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Water Current

William L. Powers, Director
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FROM THE DESK OF THE DIRECTOR . . . .

The Nebraska Water Resources Center sponsored a "Workshop on Nebraska Water Problems" on September 9-10, 1981, as the first of a three-step process to update the Center's water research program. The three-step process involves (1) assessing and ranking Nebraska's water problems on a priority scale of one to five; (2) developing a list of research needs and assembling teams of University scientists to develop research and educational programs aimed at solving the highest ranking water problems; and (3) securing the necessary funds to support the needed research from various funding agencies.

Invitations to the workshop were sent to approximately 85 water users, managers and concerned citizens to obtain a representative cross section of all interest groups. About 50 people attended. On the first afternoon of the workshop, participants met in four groups to review and list water problems in these areas: (1) Water Quality; (2) Water Quantity; (3) Water Resources Management; and (4) Legal, Institutional, Social, Economic and Political Aspects. Their charge was to discuss and list current, potential or informational water problems. A total of 94 water problems were identifies. On the second day, the 94 problems were ranked by participants with #1 signifying the highest priority water problems, and #5 the least important.

The list of the highest ranking water problems in Nebraska developed from this workshop will be examined by University scientists during a second workshop in February, 1982. The scientists will compile a list of research needs to solve these problems and assemble scientific teams to develop research programs aimed at finding solutions to the most pressing problems, or at least reducing their impact.

The ranking showed that 13 water problems were considered #1 priority problems by the participants in the September workshop. They are listed below by category.

WATER PROBLEMS RANKED AS #1 PRIORITY

WATER QUALITY

--Nitrate contamination of groundwater.

--Inability to manage ground and surface water conjunctively, i.e., lack of information.

WATER QUANTITY

--Lack of knowledge/understanding of groundwater recharge.

--Failure to store excess surface water.

--Inadequate state financing system for water development.

--Declining groundwater levels in certain parts of the state.

--Lack of state goals or objectives for future growth in water development and process whereby competing interests may reach understanding or agreement.

WATER RESOURCES MANAGEMENT

--Management of groundwater development to minimize impacts, i.e., on marginal land, wetlands, return flows, surface and groundwater supplies, municipal water and water quality.

--Overirrigation of crops (i.e., lack of acceptance of irrigation scheduling techniques).

--Improper land use, particularly in areas of readily available water (i.e., the Sandhills).

--Acceptable yield of an aquifer is undefined.

LEGAL, INSTITUTIONAL, ECONOMIC, SOCIAL AND POLITICAL

--There is a general failure to address groundwater recharge needs.

--Nebraska law does not recognize surface-groundwater interrelationship.

Further information on the workshop results may be obtained by contacting the Director's office, Nebraska Water Resources Center, 310 Agricultural Hall, University of Nebraska, Lincoln, Nebraska 68583.

ON THE HOMEFRONT

COORDINATION OF WATER EXTENSION PROGRAMS

As reported in a recent UNL Cooperative Extension Service newsletter, Dr. William Powers, Director of the Water Resources Center, has been appointed as the overall coordinator for extension water educational programs. He will have an Extension appointment (25%) with the title of Extension Coordinator for Water Programs and will take the lead in calling together appropriate specialists and others for purposes of coordinating current activities and assisting in the development of Extension educational programs in water.

WATER RESOURCES SEMINAR SERIES

The Water Resources Center will once again sponsor an Interdisciplinary Water Resources Seminar Series during the 1982 spring semester. The seminars bring together upper classmen, graduate students, professional persons, faculty and others interested in water topics.

The 1982 series, entitled "Current Water Issues in Nebraska", will feature such topics as the High Plains Ogallala Aquifer Study, interbasin transfers, irrigating the Sandhills, the Norden Dam proposal, and current state water law legislation. The hour-long seminars will feature guest speakers, and additional time may be used for questions and discussion if desired.

The seminars will be held Wednesday afternoons beginning January 13, 1982 at 3:00 p.m. in the East Campus Union Building. The exact room will be listed each week on the activities calendar in the Union.

