.

Ground Water Nitrate Management Through the Statewide Clearinghouse (with R. Spalding), Nebraska Department of Environmental Quality, \$75,000; Oct. 2001-Sept. 2004.

Ground Water Nitrate Management Through the Statewide Clearinghouse (with R. Spalding), Nebraska Department of Environmental Quality, \$25,000; Oct. 2000-Sept. 2001.

Half-life Determinations of Trichloroethylene Intermediates During Intrinsic Remediation (with D. Snow), National Water Research Institute, \$78,500; Sept. 1996-Oct. 1998.

Sprinkler Irrigation as a Remedial Technique for VOC-contaminated Ground Water (with R. Spalding and D. Alexander), Cooperative States Research Service, \$147,250; Oct. 1993-Sept. 1996.

SELECTED PUBLICATIONS

Spalding, R.F., M.E. Exner, D.D. Snow, D.A. Cassada, M.E. Burbach, and S.J. Monson. 2003. *Herbicides in Ground Water Beneath Nebraska's Management Systems Evaluation Area, Journal of Environmental Quality*, 32 (1), 92-99.

Spalding, R.F., D.G. Watts, D.D. Snow, D.A. Cassada, M.E. Exner, and J.S. Schepers. 2003. *Herbicide Loading to Shallow Ground Water Beneath Nebraska's Management Systems Evaluation Area, Journal of Environmental Quality*, 30 (4), 1184-1194.

- Exner, M.E., D. Harrell, P.L. Larsen, C. Romary, and R.F. Spalding. 2002. *A Quality-assessed Database for Pesticides in Ground Water, Proceedings of the 2nd European Conference on Pesticides and Related Organic Micropollutants in the Environment* (T.A. Albanis, ed.), Corfu, Greece, 87-92.
- Spalding, R.F., D.D. Snow, and M.E. Exner. 2002. *Acetamides and Their Transformation Products in Groundwater Beneath Nebraska's Management Systems Evaluation Area, Proceedings of the 2nd European Conference on Pesticides and Related Organic Micropollutants in the Environment* (T.A. Albanis, ed.), Corfu, Greece, 125-128.
- Spalding, R.F., Z.K. U, S.W. Hyun, G.E. Martin, M.E. Burbach, S.I.I. Yang, M. Kim, M.E. Exner, and S.J. Song. 2001. *Source Identification of Nitrate on Cheju Island, South Korea, Nutrient Cycling in Agroecosystems*, 61 (3), 237-246.
- Spalding, R.F., D.G. Watts, J.S. Schepers, M.E. Burbach, M.E. Exner, R.J. Poreda, and G.E. Martin. 2001. *Controlling Nitrate Leaching in Irrigated Agriculture, Journal of Environmental Quality*, 30 (4), 1184-1194.
- Spalding, R.F., M.E. Exner, D.D. Snow, and M.E. Stange. 1999. *The Hastings, Nebraska Ground Water Contamination Superfund Site: A Case Study in Logic and Illogic, Technology*, 6, 141-149.

OTHER PROFESSIONAL ACTIVITIES

- Member, State-wide Ground Water Monitoring Committee, Nebraska Department of Environmental Quality, 2002-present*
- Member, IANR Pesticide Advisory Committee (advisors to the Nebraska Department of Agriculture), 1985-present*

SCOTT E. SUMMERSIDE, Associate Geoscientist, 75% Scholarly Service, 25% Research

Areas of Interest: Groundwater Resource Evaluation: (Water availability and water quality assessments and related issues, Aquifer Mapping, Wellhead Protection, Groundwater Source Heat Pumps, Aquifer Tests, etc...)

Contact: ssummerside1@unl.edu, 402/472-7541

EDUCATION

B.S. Geology, University of Nebraska-Lincoln (UNL) (1989)

M.S. Water Resources Administration (Dept of Hydrology and Water Resources), University of Arizona (1991)

PROFESSIONAL EXPERIENCE

2000-present Associate Geoscientist, Conservation and Survey Division, University of Nebraska-Lincoln (UNL)

1995-2000 Assistant Geoscientist, Conservation and Survey Division, University of Nebraska-Lincoln

1994-1995 Water Scientist-Assistant Hydrogeologist, Conservation and Survey Division, UNL

1993-1994 Groundwater Geologist, Nebraska Department of Environmental Quality

1992-1993 Hydrologist II, Arizona Department of Environmental Quality

1992-1992 Hydrologist I, Arizona Department of Environmental Quality

1990-1991 Graduate Research Assistant, University of Arizona

1990 Governor's Intern, Arizona Department of Water Resources

1989 Geologist, U.S. Geological Survey

1987-1989 Research Technician, Conservation and Survey Division, University of Nebraska-Lincoln

RESEARCH [CSD-Survey](last five years 1998-2003)

Currently I am involved in survey oriented research to address hydrogeologic information needs of Nebraska's citizens. One of my current projects involves the delineation of confining conditions within the High Plains Aquifer in the Upper Big Blue NRD in East Central Nebraska. Results should assist in NRD ground-water management of areas prone to well interference problems as well as drought induced ground-water depletion. Project involves development of hydrogeologic databases from CSD testhole data and historical ground-water level information with subsequent GIS-aided analysis, interpretation and output.

Another current project involves the update and revision of testhole log books for Webster and Nuckolls Counties in south-central Nebraska based on recent test-hole drilling as part of the Platte River Cooperative Hydrologic Study (COHYST). Projects completed within the last five years include update and revision of 1:250,000 scale water-table maps of the State of Nebraska for the Nebraska Department of Environmental Quality (NDEQ) Source Water Assessment Program. The new maps reflect more recent, accurate and comprehensive water-level data, as well as a current understanding of groundwater in Nebraska; they are currently being used by a wide variety of CSD clientele. Other recent projects involved providing hydrogeologic interpretation and data via test-hole reports, aquifer tests at research sites, geologic maps and other reports for such clientele-oriented projects as COHYST, Lower Platte River Corridor Alliance, and Republican River Basin studies [Nebraska Department of Water Resources (DWR)]. Data used by the COHYST sponsors in their GIS/database efforts and ground-water modeling activities. Results of research published in reports to DWR are being utilized by the agency to plan regulatory and management activities related to water quantity in basin.

SCHOLARLY SERVICE [CSD-Survey](last five years 1998-2003)

For the years 1998-2002, I have responded to about 900 requests for scholarly service on issues related to water quantity and quality, primarily in southeast and south-central Nebraska. These issues have direct impact on the quality of life in terms of economics, public health, and environmental quality. These requests came from federal, state, and local agencies; numerous private citizens/landowners; consulting firms; industries; environmental organizations; as well as various levels of the educational community; and, the service provided has aided in decision-making by the clientele by addressing such issues as water supply, water quality, safe drinking water, environmental quality, etc... Continued requests for scholarly service from the public, including frequent referrals from past clients and fellow professionals, demonstrates the quality of service provided. Subject matter of the requests include availability of water and water quality issues for acreage developments, golf courses, cities and towns/villages, industry (i.e., ethanol plants), rural water districts, schools, utilities, ag. irrigation, domestic water supplies, etc... Other examples of recent service projects include: 1) Availability of water and geologic suitability for geothermal wells (both closed and open loop) has been a big issue recently, especially with high energy prices; 2) Drought mitigation activities for towns, individual water supplies, etc... during recent drought; 3) Wellhead protection studies for towns, NRDs, county; 4) Technical assistance on issues related to ground water management for the NRDs, NDWR, NDEQ, NDHHS; 5) Conducting field trips, presentations, workshops and other outreach activities for Nebraska Well Drillers Association (including professional geologists and license holders of other water

professionals; and 6) Hydrogeologic data and service related to Confined Animal Feeding Operations.

SELECTED GRANTS AND CONTRACTS

Confined Aquifer Delineation Project: Upper Big Blue NRD (with M. Jess and D. Gosselin), Upper Big Blue NRD, \$10,990; Nov. 2002–present.

Update Test Hole Log Books with up to 50 Holes/wells Drilled by COHYST Group (with M. Kuzila and others), Platte River Basin Cooperative Hydrology Study Sponsors, \$14,938; December 2002–September 2003.

Update Water Table Elevation Maps and Model Time of Travel Zones for Wellhead Protection Areas (with J. Szilagyi), Nebraska Department of Environmental Quality, \$190,802; June 1999–March 2001.

Geologic Maps and Test-Hole Log Books for Platte River Cooperative Hydrology Study (with D. Eversoll, M. Kuzila and many others), Platte River Basin Cooperative Hydrology Study Sponsors, first contract: \$164,300; 1998–2000.

Geologic Maps and Test-Hole Log Books for Lower Platte River Corridor Alliance (with D. Eversoll and R. Burchett), Lower Platte River Corridor Alliance, \$31,000; 1998–1999.

Republican River Study (with X. Chen, J. Goeke, D. Eversoll, and others), Nebraska Department of Water Resources, \$27,000; 1997–1999.

SELECTED PUBLICATIONS

Chen, X., J. Goeke, J. Ayers, and S. Summerside. 2003. *Observation Well Network Design for Pumping Tests in Unconfined Aquifers*, *Journal of the American Water Resources Association*, 39 (1), 17–32.

Chen, X., J. Goeke, and S. Summerside. 1999. *Hydraulic Properties and Uncertainty Analysis for an Unconfined Alluvial Aquifer*, *Ground Water*, 37 (6), 845–854.

CSD Contract Reports:

Summerside, S., M. Ponte, V. Dreeszen, S. Hartung, M. Khisty, and J. Szilagyi. March 2001. *Update and Revision of Regional 1x2 Degree Water-Table Configuration Maps for the State of Nebraska*, 9p.

Chen, X-H., J. Goeke, and S. Summerside. April 1998. *Geology, Hydrogeology, and Aquifer Hydraulic Properties from Five Test Sites in the Republican River Valley, Nebraska*, 58 p., five appendices, five cross-sections.

CSD Publications:

Diffendal, R.F., Jr., D.R. Mohlman, R.G. Corner, F.E. Harvey, K.J. Warren, S. Summerside, R.K. Pabian, and D.A. Eversoll. 2002. *Field Guide to the Geology of the Harlan*

County Lake Area, Harlan County, Nebraska—with a History of Events Leading to Construction of Harlan County Dam, Conservation and Survey Division, University of Nebraska, Lincoln, Nebraska, Educational Circular 16, 61p.

Burchett, R. and S. Summerside. Revised July 2001. *Saunders County Test-hole Logs, Nebraska Water Survey Test-Hole Report No. 78.*

Hartung, S. and S. Summerside. 2001. *Configuration of the Water Table circa 1995, Broken Bow Quadrangle, Nebraska, Nebraska Water Survey Map GM-54b, 1 Sheet, scale 1:250,000.*

Hartung, S. and S. Summerside. 2001. *Configuration of the Water Table circa 1995, Sioux City Quadrangle, Nebraska, Nebraska Water Survey Map GM-54i, 1 Sheet, scale 1:250,000.*

Summerside, S. 2001. *Configuration of the Water Table circa 1995, Fremont and Omaha Quadrangles, Nebraska, Nebraska Water Survey Map GM-54c, 1 Sheet, scale 1:250,000.*

Summerside, S. and J. Szilagyi. 2001. *Configuration of the Water Table circa 1995, Valentine Quadrangle, Nebraska, Nebraska Water Survey Map GM-54j, 1 Sheet, scale 1:250,000.*

Summerside, S. Nov. 1999. *Phelps County Test-hole Logs. Nebraska Water Survey Test-Hole Report No. 69.*

Summerside, S. April 1999. *Kearney County Test-hole Logs. Nebraska Water Survey Test-Hole Report No. 50.*

-4 other Division publications and two GSA abstracts published within last five years.

OTHER PROFESSIONAL ACTIVITIES

Member, Lincoln/Lancaster County Greenprint Resources Expert "Cabinet", 2000-2001

Member, Municipal Water Supply, Health, and Energy Subcommittee - Nebraska Drought Planning, 1998-2003

Member of 3 other statewide water-oriented committees, and chair/co-chair of 2+CSD search committees

ANDREW E. SUYKER, Post-Doctoral Research Associate, 100% Research
Areas of Interest: Carbon Exchange between Ecosystems and the Atmosphere, Atmospheric
Instrumentation

Contact: asuyker@unl.edu, 402/472-2168

EDUCATION

B.S. Meteorology, University of Alberta (1988)

M.S. Agronomy, University of Nebraska-Lincoln (1992)

Ph.D. Agronomy, University of Nebraska-Lincoln (2000)

PROFESSIONAL EXPERIENCE

2000-present Post-Doctoral Research Associate, School of Natural Resources,
University of Nebraska-Lincoln

1996-2000 Research Technician, School of Natural Resources, University of Nebraska-
Lincoln

1989-1996 Graduate Assistant, School of Natural Resources, University of
Nebraska-Lincoln

HONORS AND AWARDS

Widaman Distinguished Graduate Student (1991)

Sue Wilson Fellowship (1993)

RESEARCH

My research emphasis has been quantifying and understanding ecophysiological processes that control the exchange of methane, carbon dioxide, and energy in natural and agricultural ecosystems. I have worked in grasslands in Kansas and Oklahoma, wetlands in Minnesota and Saskatchewan (Canada), and agroecosystems in Nebraska and Oklahoma. In the wetland research, in addition to quantifying CO₂ exchange, we have also characterized methane emissions and linked these fluxes to environmental controls. The most recent project involves using efficient farming methods (i.e., no-till, irrigation) to determine if maize or maize/soybean crops are able to sequester a significant amount of carbon from the atmosphere.