Students may earn one hour of credit by registering for the seminar series. Students should register, with their advisor's permission, in their departmental seminar and/or special studies course listing. Attendance and note taking will be required.

A preliminary outline of topics will soon be available. For additional information, contact the Director's office, Water Resources Center, 310 Ag. Hall, University of Nebraska, Lincoln, Nebraska 68583-0710. Telephone: (402) 472-3305.

AGRICULTURAL AND WATER RESEARCH FUND PROJECTS

The University of Nebraska Foundation recently established an Agricultural and Water Research Fund and designated the Water Resources Center as coordinator. The fund will be used to sponsor agricultural and water-related research projects submitted to the Water Resources Center by University scientists.

An Advisory Committee of donors to the fund was established to review research proposals submitted and to advise the Water Center Director on establishing future research programs to use these funds.

At the first meeting of the Advisory Committee, the following proposals were approved for funding beginning October 1, 1981:

Principal Investigator	Project Title
James R. Gilley Raymond J. Supalla	Improved Irrigation Energy Efficiency Through Alternative Irrigation Management Practices
Thomas Dorn	Tillage Systems for Low Pressure Sprinkler Irrigation on Sloping Soils
Donald Johnson	Effect of Nitrate on Corrosion of Irrigation Distribution System Components
Richard Harnsberger	Nebraska Water Law and Administration

PROJECT FUNDED BY OWRT

The Water Resources Center is pleased to announce a new research project that was recently funded by the Office of Water Research and Technology. The project is entitled "Scheduling Procedures with Limited Water for Improved Water Use Efficiency for Corn and Soybeans," and the principal investigators are George E. Meyer and Paul E. Fischbach, Department of Agricultural Engineering, UNL.

The objectives of this three-year study are: (1) to develop quantitative criteria for scheduling and applying water to irrigated corn and soybeans, based on stage of crop development, soil moisture deficit, and crop water use; (2) to test scheduling techniques for applying water to irrigated soybeans using computer simulation; (3) to compute potential water savings over a broad area to demonstrate the impact of the improved irrigation procedures; and (4) to compute potential energy savings from reduced pumping costs for improved irrigation procedures.

NWRC RESEARCH PROGRAM

October 1 begins a new federal fiscal year. The Water Resources Center is involved in a variety of new water research projects as well as continuing many of its on-going efforts. The following is a listing of the Center's current water research program for fiscal year 1982.

Annual Cooperative Program (Continuing)

Project Title	Principal Investigator
Reduction in Development of Bloom-Forming Blue-Green Algae by Nutrient Enrichment to Maintain Desirable Pre-Bloom Dominants	James Rosowski Life Sciences
Enhancement of Water Quality in Nebraska Farm Ponds by Control of Eutrophication Through Biomanipulation	Gary Hergenrader Forestries, Fisheries & Wildlife

Parasite Communities as Indicator Systems for Predicting the Effects of Surface Water Management Options on the Biota of Prairie Rivers	John Janovy, Jr. Life Sciences
Increased Water Conservation and Percolation Through Improved Tillage Practices	Howard Wittmuss Ag. Engineering

Matching Grant and Focus Area Programs - OWRT

Water and Energy Conservation Using Center Pivot Irrigation and Reduced Tillage Systems	James R. Gilley Ag. Engineering
Conservation of Soil, Water and Energy Through Reduced Tillage Systems	Elbert C. Dickey Ag. Engineering
Water Conservation Through Limited Irrigation of Corn and Grain Sorghum in the Great Plains	Darrell G. Watts Ag. Engineering
Tillage Practice Effects on Water Conservation and the Efficiency and Management of Surface Irrigation Systems	Dean Eisenhauer Ag. Engineering So. Central Station
Irrigation Scheduling Procedures with Limited Water for Improved Water Use Efficiency for Corn and Soybeans	George Meyer Paul Fischbach Ag. Engineering

Agricultural and Water Research Fund
(University of Nebraska Foundation)

Improved Irrigation Energy Efficiency Through Alternative Irrigation Management Practices	James R. Gilley Raymond Supalla
Tillage Systems for Low Pressure Sprinkler Irrigation on Sloping Soils	Thomas W. Dorn Northeast Station
Effect of Nitrate on Corrosion of Irrigation Distribution System Components	Donald Johnson Mechanical Engr.
Nebraska Water Law and Administration	R. Harnsberger College of Law

Other Grants and Contracts

Water Quality Study of Runoff from Agricultural Lands (Dee Creek)	Denis Gilbert NWRC
Evaluation of Legal and Institutional Arrangements Associated with Ground Water Allocation in Missouri River Basin States	J. David Aiken Raymond Supalla Ag. Economics
State Water Planning - Policy Issue Analysis	Robert Burns NWRC

Impact of Water Management Alternatives	Raymond Supalla Ag. Economics
Evaluation of Advanced Technologies to Maintain Irrigated Agriculture in Nebraska	NWRC

WATER RESOURCES IN NEBRASKA

STATES TO CONTINUE REGIONAL WATER RESOURCES EFFORTS

Due to federal budget cuts, the Missouri River Basin Commission no longer exists, but the Commission's efforts will not cease if state and federal members have their way. At the final quarterly Commission meeting in August, members agreed that coordination activities and two studies now in progress should continue under new auspices.

State members met in caucus prior to the Commission meeting and authorized staff to proceed with legal steps to form a Missouri Basin States Association (MBSA). The Association would be a non-profit corporation under Nebraska law and would continue to be based in Omaha.

Federal and state members joined in passing a resolution urging the 10 basin governors to seek to have Commission assets transferred to the Association on September 30. A Water Resources Council action memorandum spelling out conditions of the termination process provides that if the states continue their interstate planning efforts, "the existing assets of the commissions, including their unobligated funds for operating budgets and comprehensive studies and existing furniture and equipment" will be transferred for the states' use. Commission members agreed that, while federal representatives would not sit as board members of the new Association, the federal presence is necessary.

State members of the Missouri River Basin Commission met September 28 to finish organizing the Missouri Basin States Association. The Association will continue some of the activities previously conducted by the Commission, and is being established on a one-year interim basis to continue the state-federal and interstate coordination. The Commission's Hydrology and Flood Plain studies will also be completed. During the year, members will decide whether some form of organization should be maintained in fiscal year 1983 and beyond.

WATER CONSERVATION WORKSHOPS PROJECT

The final report on the Water Conservation Workshops Project is now available. This project, funded by the U.S. Geological Survey and conducted by the Missouri River Basin Commission, included three workshops held in Saint Joseph, Missouri; Sioux Falls, South Dakota; and Billings, Montana during August 1981.

Evaluations of the workshop indicate that the seven-step water conservation planning procedure taught in the workshops was a useful technique to assist in the preparation of local water conservation plans. Participants also indicated that some effort should be made to demonstrate the seven-step procedure to more people.

Currently, the Commission staff is discussing future project activities with the Geological Survey and other possible supporters. Should an agreement be reached, the Commission's successor organization, Missouri Basin States Association, might continue the project.

If you are interested in receiving a copy of this report, please contact the Missouri Basin States Association, 10050 Regency Circle, Suite 403, Omaha, Nebraska 68114.

FEDERAL HIGHLIGHTS

NO FUNDS FOR STATE WATER INSTITUTES

The Water Resources Center received a wire from the director of the Office of Water Research and Technology (OWRT) as follows:

> "The continuing resolution passed by the Congress on Sept. 30 will, upon signature of the President, provide funds for certain OWRT programs until November 20, 1981 or until enactment of the 1982 appropriations bill. Because no Interior appropriations bill had yet passed the Senate, the resolution uses the House bill as the basis for the continuing resolution. No funds are provided in the House bill for the state water institutes or matching grants. We estimate it will be late October when the Senate committee marks up its bill again. After Senate passage, a House-Senate conference committee will prepare the compromise bill for approval of both houses and the President. No assurance can be given that the FY 1982 appropriations act will include funds for institutes, and until the Interior appropriations bill is finally enacted, there are no OWRT funds for institute programs. Institutes should seek other funding arrangements."