SELECTED PUBLICATIONS

Suyker, A.E., S.B. Verma, and G.G. Burba. 2003. *Interannual Variability in Net CO₂ Exchange of a Native Tallgrass Prairie*, *Global Change Biology*, 9, 1-11.

- Falge, E., D. Baldocchi, J. Tenhunen, M. Aubinet, P. Bakwin, P. Berbigier, C. Bernhofer, G.G. Burba, R. Clement, K.J. Davis, J.A. Elbers, A.H. Goldstein, A. Grelle, A. Granier, J. Guðmundsson, D. Hollinger, A. Kowalski, G. Katul, B. Law, Y. Malhi, T. Meyers, R. Monson, J.W. Munger, W. Oechel, K.T. Paw U, K. Pilegaard, U. Rannik, C. Rebmann, A.E. Suyker, R. Valentini, K. Wilson, and S. Wofsy. 2002. *Seasonality of Ecosystem Respiration and Gross Primary Production as Derived from FLUXNET Measurements, Agricultural and Forest Meteorology*, 113, 53-74.
- Falge, E., J. Tenhunen, D. Baldocchi, M. Aubinet, P. Bakwin, P. Berbigier, C. Bernhofer, J-M. Bonnefond, G.G. Burba, R.J. Clement, K.J. Davis, J.A. Elbers, M. Falk, A.H. Goldstein, A. Grelle, A. Granier, T. Grünwald, J. Guðmundsson, D. Hollinger, I. Janssens, P. Keronen, A. Kowalski, G. Katul, B. Law, Y. Malhi, T. Meyers, R. Monson, E. Moors, J.W. Munger, W. Oechel, K.T. Paw U, K. Pilegaard, U. Rannik, R. Rebmann, A.E. Suyker, H. Thorgeirsson, G. Tirone, A. Turnipseed, K. Wilson, and S. Wofsy. 2002. *Phase and Amplitude of Ecosystem Carbon Release and Uptake Potential as Derived from FLUXNET Measurements, Agricultural and Forest Meteorology*, 113, 75-95.
- Hanan, P., G.G. Burba, S.B. Verma, J.A. Berry, A.E. Suyker, and E.A. Walter-Shea. 2002. *Inversion of Net Ecosystem CO₂ Flux Measurements for Estimation of Canopy PAR Absorption, Global Change Biology*, 8 (6), 563-574.
- Falge, E., D.D. Baldocchi, R.J. Olson, P. Anthoni, M. Aubinet, C. Bernhofer, G.G. Burba, R. Ceulemans, R.J. Clement, H. Dolman, A. Granier, P. Gross, T. Grünwald, D. Hollinger, N-O. Jensen, G. Katul, P. Keronen, A. Kowalski, C.T. Lai, B. Law, T. Meyers, J. Moncrieff, E. Moors, J.W. Munger, K. Pilegaard, U. Rannik, C. Rebmann, A.E. Suyker, J. Tenhunen, K. Tu, S.B. Verma, T. Vesala, K. Wilson, and S. Wofsy. 2001. *Gap Filling Strategies for Long Term Energy Flux Data Sets, a Short Communication, Agricultural and Forest Meteorology*, 107, 71-77.
- Falge, E., D. Baldocchi, R. Olson, P. Anthoni, M. Aubinet, C. Bernhofer, G.G. Burba, R. Ceulemans, R.J. Clement, H. Dolman, A. Granier, P. Gross, T. Grünwald, D. Hollinger, N-O. Jensen, G. Katul, P. Keronen, A. Kowalski, C.T. Lai, B. Law, T. Meyers, J. Moncrieff, E. Moors, J.W. Munger, K. Pilegaard, U. Rannik, C. Rebmann, A.E. Suyker, J. Tenhunen, K. Tu, S.B. Verma, T. Vesala, K. Wilson, and S. Wofsy. 2001. *Gap Filling Strategies for Defensible Annual Sums of Net Ecosystem Exchange, Agricultural and Forest Meteorology*, 107, 43-69.
- Suyker, A.E. and S.B. Verma. 2001. *Year-round Observation of the Net Ecosystem Exchange of Carbon Dioxide in a Native Tallgrass Prairie, Global Change Biology*, 7, 279-290.

- Suyker, A.E., S.B. Verma, and T.J. Arkebauer. 1997. *Season-long Measurement of Carbon Dioxide Exchange in a Boreal Fen*, *Journal of Geophysical Research*, BOREAS Special Issue (December), 102 (D24), 29021-29028.
- Suyker, A.E., S.B. Verma, R.J. Clement, and D.P. Billesbach. 1996. *Methane Flux in a Boreal Fen: Season-long Measurement by Eddy Correlation*, *Journal of Geophysical Research*, 101 (D22:28), 637-28, 647.
- Suyker, A.E. and S.B. Verma. 1993. *Eddy Correlation Measurements of CO₂ Flux Using a Closed-path Sensor: Theory and Field Tests Against an Open-path Sensor*, *Boundary Layer Meteorology*, 64, 391-407.

OTHER PROFESSIONAL ACTIVITIES

- AmeriFlux Workshop on Standardization of Flux Analysis and Diagnostics, Corvallis, OR, August 2002
- Suyker, A.E. and S.B. Verma. 2002. *Carbon Dioxide Exchange in a Winter Wheat Field and Tallgrass Prairie*, 25th Conference on Agricultural and Forest Meteorology (AMS Conference), Norfolk, VA, May 2002, p. 172
- Suyker, A.E. and S.B. Verma. 2000. *Nighttime CO₂ Exchange in a Tallgrass Prairie and a Winter Wheat Field*, 24th Conference on Agricultural and Forest Meteorology (AMS Conference), Davis, CA, August 2000, p. 192
- Issues and Uncertainties Related to Long-term Eddy Covariance Measurements of Carbon and Energy Exchanges*, Boulder, CO, May 2000
- Suyker, A.E. 2000. *Station Footprint Relative to Flux at Sensor Location – the Model*, Automated Weather Station for Applications in Agriculture and Water Resources Management: Current Use and Future Perspectives, Lincoln, NE, March 2000
- Suyker, A.E. and S.B. Verma. 1998. *Surface Energy Fluxes in a Boreal Wetland*, 23rd Conference on Agricultural and Forest Meteorology (AMS Conference), Albuquerque, NM, November 1998, p. 271
- Suyker, A.E., S.B. Verma, and T.J. Arkebauer. 1996. *Carbon Dioxide (CO₂) Exchange in a Boreal Fen*, 22nd Conference on Agricultural and Forest Meteorology (AMS Conference), Atlanta, GA, January 1996, p. 74
- Suyker, A.E., S.B. Verma, R.J. Clement, and D.P. Billesbach. 1995. *Methane Flux by Eddy Correlation from a Boreal Fen*, American Geophysical Union Spring Meeting, Baltimore, MD, May 1995, H31D-02

JAMES B. SWINEHART, Professor, 85% Research (IANR); 15% Teaching
(Arts & Sciences)

Areas of Interest: Great Plains Cenozoic Stratigraphy and Sedimentology, Eolian
Sedimentation and Paleoclimates

Contact: jswinehart1@unl.edu, 402/472-7529

EDUCATION

- B.S. Geology, University of California-Riverside (1965)
Geology, Pennsylvania State University (1965-1970)
M.S. Geology, University of Nebraska-Lincoln (1979)

PROFESSIONAL EXPERIENCE

- 1997-present Professor, School of Natural Resources, Conservation and Survey
Division, University of Nebraska-Lincoln
1986-1997 Associate Professor/Research Geologist, Conservation and Survey Division,
University of Nebraska-Lincoln
1979-1986 Assistant Professor/Research Geologist, Conservation and Survey Division,
University of Nebraska-Lincoln
1970-1979 Research Geologist, Conservation and Survey Division, University of Nebraska-
Lincoln

HONORS AND AWARDS

Charles E. Bessey Award for best paper in natural sciences, Great Plains Research (2000)

TEACHING

Courses Taught (Fall, Spring, Summer)

GEOL 106 Environmental Geology, 3 cr (F99, F00, S02)

GEOL 869 Regional Field Geology, 1 cr (one of two instructors) (F99, F00, F02)

Masters Students Advised

Claire C. Larson (M.S. Geology 2001) Provenance, Distribution, and Sand Hills Dune Sand
Source Potential of Connely Flat Beds (latest Wisconsin), Niobrara River, Ainsworth
to Merriman, Nebraska.

RESEARCH AND SURVEY

I have established basic and applied programs focusing on the stratigraphy, sedimentology, and sedimentary
petrology of the Cenozoic strata of Nebraska and their relationship to similar strata in adjacent states. I have made

investigations of the surface and subsurface to gain an understanding of alluvial, eolian and lacustrine depositional systems in the evolution of Great Plains landscapes. This information, in the form of over 40 geologic maps, test hole reports, and open file publications is an important data set for the evaluation of Nebraska's geologic natural resources, including its groundwater. *Collaborative research on the Nebraska Sand Hills has demonstrated this region has experienced several significant mega-droughts during the last 10,000 years.*

SELECTED GRANTS AND CONTRACTS

Rural and Urban Geologic Mapping of NE- Subprojects 1 and #3, Mapping and Digitizing in the Alliance and Crawford Quadrangle (with H. LaGarry), U.S. Geological Survey, \$115,323; May 2003-April 2004.

Rural and Urban Geologic Mapping of NE- Subprojects 3 and #4, Mapping and Digitizing in the Alliance and Crawford Quadrangle (with H. LaGarry), U.S. Geological Survey, \$124,980; May 2002-April 2003.

Rural and Urban Geologic Mapping of NE- Subprojects 3 and #4, Mapping and Digitizing in the Alliance and Crawford Quadrangle (with H. LaGarry), U.S. Geological Survey, \$95,098; May 2001-April 2002.

Rural and Urban Geologic Mapping of NE-Subprojects #1 and #2, Mapping and Digitizing in the Alliance Quadrangle Area (with H. LaGarry), U.S. Geological Survey, \$90,240; May 2000-April 2000.

Rural and Urban Geologic Mapping of NE - Subproject #3 - Mapping in the Alliance Quadrangle Area (with H. LaGarry), U.S. Geological Survey, \$73,667; May 1999-April 2000.

Rural and Urban Geologic Mapping of NE; Subproject #3 - Mapping in the Alliance Quadrangle Area (with H. LaGarry), U.S. Geological Survey, \$79,635; May 1998-April 1999.

Evidence from the Nebraska Sand Hills for Persistent Late Holocene Droughts on the Great Plains (with D. Loope), National Science Foundation, \$140,500; July 1997-2000.

SELECTED PUBLICATIONS

Mason, J., J. Swinehart, R. Goble, and D. Loope. 2003 (in press). *Late Holocene Dune Activity linked to Hydrologic Drought, Nebraska Sand Hills, USA, The Holocene.*

Harvey, F., J. Swinehart, and T. Kurtz. 2001. *Hydrology and Hydrochemistry of the Jumbo and Pullman Valley Fens - Cherry County, Nebraska, Conservation and Survey Division Open File Report #58, 104 pp.*

Loope, D. and J. Swinehart. 2000. *Thinking like a Dune Field: Geologic History in the Nebraska Sand Hills, Great Plains Research, 10, 5-35.*

- Muhs, D., J. Swinehart, D. Loope, J. Been, S. Mahan, and C. Bush. 2000. *Geochemical Evidence for an Eolian Sand Dam Across the North and South Platte Rivers in Nebraska*, *Quaternary Research*, 53, 214-222.
- Muhs, D., J. Swinehart, D. Loope, J. Aleinikoff, and J. Been. 1999. *200,000 Years of Climate Change Recorded in Eolian Sediments of the High Plains of Eastern Colorado and Western Nebraska*, in *Geological Society of America Field Guide 1*, Colorado and Adjacent Areas (D. Lageson, A. Lester, and B. Trudgill, eds.), 71-95.
- Hassan, K., J. Swinehart, and R. Spalding. 1997. *Evidence for Holocene Environmental Change from C/N ratios and Delta C-13 and Delta N-15 Values in Swan Lake Sediments, Western Sand Hills, Nebraska*, *Journal of Paleolimnology*, 18, 121-130.
- Mason, J., J. Swinehart, and D. Loope. 1997. *Holocene History of Lacustrine and Marsh Sediments in a Dune-blocked Drainage, Southwestern Nebraska Sand Hills, U.S.A.*, *Journal of Paleolimnology*, 17, 67-83.
- Muhs, D., T. Stafford, Jr., J. Swinehart, S. Cowherd, S. Mahan, C. Bush, R. Madole, and P. Maat. 1997. *Late Holocene Eolian Activity in the Mineralogically Mature Nebraska Sand Hills*, *Quaternary Research*, 48, 162-176.
- Stokes, S. and J. Swinehart. 1997. *Middle and Late Holocene Dune Reactivation in the Nebraska Sand Hills*, *The Holocene*, 7, 263-273.