WATT REAFFIRMS STATE CONTROL OF WATER IN ANNOUNCING NEW LEGAL OPINION

Secretary of the Interior James Watt recently reaffirmed the historic primacy of State water management in announcing the Department's repudiation of a controversial 1979 legal opinion that sought to establish a so-called "Federal non-reserved water right."

"Our legal officers, at my request, have researched it thoroughly and determined that there is no such thing as a 'Federal non-reserved water right,' despite the previous Administration's views," Watt said.

"That means Federal land managers must follow State water laws and prodedures except where Congress has specifically established a water right or where Congress has explicitly set aside a Federal land area with a reserved water right. If they need more water for their programs, they must take their place in line like any citizen and let State authorities decide."

Watt cited an opinion just released by William Coldiron, Interior's Solicitor, which cancels out a June 25, 1979, opinion by one of Coldiron's predecessors, former Solicitor Leo Krulitz. State officials throughout the West have expressed deep dissatisfaction with the Krulitz opinion ever since it was issued, contending that it illegally interfered with their control of State water resources.

Coldiron's opinion said Congress has power to control the use of water for the benefit of Federal lands, but that Congress has demonstrated its intent for the States to control the allocation of waters within their boundaries, in all but the most limited circumstances.

After reviewing a long history of Congressional and court pronouncement especially recent Supreme Court decisions on Federal water rights, Coldiron wrote, "there is an insufficient legal basis for the creation of what has been called 'non-reserved' water rights."

"I must conclude that there is no Federal non-reserved water right," he wrote.

As a result, Coldiron added, Federal land managing agencies including Interior's National Park Service, Fish and Wildlife Service, Bureau of Reclamation, and Bureau of Land Management may not ignore or circumvent State laws in allocating the use of water unless Congress has specifically instructed them otherwise.

Instead, he concluded, Federal entities "must acquire water as would any private claimant within the various States."

REPEAL OF PRINCIPLES AND STANDARDS

The U.S. Water Resources Council (WRC) published in the September 11 issue of the Federal Register a notice that it plans to repeal the Principles and Standards for water resources planning. The interested public is invited to submit written comments within 30 days on the proposal. Comments should be directed to the Water Resources Council, 2120 "L" Street, N.W., Washington, D. C. 20037.

The Administration will propose new water project planning guidelines as a replacement for the Principles and Standards. These guidelines will be issued by the Office of Management and Budget in consultation with the Cabinet Council on Natural Resources and Environment. Their final form would be determined after consultation with the Congress, the states and interested organizations and associations.

The new guidelines would cover projects of the Bureau of Reclamation, the Army Corps of Engineers, the Soil Conservation Service, and the Tennessee Valley Authority. As proposed, the guidelines would apply only to pre- and post- authorization studies for projects not yet funded for construction. The guidelines would replace current multi-objective standards with a single guideline objective: National Economic Development (NED). However, provisions would be made to encourage planners to also formulate cost-effective alternatives which contribute to social, regional and environmental goals, and which address state and local concerns not fully accommodated by the NED objective.

CONFERENCES

8TH NATIONAL CONFERENCE ON INDIVIDUAL WASTEWATER SYSTEMS

The Eighth National Conference on Individual Wastewater Systems will be held October 20-22, 1981 in Ann Arbor, Michigan. Sponsored by the National Sanitation Foundation and the Environmental Protection Agency, the theme of this year's conference is "Providing Wastewater Services in the 80's."

The principal objective of this series of national conferences is to provide manufacturers, installers, service personnel sanitarians and other government officials, planners, engineers, developers/builders, and others with direct involvement in onsite wastewater management, information of current and general value concerning onsite systems technology, its management and the accompanying social, economic and political issues and problems. The program is designed to reduce the uncertainties in application and utilization of onsite systems by fostering a better understanding of the art and science of onsite management and by providing an opportunity for contact and interaction of individuals with differing experiences, interests and points of view.