OTHER PROFESSIONAL ACTIVITIES

- Faculty Development Leave, Learning optically stimulated luminescence dating techniques, July-Dec., 2002*
- Invited Keynote Speaker, 2002 Sand Hills Discovery Experience, Ainsworth, NE, Aug. 6, 2002*
- Treasurer, Nebraska Geological Society, 2001-present*
- Field Trip Co-Chair, 7th International Conference on Fluvial Sedimentology, Lincoln, NE, 2001*
- Co-Leader, 1999 Geological Society of America Annual Meeting Field Trip #2, Denver, CO, Oct. 23-24*
- Registered Professional Geologist, State of Nebraska, 1999-present*
- Chair, Yatkola-Edwards Grants Committee, Nebraska Geological Society, 1979-present*

JOZSEF SZILAGYI, Assistant Professor, 75% Research, 25% Survey
Areas of Interest: Hydrological forecasting, Stream-aquifer interactions, evaporation
Contact: jszilagy1@unl.edu, 402/472-9667

EDUCATION

B.S. Meteorology, Eotvos University, Hungary (1989)
M.S. Hydrology, University of New Hampshire (1994)
Ph.D. Hydrologic Sciences, University of California-Davis (1997)

PROFESSIONAL EXPERIENCE

1997-present Assistant Professor, School of Natural Resources, University of
Nebraska-Lincoln
1994-1997 Graduate Research Assistant, University of California-Davis
1992-1994 Graduate Research Assistant, University of New Hampshire
1989-1992 Operational Hydrometeorologist, National Hydrological Forecasting Center,
Hungary

HONORS AND AWARDS

The Alfred Hille Prize of the Hungarian Meteorological Society (1989)
University of California Tuition Fellowship (1995, 1996)
Janos Bolyai Research Fellowship of the Hungarian Academy of Sciences (2001)

TEACHING

Courses Taught (Fall, Spring, Summer)
CIVE 353/853 Hydrology (F99)
CIVE 352 Intro. to Water Resources Engineering , Laboratory (S99, S00)

Masters and Doctoral Students Advised

Paul Koester (M.S. Geosciences 2003) Temporal Soil Water Loss Estimation for Box Butte
County, Nebraska.

RESEARCH

Formulated a generalized system theoretical description of the kinematic wave equation for
operative hydrological forecasting. Demonstrated that the hydrological cycle (at a
continental scale) is intensifying as a result of global warming.

SURVEY

Mapped long-term groundwater recharge for Nebraska. Modeled hundred-plus capture zones for municipal wells in Nebraska.

SELECTED GRANTS AND CONTRACTS

A New Technique for Mapping Recharge Fluxes to Groundwater at a Regional Scale, National Science Foundation, \$15,120; 2003.

Equipment Grant for Modeling Subsurface Unsaturated/saturated Zone Interactions, University of Nebraska Water Center, \$11,320; 2002.

Mapping Groundwater Recharge for Nebraska, Research Council of the University of Nebraska, \$3,000; 2002.

Modeling Capture Zones in Wellhead Protection Areas, Nebraska Department of Environmental Quality, \$25,241; 1999-2000.

SELECTED PUBLICATIONS

Szilagy, J. 2002. Comment on "The Hydrology and Hydrometeorology of Extreme Floods in the Great Plains of Eastern Nebraska" by Y. Zhang, J. A. Smith, and M. L. Baeck, *Advances in Water Resources*, 25 (6), 701-702.

Szilagy, J. 2002. *Vegetation Indices to Aid Areal Evapotranspiration Estimations*, *Journal of Hydrologic Engineering*, 7 (5), 368-372.

Szilagy, J., M.B. Parlange, J.A. Patz, and T.K. Graczyk. 2002. *Sensitivity of Watershed Runoff under Humid Conditions to Potential Climate Variations*, *Journal of Environmental Engineering*, 128 (7), 635-642.

Parlange, J.Y., F. Stagnitti, A. Heilig, J. Szilagy, M.B. Parlange, T.S. Steenhuis, W.L. Hogarth, D.A. Barry, and L. Li. 2001. *Sudden Drawdown and Drainage of a Horizontal Aquifer*, *Water Resources Research*, 37 (8), 2097-2101.

Summerside, S. and J. Szilagy. 2001. *Configuration of the Water Table, circa 1995, 1x2 Degree Valentine Quadrangle, Nebraska*, Conservation and Survey Division, University of Nebraska-Lincoln.

Szilagy, J. 2001. *Modeled Areal Evaporation Trends over the Conterminous United States*, *Journal of Irrigation and Drainage Engineering*, 127 (4), 196-200.

Szilagy, J. 2001. *On Bouchet's Complementary Hypothesis*, *Journal of Hydrology*, 146, 155-158.

Szilagy, J. 2001. *Identifying the Cause of Declining Flows in the Republican River, USA*, *Journal of Water Resources Planning and Management*, 127 (4), 244-253.

Szilagy, J., G.G. Katul, and M.B. Parlange. 2001. *Evapotranspiration Intensifies over the Conterminous United States*, *Journal of Water Resources Planning and Management*, 127 (6), 354-362.

Szilagy, J. 2000. *Can a Vegetation Index Be Indicative of Areal Transpiration?*, *Ecological Modelling*, 127, 65-79.

OTHER PROFESSIONAL ACTIVITIES

Member, American Geophysical Union

TSEGAYE TADESSE, Postdoctoral Research Associate, 100% Research

Areas of Interest: drought, satellite meteorology, and data mining techniques

Contact: ttadesse2@unl.edu, 402/472-3383

EDUCATION

B.S. Physics, Addis Ababa University, Ethiopia (1982)

M.S. Space Studies, International Space University, France (1998)

Ph.D. Agrometeorology, University of Nebraska-Lincoln (2002)

PROFESSIONAL EXPERIENCE

2002-present Postdoctoral Research Associate, National Drought Mitigation Center,
School of Natural Resources, University of Nebraska-Lincoln

1998-2002 Graduate Research Assistant, National Drought Mitigation Center, School of
Natural Resources, University of Nebraska-Lincoln

1984-1998 Meteorologist, National Meteorological Services Agency of Ethiopia

1982-1984 Physics Instructor, Ethiopian Air Force Academy

RESEARCH

Presently working in a collaborative research project between the National Drought Mitigation Center (NDMC), High Plains Regional Climate Center, and the EROS Data Center in Sioux Falls, South Dakota. The responsibilities include conducting research on drought monitoring through integration of satellite and climate data. Research interests include identifying drought characteristics and their association with oceanic indices using data mining techniques.

SELECTED PUBLICATIONS

Goddard, S., S.K. Harms, S.E. Reichenbach, T. Tadesse, and W.J. Waltman. 2003. *Geospatial Decision Support for Drought Risk Management*, *Communication of the ACM*, 46 (1), 35-37.

Brown, J.F., T. Tadesse, and B.C. Reed. 2002. *Integrating Satellite Data and Climate Data for US Drought Mapping and Monitoring*, *Proceedings of the 15th Conference on Biometeorology and Aerobiology joint with 16th International Congress on Biometeorology*, Kansas City, MO, USA, October/November, 147-150.

Harms, S.K., J. Deogun, and T. Tadesse. 2002. *Discovering Sequential Rules with Constraints and Time Lags in Multiple Sequences*, *Proceedings of the 2002 National Conference on Digital Government Research*, Los Angeles, CA, USA, May, 235-241.

- Harms, S.K., D. Li, J. Deogun, and T. Tadesse. 2002. *Efficient Rule Discovery in a Geospatial Decision Support System*, *Proceedings of the 2002 International Symposium on Methodologies for Intelligent Systems*, Lyon, France, 432-441.
- Tadesse, T. 2002. *Identifying Drought and Its Associations with Climatic and Oceanic Parameters Using Data Mining Techniques*, *Ph.D. Dissertation*, University of Nebraska-Lincoln, 133 p.
- Tadesse, T., M.J. Hayes, D.A. Wilhite, and S.K. Harms. 2002. *Data Mining and Knowledge Discovery of Drought in Nebraska*, *Proceedings of the 15th Conference on Biometeorology and Aerobiology, joint with 16th International Congress on Biometeorology*, Kansas City, MO, USA, October/November, 151-153.
- Harms, S.K., J. Deogun, J. Saquer, and T. Tadesse, 2001. *Discovering Representative Episodal Association Rules from Event Sequences Using Frequent Closed Episode Sets and Event Constraints*, *Proceedings of the 2001 IEEE International Conference on Data Mining*, San Jose, CA, USA, November 29-December 2, 603-606.
- Harms, S.K., S. Goddard, S.E. Reichenbach, W.J. Waltman, and T. Tadesse. 2001. *Data Mining in a Geospatial Decision Support System for Drought Risk Management*, *Proceedings of the 2001 National Conference on Digital Government Research*, Los Angeles, CA, USA, May, 9-16.
- Tadesse, T., 2000. *Drought and its Predictability in Ethiopia*, in *Drought: A Global Assessment* (D.A. Wilhite, ed.), *Routledge Hazards and Disaster Series*, 1, 135-142.

OTHER PROFESSIONAL ACTIVITIES

Member, National Geographic Society, 2002-present

Member, American Meteorological Society, 2002-present

BRIGITTE TENHUMBERG, Research Assistant Professor, 100% Research

Areas of Interest: Theoretical Ecology, Conservation Biology, Wildlife Management

Contact: btenhumberg2@unl.edu, 402/472-0267

EDUCATION

Dipl.-Ing. Faculty of Horticulture, University of Hannover, FRG (1988)

Ph.D. Faculty of Agriculture, University of Göttingen, FRG (1992)

PROFESSIONAL EXPERIENCE

2003-present Assistant Professor, School of Natural Resources, University of Nebraska-Lincoln

2000-2002 Postdoctoral Fellow, The Ecology Centre, University of Queensland, Australia

1999-2000 Maternity Leave

1995-1999 Postdoctoral Fellow, University of Adelaide, Australia

1993-1995 Postdoctoral Fellow, Simon Fraser University, Canada

1992-1992 Research Assistant, University of Göttingen, FRG

TEACHING

Courses Taught (Fall, Spring, Summer)

BIOL2005 Population Modeling (FO1, FO2)

Masters and Doctoral Students Advised

Gitta Siekman (PhD Applied and Molecular Biology 2002) Food Foraging in Adult Parasitoid *Cotesia rubecula*: How Sugar Sources Contribute to Survival and Reproduction.

Sheridan Purvis (Honours, Applied and Molecular Biology 1996) The Effects of Host Stage, Density and Distribution on the Patch Residence Time of *Cotesia rubecula* (Hymenoptera: Braconidae).

RESEARCH

My research interests comprise life history theory, the evolutionary ecology of individual behavior and populations, and the applications of these to conservation ecology. I use mathematical models tailored to specific biological systems to increase our understanding of ecological processes. My most recent work uses decision theory to address questions in applied population ecology including active adaptive management decisions and sustainable harvest of wildlife. Decision theory uses mathematical tools from economics, fisheries, conservation biology, and pest management to make optimal decisions in the presence of

uncertainty about the system. In the past I used insects as model organisms, but my work has recently expanded to include mammals such as Arabian oryx and kangaroos. During the last five years, I have given 8 invited seminars and presented my research 8 times at 3 different national and international conferences, including the Ecological Society of America, the Ecological Society of Australia, and the Modeling and Simulation Society of Australia and New Zealand.