Registration fee for the conference is $150. For additional information or to obtain registration material, contact: National Sanitation Foundation, 3475 Plymouth Road, P.O. Box 1468, Ann Arbor, Michigan 48106.

ASCE SPECIALTY CONFERENCE

The American Society of Civil Engineers (ASCE), Water Resources Planning and Management Division, is sponsoring a Specialty Conference on Managing our Limited Water Resources to be held May 19-21, 1982 in Lincoln, Nebraska.

A highlight of the conference will be a look at the Federal High Plains Aquifer Studies. Papers are being solicited on the following topics:

--Results of the USGS High Plains Ogallala Aquifer Studies

--Results of the EDA High Plains Ogallala Economic Study

--Management of Water in the High Plains Region

--Regional Water Transfers

--Legal Aspects of Waste Application to Land

--Ground and Surface Water Relationships

--Energy-Water Requirements and Sources

--Interstate Water Management Problems

--Water Management Marketing

--The Future of Depletion Allowances

--State Water Allocation Systems, Policies and Procedures

--Water and the Sagebrush Rebellion

--Water and Federal Reserved Rights

--Interstate Water Compacts

--Groundwater Pollution and Quality Protection

--EPA's Role and Interests in Groundwater

Other management papers are also welcome. Abstracts are due by November 1, 1981, and should be submitted to: William R. Walker, Program Chairman, Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, 617 North Main Street, Blacksburg, Virginia 24060. Telephone: (703) 961-5624.

GSA ANNUAL MEETING

The 1981 annual meeting of the Geological Society of America (GSA) will be held November 2-5, 1981 in Cincinnati, Ohio.

Several water-related symposia will be conducted in connection with the annual meeting including: (1) Role of Government Agencies in the Development of Engineering Geology; (2) Regional Hydrogeology--Past, Present and Future; (3) Shales and Subsurface Hydrology; (4) Hydrogeology of High Level Nuclear Waste Isolation; and (5) Groundwater Flow and Karst Systems.

For additional information and registration material, contact: Warren D. Huff, General Chairman, Department of Geology, University of Cincinnati, Cincinnati, Ohio 45221. Telephone: (513) 475-3731 or 475-3732.

GROUND WATER IN THE 80's

The Great Lakes Rural Network, Inc. is sponsoring a Conference on "Ground Water in the 80's: The Emerging State and Local Arenas," to be held November 11-13, 1981 in Chicago, Illinois.

The objective of the conference is to bring together responsible individuals who should be aware of the severity of the threats to ground water. Experts on all aspects of the problem--from the politics and financing of ground water programs to its chemistry--will wirk with conference participants to exchange information, share experiences and explore solutions that government, industry and a concerned citizenry might bring about. Conference sessions will emphasize discussions among panelists and audience-panelist interaction. Small group workshops will provide opportunities for individual counsel on specific problems.

Conference topics will include: (1) ground water basics; (2) state groundwater programs: options, costs, politics, choices; (3) setting and using ground water standards; (4) technological options for ground water control; (5) underground injection programs and ground water; (6) ground water and legal issues; and (7) financing ground water programs.

Registration fee is $150 before October 16 and $165 thereafter. For local government, non-profit organizations, registration fee is $95 before October 16 and $110 thereafter. For additional information and registration material, contact: Beth Ytell, The Great Lakes Rural Network, P.O. Box 568, Fremont, Ohio 43420. Telephone: (419) 334-8911.

IRRIGATION SCHEDULING CONFERENCE

A Conference on Irrigation Scheduling will be held December 14-15, 1981 in Chicago, Illinois. Co-sponsors of the conference are the American Society of Agricultural Engineers, American Society of Civil Engineers, Irrigation Ass'n, American Society of Agronomy, Soil Science Society of America, and U.S. Committee on Irrigation, Drainage and Flood Control.