I have published my work in a variety of journals (40% first author papers):

- ten papers in refereed journals (four first author papers), including *American Naturalist* (second highest ranked primary publication journal in Ecology), *Journal of Animal Ecology* (seventh highest ranked primary publication journal in Ecology), and *Oikos*. Seven papers (four first author papers) were published in 2000 and 2001.
- three refereed conference papers
- one article in the Australasian Newsletter of IUCN specialist group

SELECTED GRANTS AND CONTRACTS

Evaluating the Genetic Consequences of Size-selective Harvesting on Kangaroo Populations (with Hugh P. Possingham), Murray-Darling Basin Commission, AU\$48,000; Oct. 2001-June 2002.

Influence of Individual Strategies of Resource Exploitation on Population Processes in a Patchy Environment: Dispersal of Foragers in Response to the Distribution of Resources (with Mike A. Keller and Hugh P. Possingham), Australian Research Council Small Grant Scheme, AU\$10,000; Dec. 1997.

Effects of State (e.g. Hunger Level, Age) and Life History on Foraging Decisions and Initiation of Pupation of Aphidophagous Syrphid Larvae, German Research Council, Postdoctoral Fellowship, July 1993-June 1995.

SELECTED PUBLICATIONS

Tyre, A.J., M. Bull, B. Tenhumberg, and N. Chilton. 2003 (in press). *Weak Density Dependent Effects on *Aponomma hydrosauri*, an Ectoparasite of Reptiles*, **Australian Journal of Ecology**.

Tyre, A.J., B. Tenhumberg, S.A. Field, D. Niejalke, K. Parris, and H.P. Possingham. 2003 (in press). *Improving Precision and Reducing Bias in Biological Surveys by Estimating False Negative Error Rates in Presence-absence Data*, **Ecological Applications**.

Siekmann, G., B. Tenhumberg, and M.A. Keller. 2001. *Feeding and Survival in Parasitic Wasps: Sugar Concentration and Timing Matters*, *Oikos*, 95 (3), 425-430.

- Tenhumberg, B., M.A. Keller, and H.P. Possingham. 2001. *Using Cox's Proportional Hazard Models to Implement Optimal Strategies: An Example from Behavioural Ecology*, **Mathematical and Computer Modelling**, 33, 597-607.
- Tenhumberg, B., M.A. Keller, H.P. Possingham, and A.J. Tyre. 2001. *The Effect of Resource Aggregation at Different Scales: Optimal Foraging Behaviour of Cotesia rubecula*, **The American Naturalist**, 158 (5), 505-518.
- Tenhumberg, B., M.A. Keller, H.P. Possingham, and A.J. Tyre. 2001. *Optimal Patch Leaving Behaviour: A Case Study Using the Parasitoid Cotesia rubecula*, **Journal of Animal Ecology**, 70, 683-691.
- Tenhumberg, B., A.J. Tyre, and B.D. Roitberg. 2000. *Influence of Food Supply on Variation in Adult Weight and Developmental Time in Syrphids*, **Journal of Theoretical Biology**, 202, 257-272.
- Tyre, A.J. and B. Tenhumberg. 2000. *Hidden Mechanisms Generate Negative Feedbacks in a Stochastic Model*, **Australian Journal of Ecology**, 25, 305-307.
- Tyre, A.J., B. Tenhumberg, M.A. McCarthy, and H.P. Possingham. 2000. *Swapping Space for Time and Unfair Tests of Ecological Models*, **Australian Journal of Ecology**, 25, 327-331.
- Bouskila, A., M.A. Robinson, B.D. Roitberg, and B. Tenhumberg. 1998. *Life-history Decisions under Predation Risk: Importance of a Game Perspective*, **Evolutionary Ecology**, 12, 701-715.

OTHER PROFESSIONAL ACTIVITIES

- Expert Witness at the Australian Administrative Tribunal hearing, Sydney, Australia, 2002*
- Invited Chair, Congress of Entomology, Göttingen, FRG, 1995*
- Member, German Society for General and Applied Entomology, 1988-present*
- Member, Ecological Society of Australia, 2001-present*
- Reviewer for American Naturalist, Behavioral Ecology, Animal Behaviour, Ecology Letters, Bulletin of Entomological Research, National Science Foundation*

ANDREW J. TYRE, Assistant Professor, 40% Teaching, 60% Research

Areas of Interest: Statistical Ecology, Simulation Modeling, Population Ecology

Contact: atyre2@unl.edu, 402/472-4054

EDUCATION

B.S. Zoology, University of Alberta, Canada (1991)

M.S. Behavioural Ecology, Simon Fraser University (1994)

Ph.D. Agriculture and Natural Resource Science, University of Adelaide, Australia (1999)

PROFESSIONAL EXPERIENCE

2003-present Assistant Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln

2002-2003 Research Scientist, CSIRO Marine Research, Cleveland

1999-2001 Postdoctoral Fellow, University of Queensland

TEACHING

Courses Taught (Fall, Spring, Summer)

ZOOL 4007 University of Queensland, Quantitative Ecology (FO1)

MATH 4800 University of Queensland, Mathematical Biology (FO1)

RESEARCH

At a broad scale, I am interested in using theoretical models to understand real ecological systems at scales larger and longer than can be addressed with traditional experimental and observational studies. At the same time, I am committed to connecting my models to observations of real systems. Exploring methods for challenging models with real data (Tyre and Tenhumberg, 2000, *Austral Ecology*; McCarthy et al., 2001, *Conservation Biology*) has led me to model the observation process itself, and to work on modern statistical methods to quantitatively fit ecological models to empirical data (Tyre et al., in press). My other interest is in identifying the limits of what simple models can tell us about ecological systems (e.g. Tyre et al., 2001, *Ecological Applications*). In this work I have used spatially explicit simulation models to create artificial realities sampled by virtual ecologists. In this way I am able to directly link the kinds of data collected by ecologists with the underlying dynamic processes.

SELECTED GRANTS AND CONTRACTS

Predicting Metapopulation Dynamics with Multiple Patch States, Australian Research Council Linkage Grant and Western Mining Corporation Pty Ltd., AU\$235,000; June 2002–Dec. 2004.

SELECTED PUBLICATIONS

- Tyre, A.J., C.M. Bull, B. Tenhumberg, and N. Chilton. 2003 (in press). *Indirect Evidence of Density Dependent Population Regulation in Aponomma hydrosauri (Acari: Ixodidae), an Ectoparasite of Reptiles*, **Austral Ecology**.
- Tyre, A.J., B. Tenhumberg, S.A. Field, D. Niejalke, K. Parris, and H.P. Possingham. 2003 (in press). *Improving Precision and Reducing Bias in Biological Surveys by Estimating False Negative Error Rates in Presence-absence Data*, **Ecological Applications**.
- Field, S.A., A.J. Tyre, M. Possingham, and H.P. Possingham. 2002. *Estimating Bird Species Richness: How Should Repeat Surveys Be Organized in Time?*, **Austral Ecology**, 27, 624–629.
- McCarthy, M.A., H.P. Possingham, J. Day, and A.J. Tyre. 2001. *Testing the Accuracy of Population Viability Analysis*, **Conservation Biology**, 15, 1030–1038.
- Tenhumberg, B., H.P. Possingham, and A.J. Tyre. 2001. *The Effect of Resource Aggregation on Different Scales: Optimal Foraging Behaviour of Cotesia rubecula*, **The American Naturalist**, 158, 505–518.
- Tenhumberg, B., M. Keller, H.P. Possingham, and A.J. Tyre. 2001. *Optimal Patch Leaving Behaviour: A Case Study Using the Parasitoid Cotesia rubecula*, **Journal of Animal Ecology**, 70, 683–691.
- Tyre, A.J., H.P. Possingham, and D.B. Lindenmayer. 2001. *Matching Observed Pattern with Model Process: Can Territory Occupancy Provide Information about Life History Parameters*, **Ecological Applications**, 11, 1722–1737.
- Tyre, A.J., H.P. Possingham, and D.P. Niejalke. 2001. *Detecting Environmental Impacts on Metapopulations of Mound Spring Invertebrates - Assessing an Incidence Function Model*, **Environment International**, 27, 225–229.
- Tyre, A.J. and B. Tenhumberg. 2000. *Hidden Mechanisms Generate Negative Feedbacks in a Stochastic Model*, **Australian Journal of Ecology**, 25, 305–307.
- Tyre, A.J., B. Tenhumberg, M.A. McCarthy, and H.P. Possingham. 2000. *Swapping Space for Time and Unfair Tests of Ecological Models*, **Australian Journal of Ecology**, 25, 327–331.

SHASHI B. VERMA, Professor, 15% Teaching, 60% Research, 25%

Administration

Areas of Interest: Atmospheric Trace Gas Dynamics, Carbon Sequestration,
Micrometeorology

Contact: sverma1@unl.edu, 402/472-6702

EDUCATION

B.S. Ranchi University, Ranchi, India (1965)

M.S. University of Colorado, Boulder, Colorado (1967)

Ph.D. Colorado State University, Fort Collins, Colorado (1971)

PROFESSIONAL EXPERIENCE

2002-present Charles Bessey Professor of Natural Resource Sciences, University of
Nebraska-Lincoln (UNL)

1984-present Professor, School of Natural Resource Sciences (formerly, Department
of Agricultural Meteorology), University of Nebraska-Lincoln, Tenured 1981

1997-present Director, Great Plains Regional Center of the National Institute for
Global Environmental Change

1978-1984 Associate Professor, Center for Agricultural Meteorology and Climatology,
UNL

1974-1978 Assistant Professor, Center for Agricultural Meteorology and Climatology, and
Department of Agricultural Engineering, UNL

1974 Staff Meteorologist, Dames and Moore, San Francisco, California

1972-1974 Postdoctoral Research Associate, Agricultural Meteorology Sect., Horticulture
and Forestry, UNL

1971-1972 Postdoctoral Fellow, Colorado State University, Fort Collins, Colorado

HONORS AND AWARDS

Charles Bessey Professor of Natural Resource Sciences, University of Nebraska-Lincoln
(2002)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 408/808 Microclimate: The Biological Environment (F98, F99, F00, F01, F02)

NRES 954 Turbulent Transfer in the Atmospheric Surface Layer (S97, S99, S01)

Masters and Doctoral Students Advised

Andrew E. Suyker (Ph.D. Agricultural Meteorology/Agronomy 2000) Carbon Dioxide and Methane Exchange in a Boreal Wetland.

RESEARCH

My research focuses on the exchange of atmospheric trace gases (e.g., carbon dioxide, methane) in key ecosystems. In recent years, I have concentrated on measurement and analysis of carbon sequestration in grasslands and agricultural ecosystems, employing micrometeorological techniques (e.g., eddy covariance). About two years ago, working with ten faculty members from UNL's School of Biological Sciences and Departments of Agronomy and Horticulture, Agricultural Economics and Biological Systems Engineering, I began leading a focused interdisciplinary research program (funded by three major grants from the U.S. Department of Energy and U.S. Department of Agriculture) to quantify carbon sequestration in dryland and irrigated agroecosystems and to improve understanding of relevant biophysical controlling factors. My recent research has provided systematic determination of carbon dioxide exchange in key ecosystems, which should lead to an improved prediction of future climate. SiB2 is perhaps the only comprehensive terrestrial biosphere model fully integrated in a GCM (General Circulation Model) and thus, has the capability of modeling and prediction at global scales. The modeling team at the Carnegie Institution of Washington and Stanford University has indicated that my measurements of mass and energy fluxes in a grassland ecosystem provided the first (and perhaps the only) thorough testing and resultant improvement of this important model, needed to advance our understanding of the crucial atmospheric-biospheric processes.

SELECTED GRANTS AND CONTRACTS

Carbon Sequestration in Dryland and Irrigated Ecosystems: Quantification at Different Scales for Improved Prediction (Principal Investigator, with K.G. Cassman, T.A. Arkebauer, A. Dobermann, K.G. Hubbard, J.M.H. Knops, D.T. Walters, and H. Yang), U.S. Department of Energy-Office of Biological and Environmental Research, \$900,000; 2003-2006.

Carbon Sequestration and Global Climate Change (Principal Investigator, with R. Ballinger, K.G. Cassman, T.J. Arkebauer, A. Dobermann, A.A. Gitelson, K.G. Hubbard, J. Knops, D.C. Rundquist, E.A. Walter-Shea, D.T. Walters, and H. Yang), U.S. Department of Energy-EPSCoR, \$1,000,006; 2003-2004 (16 months).

Carbon Sequestration in Agriculture (Principal Investigator, with T.A. Arkebauer, K. Cassman, A. Dobermann, K.G. Hubbard, J.M.H. Knops, and D. Walters), U.S.

Department of Agriculture: Consortium for Agricultural Soils Mitigation of Greenhouse Gases, \$621,762; 2002-2004.

Measurement and Modeling of Net Exchange of Carbon Dioxide in Grassland and Agricultural Ecosystems in the ARM-CART Region (Principal Investigator, with J.A. Berry), National Institute for Global Environmental Change, the Great Plains Regional Center, \$481,525; 1999-2002.

Characterization and Improvement of EOS Land Products Using Measurements at AmeriFlux Grassland and Wheat Sites in the ARM-CART Region (Co-PI with E.A. Walter-Shea), National Aeronautics and Space Administration, \$505,000; 1998-2001.

Net Exchange of Carbon Dioxide in Grassland and Agricultural Ecosystems in the ARM-CART Region: Modeling and Year-Round Measurement (Principal Investigator, with J.A. Berry), National Institute for Global Environmental Change, the Great Plains Regional Center, \$504,800; 1996-1999.

SELECTED PUBLICATIONS

Suyker, A.E., S.B. Verma, and G.G. Burba. 2003. *Interannual Variability in Net CO₂ Exchange of a Native Tallgrass Prairie*, **Global Change Biology**, 9, 255-265.

Gu, L., D. Baldocchi, S.B. Verma, T.A. Black, T. Vesala, E.M. Falge, and P.R. Dowty. 2002. *Advantages of Diffuse Radiation for Terrestrial Ecosystem Productivity*, **Journal of Geophysics Research**, 107 (D6), 10.1029/2001JD001242.

Arkebauer, T.J., J.P. Chanton, S.B. Verma, and J. Kim. 2001. *Field Measurements of Internal Pressurization of Phragmites Australis and Implications for Regulation of Methane Emissions in a Mid-Latitude Prairie Wetland*, **American Journal of Botany**, 88, 653-658.

Burba, G.G. and S.B. Verma. 2001. *Prairie Growth, PAR Albedo and Seasonal Distribution of Energy Fluxes*, **Agricultural and Forest Meteorology**, 107, 227-240.

Suyker, A.E. and S.B. Verma. 2001. *Year-Round Observations of the Net Ecosystem Exchange of Carbon Dioxide in a Native Tallgrass Prairie*, **Global Change Biology**, 7, 279-289.

Burba, G.G., S.B. Verma, and J. Kim. 1999. *Energy Fluxes of an Open Water Area in a Mid-Latitude Prairie Wetland*, **Boundary-Layer Meteorology**, 91, 495-504.

Burba, G.G., S.B. Verma, and J. Kim. 1999. *A Comparative Study of Surface Energy Fluxes of Three Communities (Phragmites Australis, Scirpus Acutus and Open Water) in a Prairie Wetland Ecosystem*, **Wetlands**, 19, 451-457.

Kim, J., S.B. Verma, and D.P. Billesbach. 1998. *Seasonal Variation in Methane Emission From a Temperate Phragmites-Dominated Marsh: Effect of Growth Stage and Plant-Mediated Transport*, *Global Change Biology*, 5, 433-440.

Kim, J., S.B. Verma, D.P. Billesbach, and R.J. Clement. 1998. *Diel Variation in Methane Emission From a Midlatitude Prairie Wetland: Significance of Convective Throughflow in Phragmites Australis*, *Journal of Geophysical Research*, 103, 28,029-28,039.

Shurpali, N.J. and S.B. Verma. 1998. *Micrometeorological Measurements of Methane Flux in a Minnesota Peatland During Two Growing Seasons*, *Biogeochemistry*, 40, 1-15.

OTHER PROFESSIONAL ACTIVITIES

Member, SNRS-CSD Integration Committee, 2002-date

Nebraska Representative on the Executive Committee of the Consortium for Agricultural Soils Mitigation of Greenhouse Gases (CASMGs), 2001-date

Member, Advisory Committee, School of Natural Resource Sciences, 2000-date

Member, Carbon Sequestration Advisory Committee (mandated by Legislative Bill 957 and appointed by Governor Mike Johanns), 2000-date

Member, Steering Committee of the "Fluxnet" Project intended to unify the global array of regional tower flux networks for validating EOS terrestrial carbon, water and energy budgets, 1998-date

Member, Steering Committee, U.S. National Flux Network, AmeriFlux, 1996-date

Board of Editors, Agricultural and Forest Meteorology, An International Journal, 1994-date

Member, University of Nebraska Agricultural Research and Development Center Advisory Committee, 1984-date

Nebraska Representative on the National Atmospheric Deposition Program, 1978-date

Member, Blue Sky Committee, University of Nebraska-Lincoln (appointed by Senior Vice Chancellor Richard Edwards), 2002-2003

Member, Search Committee, Vice Chancellor for Research, University of Nebraska-Lincoln, 2000-2001

**ELIZABETH A. WALTER-SHEA, Professor, 35% Teaching, 65% Research
(25% Teaching Coordinator)**

Areas of Interest: Environmental Biophysics, Remote Sensing

Contact: ewalter-shea1@unl.edu, 402/472-1553

EDUCATION

B.S. Geography, University of Central Arkansas (1978)

M.S. Geography, Texas A&M University (1981)

Ph.D. Agronomy (Agricultural Meteorology emphasis), University of Nebraska-Lincoln
(UNL) (1987)

PROFESSIONAL EXPERIENCE

2003-present Professor, School of Natural Resources, University of Nebraska-Lincoln

1997-2003 Associate Professor, School of Natural Resource Sciences, University of
Nebraska-Lincoln

1995-1997 Associate Professor, Department of Agricultural Meteorology, University of
Nebraska-Lincoln

1989-1995 Assistant Professor, Department of Agricultural Meteorology, University of
Nebraska-Lincoln

1987-1989 Assistant Professor (Special Appointment), Department of Agronomy,
University of Nebraska-Lincoln

HONORS AND AWARDS

*Editors' Citation for Excellence in Manuscript Review, American Society of Agronomy
(2002)*

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 408/808 Microclimate: The Biological Environment, (team-taught) (F98, F99,
FO0, FO1, FO2)

NRES 908 Solar Radiation Interactions at the Earth's Surface, (S98, SO0, SO2)

NRES 491/891 Seminar in Natural Resource Sciences (team-taught) (FO2)

Masters and Doctoral Students Advised

Kham Noam Nang (Ph.D. Natural Resource Sciences, expected 2003) Understanding the
Fraction of PAR Utilized by Vegetation and its Relation to Remotely-Sensed Data.

Martha Durr (M.S. Agronomy 1998) *The Penetration of Photosynthetically Active and Ultraviolet Radiation into Vegetative Canopies.*

Liqiang Chen (Ph.D. Agronomy, withdrew) *Light Interactions with Conifer Tree Elements.*

SNRS Teaching Coordinator, August 2000-present

RESEARCH

Relationships between remotely-sensed spectral properties of vegetated surfaces and biophysical properties; ultraviolet radiation interactions in vegetative canopies

SELECTED GRANTS AND CONTRACTS

Carbon Sequestration and Global Climate Change (with S. Verma, K. Cassman et al.), Department of Energy - EPSCoR. \$840,000; 2000-2003.

Characterization and Improvement of EOS land Products Using Measurements at AmeriFlux Grassland and Wheat Sites in the ARM/CART Region (with S. Verma et al.), National Aeronautics and Space Administration EOS Validation Program, \$505,000; 1998-2002.

Analysis of the Effect of Changing Climate Variability on Crop Production in the Southeast: an Integration of Stochastic Modeling, Regional Climate Modeling, Crop Modeling and Remote Sensing Techniques (with D. Rundquist, L. Mearns et al.), National Aeronautics and Space Administration, \$1,066,878 (@ UNL \$185,146); 1997-1999.

Determining Vegetation Structural Parameters Amenable to Remote Sensing and Ecological Modeling of Complex 3-D Surfaces (with J. Privette), National Aeronautics and Space Administration, \$30,000 (@ UNL \$6500); 1997.

Ultraviolet Dosimetry in Crop Canopies (with K. Hubbard, G. Yuen, and G. Horst), University of Nebraska Agricultural Research Division Interdisciplinary Research Grant, \$39,800; 1996-1998.

Radiation and Gas Exchange of Understory Species at BOREAS (with T. Arkebauer), National Aeronautics and Space Administration, \$60,800; 1996-1998.

SELECTED PUBLICATIONS

Hanan, N. P., G. Burba, S.B. Verma, J.A. Berry, A. Suyker, and E.A. Walter-Shea. 2002. *Inversion of Net Ecosystem CO₂ Flux Measurements for Estimation of Canopy PAR Absorption, Global Change Biology*, 8, 563-574.

- Peters, A.J., E.A. Walter-Shea, J. Lei, A. Viña, M. Hayes, and M.D. Svoboda. 2002. *Drought Monitoring with NDVI-based Standardized Vegetation Index, Photogrammetric Engineering & Remote Sensing*, 68, 71-75.
- Yuen, G., C. Jochum, L. Giesler, M. Shulski, E. Walter-Shea, K. Hubbard, and G. Horst. 2002. *UV-B Biodosimetry in Turfgrass Canopies, Crop Science*, 42, 859-868.
- Antunes, M.A.H., E.A. Walter-Shea, and M.A. Mesarch. 2001. *Test of an Extended Mathematical Approach to Calculate Maize Leaf Area Index and Leaf Angle Distribution, Agricultural and Forest Meteorology*, 108, 45-53.
- Weiss, A., T.J. Arkebauer, and E.A. Walter-Shea. 2001. *Predicting Albedo in Two Heliotropic Crops, Agricultural Systems*, 68, 137-150.
- Privette, J.L., G.P. Asner, J. Conel, K.F. Huemmrich, R. Olson, A. Rango, A.F. Rahman, K. Thome, and E.A. Walter-Shea. 2000. *The EOS Prototype Validation Exercise (PROVE) at the Jornada: Overview and Lessons Learned, Remote Sensing of Environment*, 74, 1-12.
- Mesarch, M.A., E.A. Walter-Shea, G.P. Asner, E.M. Middleton, and S.S. Chen. 1999. *A Revised Measurement Methodology for Conifer Needles Spectral Optical Properties Evaluating the Influence of Gaps Between Elements, Remote Sensing of Environment*, 68, 177-192.
- Walter-Shea, E.A., J.L. Privette, D. Cornell, M.A. Mesarch, and C.J. Hays. 1997. *Relations Between Directional Spectral Vegetation Indices and Leaf Area and Absorbed Radiation in Alfalfa, Remote Sensing of Environment*, 61, 162-177.
- 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, Journal of Geophysical Research*, 97, 18,925-18,934.
- Walter-Shea, E.A., J.M. Norman, and B.L. Blad. 1989. *Leaf Bidirectional Reflectance and Transmittance in Corn and Soybean, Remote Sensing of Environment*, 29, 161-174.

OTHER PROFESSIONAL ACTIVITIES

- Occasional Reviewer for Agronomy Journal, Remote Sensing of Environment, Photogrammetric Engineering & Remote Sensing, NASA Research Projects, NASA Research Proposals, UNL Agricultural Research Division Research Projects*
- Graduate Faculty Fellow, University of Nebraska-Lincoln, 1993-present*
- Member, CASNR Faculty Advisory Council, 1994-1996*
- Member, ARD Advisory Council, 1995-1997; Chair of Widaman Trust Distinguished Graduate Assistant Award Committee and Hardin Distinguished Graduate Fellowship*

Program Committee; Served as secretary of the ARD-AC during the 1996-97 academic year

Member, Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) User Working Group (UWG), 1995-1998

Member, International Geoscience and Remote Sensing Symposium (IGARSS '96) Steering and Technical Committees, 1996

Member, SNRS Implementation Committee and Support Subcommittee, 1996-1997

Member, Academic Senate Library Committee, 1998-2000

Chair, SNRS Graduate Committee, 1998-2000

Member, School of Natural Resource Sciences Nominating Committee, 1998-2001

Ex-officio member, SNRS Curriculum and Graduate Committees, 1999 to present

Member, CASNR Recruitment, Retention and Placement (RRP) Committee, 2001 to present

Co-chair, Natural Resource Sciences Graduate Specialization (Bio-Atmospheric Interactions)

Member, professional societies: American Society of Agronomy, American Society for Photogrammetry and Remote Sensing, Ecological Society of America, American Meteorological Society, Institute of Electrical and Electronics Engineers (Associate Member), International Society for Optical Engineering (Associate Member), Gamma Sigma Delta

DAVID A. WEDIN, Associate Professor, 40% Teaching, 60% Research

Areas of Interest: Ecosystem Ecology, Grassland and Forest Ecology

Contact: dwedin1@unl.edu, 402/472-9608

EDUCATION

B.A. Biology / Paracollege, St.Olaf College (1981)

Ph.D. Ecology, University of Minnesota-Minneapolis (1990)

PROFESSIONAL EXPERIENCE

2000-present Associate Professor, School of Natural Resources, University of Nebraska-Lincoln

1998-2000 Assistant Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln

1997-1998 Associate Professor (tenured), Department of Botany, University of Toronto

1992-1997 Assistant Professor, Department of Botany, University of Toronto

1990-1992 Postdoctoral Research Associate, NRRI, University of Minnesota-Duluth

HONORS AND AWARDS

Junior Faculty Excellence in Research Award, Agricultural Research Division, University of Nebraska-Lincoln (1999)

National Science Foundation Graduate Fellow (1983-1987)

TEACHING

Courses Taught (Fall, Spring, Summer)

BIOS 320 Principles of Ecology (FOO, FO1, FO2)

BIOS 457/857 Ecosystem Ecology (SOO, SO2)

NRES 299 Ecosystems of Northeast Nebraska (FOO)

NRES 423/823 Integrated Resource Management (S99, SOO, SO1, SO2, SO3)

NRES 424/824 Forest Ecology (F98, F99, FOO, FO1, FO2)

NRES 810 Landscape Ecology (S99, SO1)

Masters and Doctoral Students Advised

Cullen Robbins (M.S. Natural Resource Sciences, expected 2003) Analyses of High Resolution Hyperspectral Imagery for Ponderosa Pine Woodlands.