The conference will cover the latest in irrigation scheduling. Topics to be covered include: (1) spectral remote sensing inputs, (2) evaluating irrigation strategies, (3) optimizing irrigation management, (4) optimum water use, (5) projecting irrigation with soil instruments, (6) agro-environmental monitoring system, (7) demand theory and application, (8) computer assisted irrigation scheduling, (9) irrigation scheduling computer program, and (10) irrigation scheduling in subhumid areas.

Additional information and registration forms may be obtained by contacting Cathy Burg, American Society of Agricultural Engineers, Box 410 St. Joseph, Michigan. Telephone: (616) 429-0300.

WATER QUALITY MODELING SHORT COURSE

A short course on WATER QUALITY MODELING will be held in Las Vegas, Nevade, January 11-15, 1982. The objectives of this course are to define the need and justification for water quality criteria, to establish the constraints imposed by current regulations, to present the fundamentals of modeling techniques and to demonstrate their applicability to the rational solution of water quality management.

The course is designed to aid managers, technicians, regulatory personnel and others who are intimately involved in the decision making process regarding water quality control. Upon completion of the course, participants will understand the principles of modeling techniques, their limitations and their application to chemical, biological and physical processes.

For further information contact P.A. Krenkel, Executive Director, Water Resources Center, Desert Research Institute, P.O. Box 60220, Reno, NV 89506. Telephone: (702) 67307361. (Continuing education credits will be awarded, if desired).

PUBLICATIONS

SATELLITE HYDROLOGY PUBLICATION AVAILABLE

The American Water Resources Association announces the publication of Satellite Hydrology, edited by M. Deutsch, D. R. Wiesnet, and A. Rango. Satellite Hydrology is a full color volume with more than 100 papers contributed by some of the foremost authorities in hydrology and remote sensing from around the world. This proceedings includes an overview section and chapters on satellite data applied to: Meteorology, Ground Water, Wetlands, Snow and Ice, Surface Water, Coastal Zone, Soil Moisture, Hydro Data Relay, Water Quality and Environment, and Water Use and Management.

Introductory price is $65.00 if payment is received before October 15, 1981, and after October 15, the price will be $85.00. For ordering information please contact the American Water Resources Association, St. Anthony Falls Hydraulic Lab, Mississippi River at 3rd Ave., S.E., Minneapolis, MN 55404-2195. Telephone: (612) 376-5050.

POSITIONS AVAILABLE

HYDROMETEOROLOGIST POSITION

The Center for Agricultural Meteorology and Climatology (CAMaC) and the University of Nebraska-Lincoln invites applications for the position of hydrometeorologist (Assistant or Associate Professor).

The duties and responsibilities of this tenure-track position include: (1) develop, in conjunction with other specialists in hydrology, ecology and meteorology, a research program to quantify the precipitation and evapotranspiration components of the hydrologic balance in the Sandhills and other selected regions of Nebraska; (2) provide information on precipitation and evapotranspiration to agenices of government and to the public to assist in rational development of water resources; and (3) extend use of the methods developed in above-mentioned research program to improve knowledge of the hydrologic balance in other regions of the state. This position reports to the Director of CAMaC and to the Director of the Conservation and Survey Division of the Institute of Agriculture and Natural Resources.

Qualifications include a Ph.D. degree in meteorology or climatology, with specific training and experience in hydrometeorology. Strong background in hydrology, instrumentation, mathematics and computer science is desirable. Salary is commensurate with experience and training.

Interested applicants should contact Norman J. Rosenberg, Director, Center for Agricultural Meteorology and Climatology, Ag. Engineering Building, University of Nebraska, Lincoln, Nebraska 68583-0726. Telephone: (402) 472-3679.

The University of Nebraska is an Equal Opportunity/Affirmative Action Employer.

POSITIONS IN FORESTRY AND ENVIRONMENTAL STUDIES

The School of Forestry and Environmental Studies at Duke University invites applications for the following positions:

(1) Forest Ecology - Candidates are sought who have interests and skills in the productivity, protection and management of forest ecosystems. Candidates in related areas of ecology are also encouraged to apply. Duties include participation in interdisciplinary applied ecology studies, development of an active research program, and teaching of graduate level ecology.

(2) Watershed Hydrology - Applications are sought for a position in watershed hydrology from qualified individuals with an understanding of: the physical and biological processes important in whatershed hydrology, the impact of land use and management on water resources, processes and relationships concerned with the quantity and quality of water, and stochastic and deterministic hydrology for the simulation of watershed processes.

(3) Environmental Toxicology - Applications are invited for a position in environmental toxicology with an emphasis on the mechanisms and assessment of toxicity in either aquatic or terrestrial environments. The applicant should be broadly experienced in the physiological aspects of toxicological effects and have demonstrated quantitative and statistical abilities. Duties include participation in interdisciplinary applied ecology studies, development of an active research program, and liaison with other toxicology units on campus, and graduate level teaching.

(4) Forest and Natural Resouces Management Systems Science - Applications are invited for a faculty appointment in the application of systems analytic methods to problems in forest and natural resource management. Both tenure-track and research appointments can be made. Candidates must have a background in one or more of the following areas: (a) operations research as applied to natural resource management; (b) natural resource and environmental systems analysis; and (c) managerial economics as applied to forest and natural resources. Preference will be given to those who have broad training and experience in the application of management science to natural resource problems.

Tenure-track appointments will be made at the assistant or associate professor level. Research appointments will be offered on an academic year basis for a period of up to three years at both junior and senior levels. Opportunities exist for joint appointments in other departments of the university.

Interested applicants should submit a curriculum vitae, representative publications, and at least three references. Those completing a Ph.D. should submit transcripts. The closing date for these positions is December 15, 1981. All inquires and materials for all positions should be addressed to: Chairman, Faculty Council, School of Forestry and Environmental Studies, Box DM, Duke University, Durham, North Carolina 27706.

Duke University is an Equal Opportunity/Affirmative Action Employer.

GRADUATE STUDENT RESEARCH FELLOWSHIPS

The School of Forestry and Environmental Studies at Duke University invites applications from superior students for graduate research fellowships in environmental science. Potential research areas include forest and wetlands ecology, water quality modeling, statistical analysis of water quality data, risk analysis, population biology, forest micrometeorology, silviculture, and soil science. Preference will be given to applicants with a strong background in quantitative methods.

The school offers the Master of Forestry and Master of Environmental Management degrees, as well as concurrent degrees with the School of Business (Master of Business Adminstration) and the Institute of Policy Sciences and Public Affairs (Master of Arts). In addition, the M.S., M.A. and Ph.D. degrees are offered through the Graduate School. Areas of concentration are:

Natural Resources Science/Ecology,
Natural Resources Systems Science,
Natural Resources Economics/Policy.

In each area of concentration, the emphasis is on quantitative analysis of natural resource and environmental problems.

Applicants for research fellowships in environmental science should submit a curriculum vitae to: Dr. Kenneth H. Reckhow, School of Forestry and Environmental Studies Box DM, Duke University Durham, North Carolina 27706.

Duke University is an equal access institution.

PROJECT TITLE: Measurement of Actual Transpiration of Native Grass Stands as a Component of Nebraska Sandhills Groundwater Hydrology

PRINCIPAL INVESTIGATOR: A. T. Harrison, Assoc. Professor
School of Life Sciences
University of Nebraska-Lincoln

The objective of this project during the 1980 and 1981 field seasons was to quantify soil moisture and plant transpiration dynamics on a typical, native, ungrazed Nebraska Sandhills prairie with two related major long-term objectives: (1) to quantify the role of native vegetation in site-specific evapotranspiration, and to document consumptive use by native grass species on different Sandhills soil types; and (2) to identify which vegetation/soil sites may act as important hydrologic water table recharge sites based on site-specific precipitation/transpriation/percolation dynamics.