Xiaoping Ding (M.S. Natural Resource Sciences 2002) Effects of Ponderosa Pine Forest Establishment on Nitrogen Cycling in the Nebraska Sandhills.

RESEARCH

As an ecosystem ecologist, I use an interdisciplinary approach to study the function and structure of Great Plains ecosystems in a period of unprecedented global change. These ecosystems include grasslands, woodlands and forests. Areas of emphasis include productivity and carbon balance, nutrient cycling, soil organic matter dynamics, ecosystem water balance and the “scaling up” of plot level data to landscape and regional scales.

SELECTED GRANTS AND CONTRACTS

Sand Hills Biocomplexity: Integrating Biogeophysical Processes Across Space and Time (with 14 others), National Science Foundation, \$1,800,000; Sept. 2003–Aug. 2007.

Sandhills Biocomplexity (with 9 others), UNL Strategic Research Cluster Grant Program, \$50,000; July 2002–June 2004.

Biodiversity, Disturbance and Ecosystem Functioning at the Prairie–forest Border (with D. Tilman and 7 others), National Science Foundation (Long Term Ecological Research), \$4,200,000; Sept. 2000–Aug. 2006.

Spatiotemporal Coupling of Ecological and Geological Dynamics in the Nebraska Sand Hills (with T.J. Arkebauer, S.C. Fritz, G.M. Henebry, and D. Loope), National Science Foundation, \$100,000; Sept. 2000–Aug. 2002.

Interaction of Biodiversity, CO₂ and N on ecosystem Functioning (with P. Reich and 4 others), Department of Energy (TECO), \$1,500,000; Sept. 1996–Aug. 1999.

SELECTED PUBLICATIONS

Wedin, D.A. 2003 (in press). *C₄ Grasses: Resource Use, Ecology and Global Change*, Chapter in *Warm Season Grasses* (L. Moser, ed.), Crop Science Society of America.

Craine, J.M., D.A. Wedin, F.S. Chapin, and P.B. Reich. 2003. *Relationship Between the Structure of Root Systems and Resource Use for 11 North American Grassland Plants*, *Plant Ecology*, 165, 85–100.

Craine, J.M., D.A. Wedin, and P.B. Reich. 2001. *The Response of Soil CO₂ Flux to Changes in Atmospheric CO₂, Nitrogen Supply, and Plant Diversity*, *Global Change Biology*, 7, 947–953.

Reich, P., J. Knops, D. Tilman, J. Craine, D. Ellsworth, M. Tjoelker, T. Lee, D. Wedin, S. Naeem, D. Behauidin, G. Hendrey, S. Jose, K. Wragge, J. Goth, and W. Bengtson. 2001. *Plant Diversity Enhances Ecosystem Responses to Elevated CO₂ and Nitrogen Deposition*, *Nature*, 410, 809–812.

Reich, P.B., D.W. Petersen, D.A. Wedin, and K. Wragge. 2001. *Fire and Vegetation Effects on Productivity and Nitrogen Cycling Across a Forest–grassland Continuum*, *Ecology*, 82, 1703–1719.

- Tilman, D., P.B. Reich, J. Knops, D. Wedin, T. Mielke, and C. Lehman. 2001. *Diversity and Productivity in a Long-term Grassland Experiment*, *Science*, 294, 843-845.
- Gholz, H.L., D.A. Wedin, S. Smitherman, M. Harmon, and W.J. Parton. 2000. *Long-term Dynamics of Pine and Hardwood Litter in Contrasting Environments: Toward a Global Model of Decomposition*, *Global Change Biology*, 6, 751-766.
- Sage, R.F., D.A. Wedin, and M. Li. 1999. *The Biogeography of C₄ Photosynthesis: Patterns and Controlling Factors*, in *The Biology of C₄ Photosynthesis* (R.F. Sage and R.K. Monson, eds.), Academic Press, 313-373.
- Johnson, N.C. and D.A. Wedin. 1997. *Soil Carbon, Nutrients, and Mycorrhizae During Conversion of a Dry Tropical Forest to Grassland*, *Ecological Applications*, 7, 171-182.
- Wedin, D.A. and D. Tilman. 1996. *Influence of Nitrogen Loading and Species Composition on the Carbon Balance of Grasslands*, *Science*, 27, 1720-1723.

OTHER PROFESSIONAL ACTIVITIES

Coordinator, Sand Hills Biocomplexity Project (<http://sandhills-biocomplexity.unl.edu>)

Lead author, NSF site review team, Niwot Ridge LTER Site, University of Colorado, July 2001

Participant, National Science Foundation workshop on "Linking Ecological Biology and Geoscience", 2001

Guest course instructor, "Interactions between element cycles and ecosystems", graduate course at Wageningen Agricultural University, The Netherlands, April 1999

Author or co-author of 15 conference presentations, 1998-2003

Presented 10 invited academic lectures at other institutions, 1998-2003

*Associate Editor, **American Naturalist**, 1997-2000*

Ad hoc reviewer for 25 academic journals (5-10 reviews per year)

UNL committee memberships: ARD advisory council, Life Sciences Curriculum Coordinating Committee, Natural Resources Undergraduate Curriculum Committee

Development of Nebraska Field Research Sites website

(<http://snrs.unl.edu/wedin/nefieldsites>)

ALBERT WEISS, Professor, 85% Teaching, 15% Research

Areas of Interest: Crop simulation modeling, agricultural climatology

Contact: aweiss1@unl.edu, 402/472-6761

EDUCATION

B.S. City College of New York (1962)

M.S. Rutgers University (1969)

Ph.D. Cornell University (1975)

PROFESSIONAL EXPERIENCE

1997-present Professor, School of Natural Resource Sciences, University of Nebraska-Lincoln (UNL)

1992-1997 Professor, Department of Agricultural Meteorology, University of Nebraska-Lincoln

1985-1992 Associate Professor, Department of Agricultural Meteorology, University of Nebraska-Lincoln

1981-1985 Associate Professor, Panhandle Research and Extension Center, University of Nebraska

Jan.-Feb. 1983 Visiting Scientist, Agricultural Physics Section, Department of Physics, University of Dar es Salaam, Dar es Salaam, Tanzania

1974-1981 Assistant Professor, Panhandle Research and Extension Center, University of Nebraska

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 906 Crop Growth and Yield Modeling (S98, S00, S02)

NRES 907 Agricultural Climatology (S99, S01, S03)

Masters and Doctoral Students Advised

Nereu A. Streck. (Ph.D. Agronomy 2002) Developmental and Physiological Responses of Winter Wheat (*Triticum aestivum* L.) to Selected Environmental Factors.

Jaepil Won (M.S. Agronomy 2001) Assessing Winter Wheat Responses to Climate Change Scenarios: A Simulation Study.

Qingwu Xue (Ph.D. Agronomy 2000) Phenology and Gas Exchange in Winter Wheat (*Triticum aestivum* L.).

Alex Moreno-Sotomayor (M.S. Agronomy 1999) Maize Leaf Anatomy and Gas Exchange as a Function of Age and Abiotic Stresses.

RESEARCH

My current research interests are in the simulation of winter wheat growth, development and yield and aspects of agricultural climatology related to crop simulation modeling. Regarding the former interest, improved algorithms for phenological development, leaf appearance, and kernel number have been developed for winter wheat. Current work is on improved algorithms for kernel weight and plant height. Regarding the latter interest, a generalized algorithm to simulate solar irradiance for any location where daily maximum and minimum temperatures are measured has been developed. Current work is on the best method to calculate mean daily air temperature for use in non-linear algorithms.

SELECTED PUBLICATIONS

- Streck, N.A., A. Weiss, Q. Xue, and P.S. Baenziger. 2003 (in press). *Incorporating a Chronology Response into the Prediction of Leaf Appearance Rate in Winter Wheat*, **Annals of Botany**.
- Weiss, A., C.J. Hays, and J. Won. 2003 (in press). *Assessing Winter Wheat Responses to Climate Change Scenarios: A Simulation Study in the U.S. Great Plains*, **Climate Change**.
- Streck, N.A. and A. Weiss. 2003. *A Generalized Vernalization Response Function for Winter Wheat*, **Agronomy Journal**, 155-159.
- Streck, N.A., A. Weiss, and P.S. Baenziger. 2003. *Improving Predictions of Developmental Stages in Winter Wheat: A Modified Wang and Engel Model*, **Agricultural and Forest Meteorology**, 115, 139-150.
- Moreno-Sotomayor, A., A. Weiss, E.T. Paparozzi, and T.J. Arkebauer. 2002. *Stability of Leaf Anatomy and Light Response Curves of Field Grown Maize as a Function of Age and Nitrogen Stress*, **Journal of Plant Physiology**, 159, 819-826.
- Weiss, A., T.J. Arkebauer, and E.A. Walter-Shea. 2001. *Predicting Albedo in Two Heliotropic Crops*, **Agricultural Systems**, 68, 137-150.
- Weiss, A., C.J. Hays, Q. Hu, and W.E. Easterling. 2001. *Incorporating an Estimate of Bias Error in Predicting Solar Radiation and Implications for Yield Forecasting*, **Agronomy Journal**, 93, 1321-1326.
- Weiss, A., L. Van Crowder, and M. Bernardi. 2000. *Communicating Agrometeorological Information to Farming Communities*, **Agricultural and Forest Meteorology**, 103, 185-196.
- Antunes, M.A.H., J.J. Brejda, X. Chen, B.C. Leavitt, E.A. Tsvetsinskaya, A. Weiss, and T.J. Arkebauer. 1998. *Team Research: A Class Project on Scaling up from Leaf to Canopy Synthesis*, **Journal of Natural Resources Life Science Education**, 27, 49-54.

Easterling, W.E., A. Weiss, C.J. Hays, and L.O. Mearns. 1998. *Spatial Scales of Climate Information for Simulating Wheat and Maize Productivity: the Case of the U.S. Great Plains*, *Agricultural and Forest Meteorology*, 90, 51-63.

OTHER PROFESSIONAL ACTIVITIES

Organized symposium "Crop Modeling and Genomics" for the 2000 annual meeting of the American Society of Agronomy

Special associate editor, for the symposium "Crop Modeling and Genomics, published in the Agronomy Journal, 95, 1-113; 2003

Organized symposium "Simulating Plant Processes: Assessments and New Directions" for the 2003 annual meeting of the American Society of Agronomy

PERRY B. WIGLEY, Professor, 50% Survey, 10% Research

Areas of Interest: Cretaceous stratigraphy, geology of the Dakota Aquifer, subsurface geologic mapping

Contact: pwigley@unl.edu, 402/472-7525

EDUCATION

B.S. Geology, Birmingham-Southern College

M.S. Geology, Virginia Polytechnic Institute

Ph.D. Geology, Virginia Polytechnic Institute

PROFESSIONAL EXPERIENCE

1998-Present Professor and Research Geologist, Conservation & Survey Division,
University of Nebraska-Lincoln (UNL)

1987-1998 Director, Conservation and Survey Division, University of Nebraska-Lincoln

1985-1987 Manager of Geology, Texas Eastern Corporation

1982-1985 Exploration Manager, Onshore North America, Texas Eastern Corporation

1981-1982 Senior Staff Explorationist, Texas Eastern Corporation

1980-1981 Assistant State Geologist, Georgia Geologic Survey

1978-1981 Part-time consultant in environmental geology, coal geology and petroleum geology

1974-1980 Professor of Geology, Eastern Kentucky University

1975 Summer Fellow; National Aeronautics and Space Administration

1973-1974 Visiting Associate Professor of Earth Sciences

1970-1974 Associate Professor of Geology, Eastern Kentucky University

1970-1971 Taught summer field camp for University of Kentucky

1967-1970 Assistant Professor of Geology, Eastern Kentucky University

1968-1978 Part-time field geological mapping for the U.S. Geological Survey

RESEARCH

Major research emphasis is to gain a better understanding of the stratigraphy of the Dakota Group in eastern Nebraska.