Data has been collected on plant physiology and water stress relations and consumptive use at three major topographic/soil/vegetation sites on Arapaho Prairie in Arthur County in the southwestern Sandhills region. Data on transpiration use by five dominant Sandhills grass species were collected in addition to gravimetric soil mosture, bulk density, and texture, all at four topographic sites at 40 cm intervals to 140 cm in the soil profile.

Meteorological station equipment was installed at the research site in 1981 to collect growing season data on precipitation, humidity, temperature, windspeed, wind direction, and light intensity which will be used in modeling consumptive use by native vegetation. A total of 12 neutron access tubes were installed along the 130 ft dune topographic gradient with three tubes at four different sites: ridge, slope, swale, and valley. During 1980, the access tube sites were calibrated with parallel gravimetric sampling in the spring and summer, and data taken at approximately two-week intervals through the 1980 and 1981 growing seasons. We currently have three years worth of site-specific precipitation and soil mosture dynamics, measured gravimetrically during 1979, and by neutron probe in 1980 and 1981 on identical sites.

Two observation wells on a steep dune were installed and instrumented with continuous recorders at two topographic positions on the research site during 1981 to document water table dynamics as related to precipitation and percolation events. These observation wells are approximately two miles distant from the nearest actively pumping center pivot operation.

Consumptive use during the 90-day experimental period of June, July and August was measured directly by soil moisture withdrawal and from the 140 cm profile assuming no growing season percolation occurred below 140 cm (soil water content values never reached field capacity) and correcting precipitation events for litter interception.

Consumptive use values measured gravimetrically for the 90 days are surprisingly similar at 230 mm, 230 mm, and 213 mm for ridge, slope and swale sites, respectively, averaging 2.6 mm/day during the middle of the growing season. Litter evaporation was minor at approximately 10 mm over the 90-day period. Precipitation was recorded at 193 mm. Total

soil moisture withdrawal was least at the swale site (-31 mm) due to the shallow rooted western wheatgrass which totally dominates the site. Soil moisture withdrawal at the slope and ridge sites, dominated by deeply rooting warm season grasses, was -47 mm and -39 mm, respectively.

Some striking observations important for future hydrologic work in the Nebraska Sandhills have emerged from the soil profile moisture dynamics measurements. First, during the summer growing season, the soil profile moisture deficits at all depths always exceeded the subsequent bi-weekly precipitation inputs, and deficits increased gradually throughout the growing season. Precipitation events sufficient to recharge the profile rarely occur. The deficits were greatest at the lower elevation valley bottom and swale sites with organic surface soils and finer textured soils below.

It appears that deep recharge and significant percolation events do not usually occur in the Sandhills during a "normal" growing season. During 1979, season end soil moisture profile deficits ranged from approximately 100 mm in the ridge profile to 250 mm in the swale site. Thirty-year average winter (October-March) precipitation of 80 mm would not restore this deficit at any site, and average April precipitation of 50 mm would recharge only the sandy ridge site profile beyond field capacity and thus allow percolation below the rooting zone of these ridge sites.

The implications of this data are rather important. Only the steepest, sandy, poorly vegetated ridge sites may act as hydrologic recharge sites on a regular basis. These steep topographic sites comprise only 10-15 percent of the Sandhills groundwater "watershed". In the experimental area in Arthur County in the southwestern Sandhills, only exceptionally wet winter or spring (April is probably the most important month) precipitation events above the 30-year mean can act as important water table recharge events. It is rather clear, and based on repeated observation in the Sandhills ecological literature, that growing season normal precipitation (75-80 percent of the yearly total) may be inconsequential for water table recharge by naturally vegetated dunes. More importantly, especially for the drier western Sandhills, finer textured valley soils of high water holding capacity and densely vegetated (comprising 10-20 percent of the research study site) may act as hydrologic recharge sites only infrequently in extremely wet winter or springs, or in sequentially "wet" years.

A detailed knowledge of the function of natural recharge sites within the Sandhills will be important in future predictive modelling of water table dynamics and the effects of large-scale, regional groundwater development within the Sandhills with attendant future problems and tradeoffs concerning groundwater development vs. surface water, subirrigated meadows and wildlife values.