SURVEY

Dakota atlas of Lancaster County: Building digital databases and constructing maps of the Dakota Aquifer, e.g. top of the Dakota, base of the Dakota, net sand and gravel, total thickness and plotting water chemistry. Eventually this will be expanded to the entire area of eastern Nebraska where the Dakota serves as an aquifer.

SELECTED GRANTS AND CONTRACTS

Dakota Atlas of Lancaster County; Lower Platte South Natural Resources District, \$18,000; NSF/AASG Summer Intern Program, \$4,000; UCARE, \$4,000; 2001-2002 academic year.

SELECTED PUBLICATIONS

Wigley, Perry B., et al. 2003. Atlas of the Dakota Aquifer Atlas in Lancaster County, Nebraska (In review for CSD publication).

Wigley, Perry B. 2001. The Dakota Aquifer as a Sustainable Resource; International Geological Congress, Rio, Invited Paper.

OTHER PROFESSIONAL ACTIVITIES

Arranged for donation of Dakota core and samples from Marathon Petroleum

Served on NSF Grant Review Panels, 2002 and 2003

Reviewed continuing work in Lancaster County with Lower Platte South NRD and Papio-Missouri Tributaries NRD

Have directed eight M.S. theses in paleoecology, hydrogeology, petroleum geology, coal geology and micropaleontology

Directed a doctoral study in environmental ethics for a student at Drew University

DONALD A. WILHITE, Professor and Associate Director, 10% Teaching, 90% Research (25% Research, 65% Scholarly Service)

Areas of Interest: Drought preparedness, mitigation, and policy, climate and drought monitoring, climate impact assessment, development of climate-based decision support tools

Contact: dwilhite2@unl.edu, 402/472-4270

EDUCATION

B.S. Geography, Minor-History, Central Missouri State University-Warrensburg (1967)

M.S. Geography/Climatology, Arizona State University-Tempe (1969)

Ph.D. Geography/Climatology and Water Resources, University of Nebraska-Lincoln (1975)

PROFESSIONAL EXPERIENCE

2002-Present Associate Director, School of Natural Resources, University of Nebraska-Lincoln

1995-Present Professor, School of Natural Resources, and Director, National Drought Mitigation Center and International Drought Information Center, University of Nebraska-Lincoln

1985-1995 Professor and Associate Professor, Department of Agricultural Meteorology, and Director, International Drought Information Center, University of Nebraska-Lincoln

1979-1985 Assistant Professor, Center for Agricultural Meteorology and Climatology (CAMaC), University of Nebraska-Lincoln

HONORS AND AWARDS

Chair and Rapporteur, Drought Discussion Group, U.N. Secretariat for the International Strategy for Disaster Reduction, Geneva (2002 to present)

Member, Editorial Board, *Disaster Prevention and Management: An International Journal* (1996 to present)

Member, Editorial Board, *Advances in Natural and Technological Hazards Research* (book series) Kluwer Academic Publishers (1995 to present)

Member, Editorial Board, *Natural Hazards* (Journal of the International Society for the Prevention and Mitigation of Natural Hazards) (1993 to present)

Member, Editorial Board, *Időjárás* (Journal of the Hungarian Meteorological Service) (1992 to present)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 452/852, GEOG/METR/AGRO 450/850 *Climate and Society* (S 99, SO2)

Masters and Doctoral Students Advised

Tsegaye Tadesse (Ph.D. Agronomy 2002) *Identifying Drought and Its Associations with Climatic and Oceanic Parameters Using Data Mining Techniques.*

Hong Wu (Ph.D. Natural Resources 2002) *Agricultural Drought Risk Assessment: An Operational Model for Nebraska.*

Polly Ann Najarian (M.S. Agronomy 2000) *An Analysis of State Drought Plans: A Model Drought Plan Proposal.*

Olga Wilhelmi (Ph.D. Agronomy 1999) *Methodology for Assessment Vulnerability to Agricultural Drought: A Nebraska Case Study.*

RESEARCH

Emphasis during the past five years has been on the development and improvement of drought planning and risk assessment methodologies, improved drought monitoring through the application of climate and water supply indices and indicators, and the development of vulnerability assessment tools for agricultural drought impacts. New climate-based decision support tools for agriculture and other sectors have been developed to reduce drought risk.

SELECTED GRANTS AND CONTRACTS

National Drought Mitigation Center, CSREES/USDA, annual funding \$200,000; 1995-present.

Risk Assessment and Exposure Analysis on the Agricultural Landscape: A Holistic Approach to Spatio-Temporal Models and Tools for Agricultural Risk Assessment and Exposure Analysis (with S. Goddard, J. Deogun, M. Hayes, K. Hubbard, H. Jose, S. Reichenbach, W. Waltman, and M. Svoboda), USDA Risk Management Agency, \$1,086,600; Oct. 2002-Sept. 2005.

Improving Drought Monitoring through the Integration of Climate and Satellite-Based Data (with K.G. Hubbard and M.J. Hayes), U.S. Geological Survey, \$75,980 (1st year); July 2002-June 2005.

Engaging Agricultural Communities in the Great Plains of the U.S. with the Application and Development of Climate Prediction and Information (with S. Hu, G. Lynne, W. Waltman, K. Hubbard, and M. Hayes), National Oceanic & Atmospheric Administration Office of Global Programs, \$432,916; May 2002-April 2005.

Drought as a Limiting Factor of Cereal Production (Cooperative project with the Czech Republic) (with M. Dubrovsky), North Atlantic Treaty Organization Science Program, \$25,000; Oct. 2002–Sept. 2004.

Intelligent Joint Evolution of Data and Information: An Integrated Framework for Drought Monitoring and Mitigation (with A.K. Samal, K.G. Hubbard, L.K. Soh, and W. Waltman), National Science Foundation, \$199,900; Sept. 2002–Aug. 2004.

Digital Government: A Decision Support System for Drought Risk Management (with S. Reichenbach, S. Goddard, W. Waltman, J. Deogun, P. Revesz, K. Hubbard, and M. Hayes), National Science Foundation, \$1,000,000; May 2001–April 2004.

Drought Risks and Mitigation on the Agricultural Landscape: A Series of Risk Analysis, Management, and Mitigation Workshops for Nebraska Farmers and Ranchers (with M.J. Hayes, H.D. Jose, W.J. Waltman, K.G. Hubbard, Q.S. Hu, and M.D. Svoboda), USDA Risk Management Agency, \$95,198; Oct. 2002–Sept. 2003.

SELECTED PUBLICATIONS

Wilhite, D.A. 2003. (In press). *Drought*, in *Encyclopedia of World Climates* (J. Oliver, ed.), London, United Kingdom: Kluwer Academic Publishers.

Wilhite, D.A. 2003 (in press). *Drought Policy and Preparedness: International Experiences and Future Directions*, in *Drought: People, Policy, and Place* (L. Botterill and M. Fisher, eds.), Melbourne, Australia: CSIRO Publishing.

Wilhelmi, O., K. Hubbard, and D.A. Wilhite. 2002. *Spatial Representation of Agroclimatology in a Study of Agricultural Drought*, *International Journal of Climatology*, 2, 1399–1414.

Wilhelmi, O. and D.A. Wilhite. 2002. *Assessing Vulnerability to Agricultural Drought: A Nebraska Case Study*, *Natural Hazards*, 25, 37–58.

Wilhite, D.A. 2002. *Combating Drought through Preparedness*, *Natural Resources Forum*, 26, 275–285.

White, D.H., D.A. Wilhite, B. O’Meagher, and G.L. Hammer. 2001. *Highlights of Drought Policy and Related Science in Australia and the U.S.A.*, *Water International*, 26 (3), 349–357.

Wilhite, D.A. 2001. *Moving Beyond Crisis Management*, *Forum for Applied Research and Public Policy*, 16 (1), 20–28.

Wilhite, D.A. (ed.). 2000. *Drought: A Global Assessment* (2 volumes, 51 chapters, 700 pages), in a 7–volume series *Hazards and Disasters: A Series of Definitive Major Works* (A.Z. Keller, ed.), London, United Kingdom: Routledge Publishers.

Wilhite, D.A. 2000. *Drought as a Natural Hazard: Concepts and Definitions*, Chapter 1 in *Drought: A Global Assessment* (D.A. Wilhite, ed.), Natural Hazards and Disasters Series, London, United Kingdom: Routledge Publishers, 3-18.

Wilhite, D.A., M.K.V. Sivakumar, and D.A. Wood (eds.). 2000. *Early Warning Systems for Drought Preparedness and Management* (Proceedings of an Experts Meeting), Geneva, Switzerland: World Meteorological Organization.

OTHER PROFESSIONAL ACTIVITIES

Global Drought Preparedness Network, partnership with the United Nations Secretariat for the International Strategy for Disaster Reduction. Project is aimed at the development of regional drought preparedness networks that will be coordinated through the NDMC and ISDR, involving collaborative efforts with key regional organizations. Funding to be provided through donor countries through the ISDR and other regional sources.

HONG WU, Postdoctoral Research Associate, 100% Research

Areas of Interest: Drought/climate indices, assessment of drought risk/impacts

Contact: hwu2@unl.edu, 402/472-9954

EDUCATION

B.S. Climatology, Nanjing Institute of Meteorology, Nanjing, China (1989)

M.S. Applied Climatology, Chinese Academy of Meteorological Sciences, Beijing, China (1992)

Ph.D. Natural Resource Sciences, University of Nebraska-Lincoln (2002)

PROFESSIONAL EXPERIENCE

Jan. 2003-present Postdoctoral Research Associate, National Drought Mitigation Center and High Plains Regional Climate Center, School of Natural Resources, University of Nebraska-Lincoln (UNL)

Aug. 2001-Dec. 2002 Research Assistant, National Drought Mitigation Center, School of Natural Resource Sciences, University of Nebraska-Lincoln

Aug. 1999-Aug. 2001 Research Assistant, Center for Advanced Land Management Information Technologies (CALMIT), Conservation and Survey Division, University of Nebraska-Lincoln

Aug. 1998-Aug. 1999 Research Assistant, National Drought Mitigation Center, School of Natural Resource Sciences, University of Nebraska-Lincoln

Jan. 1995-Jul. 1998 Assistant Professor, National Climate Center, Beijing, China

Jul. 1993-Dec. 1994 Chinese Academy of Meteorological Sciences, Beijing, China

RESEARCH

Conduct research on the use of drought/climate indices in the assessment of drought risk/impacts in Nebraska and surrounding states in association with the programs of the National Drought Mitigation Center and the High Plains Regional Climate Center, 2003-present. Calibrate and test the Crop-Specific Drought Index (CSDI) against actual NASS data. Prepare the results of research for publication in appropriate journal articles and for presentation at scientific and other meetings. To prepare research proposals and participate in other activities as designated by the NDMC and HPRCC.

Developed an operational agricultural drought risk assessment model for Nebraska with the NDMC, 2001-2002.

Monitored vegetation condition using remote sensing data; developed weekly SVI (Standardized Vegetation Index) map from NDVI images using ERDAS, with the CALMIT, 1999-2001.

Collected and distributed drought information across the world with the NDMC, 1998-1999.

SELECTED PUBLICATIONS

Wu, H. and D.A. Wilhite. 2003 (in press). *An Operational Agricultural Drought Risk Assessment Model for Nebraska, USA, Natural Hazards.*

Wu, H. 2002. *Agricultural Drought Risk Assessment: An Operational Model for Nebraska, Ph.D. Dissertation*, University of Nebraska, Lincoln, 127 p.

Wu, H., M.J. Hayes, A. Weiss, and Q. Hu. 2001. *An Evaluation of the Standardized Precipitation Index, China-Z Index, and Statistical Z-Score*, *International Journal of Climatology*, 21, 745-758.

C. WILLIAM ZANNER, Assistant Professor, 60% Research, 30% Teaching, 10% CSD

Areas of interest: Soil Geomorphology and Pedology, Wetlands, Quaternary and Holocene Landscape Evolution, Aeolian and Periglacial Processes, Mineralogy of Soil and Geological Materials

Contact: bzanner2@unl.edu, 402-472-0674

EDUCATION

B.S. Communication Arts, University of Wisconsin-Madison (1971)

M.S. Soil Chemistry, University of Minnesota (1992)

Ph.D. Soil Genesis, Minor in Quaternary Geology/Paleoecology, University of Minnesota (1999)

PROFESSIONAL EXPERIENCE

2000-present Assistant Professor, School of Natural Resource Sciences and Conservation and Survey Division, University of Nebraska-Lincoln (UNL)

2000-present Adjunct Assistant Professor, Department of Soil Science, North Carolina State University

1999-2000 Extension Associate, Department of Soil Science, North Carolina State University

1999 Postdoctoral Associate, University of Minnesota, Department of Soil, Water, and Climate

HONORS AND AWARDS

Fellow of the Center for Great Plains Studies (2003)

Outstanding Teaching Award, UNL College of Agricultural Sciences and Natural Resources (2002)

Sigma Xi Research Award, University of Minnesota Chapter of Sigma Xi (1998)

TEACHING

Courses Taught (Fall, Spring, Summer)

NRES 477/877 Great Plains Field Pedology (SO1, SO2, SO3)

NRES 468/868 Wetlands (taught jointly) (FO2)

NRES 496/896 Genesis and Landscapes of Great Plains (SO2)

NRES 279 Field Description of Soils (FO2, SO3)

AGRO 496F/896F Nebraska Range Short Course (taught jointly) (Su02)

Masters and Doctoral Students Advised

Will Myers (M.S. Natural Resources, expected 2005) Influence of Soil Properties on Well Grout Performance.

Jeffery Hellerich (M.S. Natural Resources, expected 2004) Effects of Landscape Position on Soil Properties after Afforestation.

Current M.S. and Ph.D. Committees: Justin Ewing (NCSU Ph.D. Soil Science), Eric Mousel (UNL Ph.D. Agronomy and Horticulture), Xiaodong Miao (UNL Ph.D. Geosciences), Matthew Dooley (UNL Ph.D. Geography), Jolene Cox and Dara Slaven, (UNO M.A. Geography), Ryan Szuch (NCSU M.S. Soil Science)

Other Teaching-Related Contributions

2002-present Coach of the University of Nebraska Soil Judging Team, first place in Regional Contest, Fall 2002

RESEARCH

Major research emphases: Modification of soils and landscapes under the influence of climate change or land use change; Wetlands. Examples: Changes in soil properties in the Nebraska Sand Hills after afforestation. Formation of Nebraska's Rainwater Basins and Carolina Bays on the southeastern US Coastal Plain. Effects of management choices and land use change on Saline Wetlands in Lancaster County, NE. Mineralogy of Soil and Geological Materials.

Accomplishments: Funded projects or submitted proposals (Saline Wetlands) in all these areas. Ongoing project with USDA-NRCS on the use of magnetic susceptibility for delineating wetlands. Contract XRD mineralogical analyses for faculty at UNL, UNK, University of Kansas, Trinity College, and the US Army Core of Engineers. Involvement with nine graduate students in Nebraska and North Carolina working in the areas of landscape evolution and wetlands. Faculty sponsor for two funded Undergraduate Research Scholarships in these areas.

SURVEY

Major activities: UNL Experiment Station-CSD representative at the National Cooperative Soil Survey Conference, Fort Collins, CO, June 2001. UNL-CSD representative at the U.S. Geological Survey (USGS) Soil Geochemical Landscapes Workshop, March 2003. Proposal reviewer for USGS Geotechnical Landscapes Proposal, August 2002.

Natural Resources expertise: Audubon Society, AgriDrain, James Arthur Vineyard, Construction Companies, USGS, Eastern Illinois University, Trinity College, Colorado State

University, Bradley University; at UNL: CSD, SNR, Geography, Agronomy/Horticulture, Geosciences; UNO and UNK.

SELECTED GRANTS AND CONTRACTS

Integrating Geospatial Information Technologies into Natural Resource Curricula (with L. Powell and three collaborators), UNL Teaching, Learning, and Technology Grant, \$5,100; 2002-2003.

Relating Landscape Scale Characteristics with Phosphorus Loss Potential to Surface Waters (with M. Mamo and two collaborators), USGS Competitive Grants Program (Section 104b), \$12,500; Mar. 2002-Feb. 2003.

Long-term Forest Establishment on Prairie Soils: Effects on Soil Microbiological, Mineralogical, Physical, and Chemical Properties (with R.A. Drijber), ARD Interdisciplinary Research Program, University of Nebraska, \$40,000; July 2001-July 2004.

Rainwater Basins: Subsurface Control of Surface Relief and Its Influence on Ephemeral Wetlands in Nebraska, Layman Trust Fund, University of Nebraska, \$7,250; July 2001-June 2002.

Methodology to Assess Soil, Hydrologic, and Site Parameters that Affect Wetland Restoration Success (with M.J. Vepraskas and two collaborators at North Carolina State University), North Carolina Department of Transportation, \$1.9 million; 2000-2007.

Develop and Publish Guide to the Wetlands of Minnesota (in press) (with J.C. Bell, University of Minnesota), Minnesota Board of Soil and Water Resources, \$50,000; 1997-1999.

SELECTED PUBLICATIONS

Mason, J.A. and C.W. Zanner. 2003 (in press). *Pedology, Soil Classification and Survey of Grass and Soils*, in *Encyclopedia of Soils in the Environment* (D. Hillel, C. Rosenzweig, D. Powlson, K. Scow, M. Singer, and D. Sparks, eds.), Academic Press.

Zanner, C.W. and J.C. Bell (editors). 2003 (in press). *Guide to Minnesota's Wetlands*, Minnesota Board of Water and Soil Resources and University of Minnesota Extension Service.

Wysocki, D.A. and C.W. Zanner. 2003. *Landforms*, in *Encyclopedia of Soil Science* (Rattan Lal, ed.), Marcel Dekker, Inc., New York.

Doran, J.W. and C.W. Zanner. 2001. *A Review of Year 2000 Research in Earth Science: Soils*, *Geotimes*, 46 (7), 37-38.

- Zanner, C.W. 2000. *Protecting Your Wetlands: North Carolina Farm*A*Syst*, North Carolina Cooperative Extension Service, North Carolina State University, Raleigh, NC.
- Zanner, C.W. and E.A. Nater. 2000. *Late-Quaternary Landscape Evolution in Mower County MN*, in *Contributions to the Geology of Mower County, Minnesota* (J.H. Mossler, ed.), *Minnesota Geological Survey Report of Investigations No. 50*, Minnesota Geological Survey, St. Paul, MN.
- Mason, J.A., E.A. Nater, C.W. Zanner, and J.C. Bell. 1999. *A New Model of Topographic Effects on the Distribution of Loess*, *Geomorphology*, 28, 223-236.
- Thompson, J.A., J.C. Bell, and C.W. Zanner. 1998. *Soil Geomorphology and Hydrology of a Mollisol Catena in Southeastern Minnesota*, *Soil Science Society of America Journal*, 62, 1126-1133.
- Zanner, C.W. and P.R. Bloom. 1995. *Mineralization, Nitrification, and Denitrification in Histosols of Northern Minnesota*, *Soil Science Society of America Journal*, 59, 1505-1511.

OTHER PROFESSIONAL ACTIVITIES

- Secretary, Soil Geomorphology Committee (S880) of the Soil Science Society of America, term 2001-2004*
- Co-Chair, symposium: Deep Regolith: Exploring the Lower Reaches of Soil, Annual ASA-SSSA Meetings, Charlotte, NC, 2001*
- Co-Editor, special issue of Geoderma, based on papers presented at the symposium Deep Regolith: Exploring the Lower Reaches of Soil, Annual ASA-SSSA Meetings, Charlotte, NC, 2001; in review*
- Journal article reviewer: Soil Science Society of America Journal, Journal of Arid Environments, and Soil Science*
- Review Committee, USDA National Research Initiative, Washington DC, April 22-25, 2002*
- Proposal Reviewer, USDA National Research Initiative, 2003*
- Invited speaker, University of Missouri Department of Geosciences, Nebraska's Rainwater Basins and Coastal Carolina Bays: Catastrophic Collisions or Prosaic Processes?; 2003*
- Invited speaker, Geomorphic investigations for a Carolina Bay wetland restoration project. Geological Society of America Abstracts with Programs, 34, 58; 2002*
- Invited speaker, Carolina Bay Evolution: Can deep soil investigations shed light on a Coastal Plain enigma. ASA-SSSA-CSSA Annual Meetings, Charlotte, NC, 2001*
- Invited speaker, Soil geomorphology: Landscape-scale issues in North Carolina and Nebraska. Department of Soil, Water, and Climate Seminar Series. University of Minnesota, 2001*

XINHUA ZHOU, Research Assistant Professor, 100% research

Area of Interest: Shelterbelt ecology, Ecophysiology, Boundary-layer Meteorology

Contact: xzhou2@unl.edu, 402/472-6639

EDUCATION

B.S. Forestry, Northeast Forestry University (1982)

M.S. Forest Ecology, Northeast Forestry University (1987)

Ph.D. Forest and Horticulture, University of Nebraska-Lincoln (1999)

PROFESSIONAL EXPERIENCE

2002-present Research Assistant Professor, University of Nebraska-Lincoln

1992-1993 Research Associate Professor, Chinese Academy of Sciences

1990-1992 Research Assistant Professor, Chinese Academy of Sciences

HONOR AND AWARDS

Graduate Student Research Award, Nebraska Statewide Arboretum (1994)

Young Scientist Prize, Chinese Academy of Sciences (1993)

State Special Honorarium, State Council of the People's Republic of China (1993)

National Award, for progress in science and technology, to "Sustained Yield and Regeneration of Farmland Shelterbelts", State Committee of Science and Technology, China (1993)

RESEARCH

Shelterbelt aerodynamics: (1) defined the three-dimensional aerodynamic structure, (2) developed a method to describe the defined structure, and (3) modeled the aerodynamic influence of the defined structure. Carbon sequestration of shelterbelt: develop a model to estimate the biomass of shelterbelts. Ecological impacts of tree invasion on grassland: measurements of water balance in forest-grassland ecosystems.

SELECTED PUBLICATIONS

Zhou, X.H., J.R. Brandle, C.W. Mize, and E.S. Takle. 2003 (submitted, accepted with revisions). *Three-dimensional Aerodynamic Structure of a Tree Shelterbelt: Definition, Characterization and Working Models*, **Agroforestry Systems**.

Brandle, J.R., X.H. Zhou, and E.S. Takle. 2003 (in press). *The Influence of Three-dimensional Structure of a Tree Shelterbelt on Aerodynamic Effectiveness*, in **Land-use Management for the Future**, Proceedings of the Sixth Conference on Agroforestry in North America, Hot Springs, Arkansas, USA.

- Zhou, X.H., J.R. Brandle, and E.S. Takle. 2003 (in press). *Estimating the Three-dimensional Structure of a Green Ash Shelterbelt: Distribution of Vegetative Surface Area, in Land-use Management for the Future*, Proceedings of the Sixth Conference on Agroforestry in North America, Hot Springs, Arkansas, USA.
- Zhou, X.H., J.R. Brandle, E.S. Takle, and C.W. Mize. 2003 (in press). *Relationship of Three-dimensional Structure to Shelterbelt Function: A Theoretical Hypothesis*, **Journal of Crop Production**.
- Brandle, J.R., X.H. Zhou, and L. Hodges. 2003. *Agroforestry for Enhancing Water Use Efficiency*, **Encyclopedia of Water Science**, Marcel Dekker, Inc. New York.
- Takle, E.S., J.R. Brandle, R.A. Schmidt, R. Garcia, I.V. Litvina, W.J. Massman, X.H. Zhou, G. Doyle, and C.W. Rice. 2003. *High-frequency Pressure Variations in the Vicinity of a Surface CO₂ Flux Chamber*, **Agricultural and Forest Meteorology**, 114, 245-250.
- Zhou, X.H., J.R. Brandle, E.S. Takle, and C.W. Mize. 2002. *Estimation of the 3-dimensional Aerodynamic Structure of a Green Ash (*Fraxinus pennsylvanica* Marsh.) Shelterbelt*, **Agricultural and Forest Meteorology**, 111, 93-108.
- Takle, E.S., J.R. Brandle, R.A. Schmidt, R. Garcia, I.V. Litvina, G. Doyle, X.H. Zhou, Q.J. Hou, C.W. Rice, and W.J. Massman. 2000. *Pressure Pumping of Carbon Dioxide from Soil*, **The 24th Conference on Agricultural and Forest Meteorology, American Meteorological Society**, Aug. 14-18, Davis, California, USA, 190-191.
- Jiang, F.Q., J.J. Zhu, and X.H. Zhou. 1999. *Studies on the Model and its Application for Continulative Economic Benefits of Windbreak Management*, **Scientia Silvae Sinicae**, 35, (1), 9-14.

OTHER PROFESSIONAL ACTIVITIES

Member, of an editorial advisory board of the internationally circulated journal, Acta Ecologica Sinica, 2000-date