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Water Current

Millard W. Hall, Director
Volume 10, Number 1

RECEIVED
ENVIRONMENTAL
PROGRAMS

FEB 10 1978

IANR

Karen E. Stork, Editor
January/February 1978

NEBRASKA WATER RESOURCES CENTER

Annual Report - 1977 -

The Nebraska Water Resources Center (NWRC) was established in November 1964 as a result of state and federal actions authorized by the Water Resources Research Act of 1964. Activities during the past year have included programs in water research, education and information dissemination, as well as various IANR staff functions.

Research: During the past year the Center sponsored and administered a research program involving 25 projects totaling approximately \$1.3 million. This included 11 annual allotment and five matching grant projects funded by the Office of Water Research & Technology, U.S. Department of Interior. A major project was continued in cooperation with the Conservation & Survey Division and the Upper Big Blue NRD to develop a quantitative planning capability for the District. Other efforts included continuation of a project on artificial recharge, initiation of a major project on the optimal management of irrigated agriculture, and initiation and completion of a project in cooperation with the Corps of Engineers on the measurement and analysis of urban flood damages in Nebraska.

Education: During the past year the Center sponsored the following educational activities: (1) an interdisciplinary water resources seminar series on "Water Resources Planning and Management" offered for 1 or 2 credit hours during the spring semester; (2) two Research Overviews outlining the Center's research program and the water resources research programs of IANR--one held in Lincoln and the other in North Platte; (3) participated in planning and then hosted a conference sponsored by the Missouri River Basin Commission on "Scarce Allocation of Groundwater" attended by 60 persons in the Missouri River Basin region; (4) further developed courses in Hydrology and Water Resources taught to Civil and Agricultural Engineering undergraduate and graduate students; and (5) hosted information exchange sessions on artificial recharge, hydrologic modeling and various other topics.

Information Dissemination: The Water Resources Center continues to publish a bi-monthly newsletter outlining water resources activities in Nebraska and elsewhere which is mailed both locally and nationally. The Center periodically distributes a publications list describing recent water resources related library acquisitions available for loan to interested persons. A proceedings of the spring water resources seminar series was also published. During the past year, various staff members were involved in a number of speaking engagements before groups throughout the state to discuss Nebraska's water problems and the work of the Center, including presentations at Wayne State College, Chadron State College, various Natural Resources Districts, the Humboldt Lion's Club, hydrology for women seminar, hydrology short course, and the presidents of Nebraska's junior and technical colleges.

IANR Staff Functions: In 1975 the Nebraska Unicameral gave special recognition to the Center's growing competence by designating it for increased funding through an Area of Excellence Program in Water Resources Management. These funds have been used to enhance and expand the Center's activities, largely through the employment of additional staff. During the past year two professional staff members were added--a Water Resources Specialist and a Water Resources Management Specialist. NWRC staff have worked with other University units and local, state and federal agencies to help define and resolve Nebraska's water problems. The Center Director is chairman of a Water Policy Committee of five which oversees and directs this Area of Excellence Program.

The Director also serves on various committees and advisory boards of state agencies. For example, during the past year he was appointed to the Governor's Drought Task Force, advisor to the Nebraska Natural Resources Commission and member of the advisory board for the Nebraska Conservation Program (LB 450). Center staff are also involved in national water resources policy making. The Director testified before two congressional committees on U.S. water research and education, testified once on the U.S. water policy review, and is a member of the National Governor's Association Task Force on U.S. Water Policy. The Director also serves as Assistant Director of the Agricultural Experiment Station and as Executive Secretary of the Universities Council on Water Resources, and much of the work of these organizations is performed through the offices of the Center. Other staff members also serve on various University and agency committees.

ON THE HOMEFRONT

WATER RESOURCES SEMINAR

Once again the Nebraska Water Resources Center is sponsoring an Inter-disciplinary Water Resources Seminar series during the 1978 spring semester. The intent of these seminars is to bring together upper classmen, graduate students, professional persons, faculty and others interested in water topics.

This year the series will focus on "Water Resources Policy: The National Water Policy Review and Its Impacts." The seminars will be held on Wednesday afternoons from 3:00 to 5:00 p.m. in the East Campus Union Building. The exact room number will be listed each week on the activities calendar in the Union.

Seminars planned for the coming two months are as follows:

<u>Date</u>	<u>Topic</u>	<u>Speaker</u>
February 8	Identification of Issues and Options: Part I -- Cost Sharing	Raymond Supalla, Dept. of Agricultural Economics
	-- Institutional Arrangements/ Federal Reserved Rights	J. David Aiken, Dept. of Agricultural Economics
February 15	Identification of Issues and Options: Part II -- Water Quality	Dayle Williamson, Nebr. Natural Resources Commission
	-- Water Conservation	Warren White, State Office of Planning & Programming
February 22	Identification of Issues and Options: Part III -- Water Resources Research	M. Wayne Hall, Water Res. Center
	-- Water Resources Planning and Evaluation	Gary L. Lewis Water Res. Center
March 1	National Water Policy Review: Federal Impacts	Unannounced
March 8	National Water Policy Review: Regional Impacts (Missouri River Basin)	Unannounced
March 15-17	Nebraska Spring Water Conference	
March 29	National Water Policy Review: State and Local Impacts	Unannounced

DEADLINE FOR SUBMITTING ANNUAL ALLOTMENT PROPOSALS

The deadline for filing an annual allotment research proposal for fiscal year 1979 (beginning October 1, 1978) with the Nebraska Water Resources Center is March 1, 1978.

Prospective principal investigators are requested to submit a complete rough draft proposal prior to this date for review by the Director. Meetings with researchers will then be scheduled to discuss their proposal ideas.

For further information, please contact the Director's office.

SLIDE-TAPE SHOW AVAILABLE

The Water Resources Center has received a copy of a slide-tape show entitled, "208 Water Quality Planning and the Cattle Industry." This presentation was prepared by the National Cattleman's Association in Denver, Colorado and is approximately 25 minutes in length. The slide-tape show is intended to provide cattlemen with background information regarding the need for and impact of water quality planning on their industry.

If you wish to schedule this slide-tape presentation for viewing (free of charge), please contact Don Wilhite at the Nebraska Water Resources Center, 310 Agricultural Hall, University of Nebraska; or phone (402) 472-3805.

GRANTSMANSHIP TRAINING PROGRAM PLANNED

The Water Resources Center will be sponsoring a Grantsmanship Training Program during the week of September 18-22, 1978. This one-week, small group workshop for non-profit, private and public agencies is intended to develop and improve the participant's funding and planning skills. In addition, the program also focuses on the primary sources of information that will better acquaint the participant with funding sources applicable to his or her field of interest. The session will be taught by a representative of the Grantsmanship Center in Los Angeles and enrollment is limited to 22 persons.

The tuition for this one-week session will be \$325.00, payable to the Grantsmanship Center. For more information, please contact Don Wilhite at (402) 472-3805.

PAPER PRESENTED AT AGU MEETING

M. L. Quinn, a member of the Nebraska Water Resources Center staff, presented a paper at the American Geophysical Union's (AGU) annual five-day meeting held this past December in San Francisco. The paper, entitled "Water-Short Reservoirs in Nebraska," was part of a special one-day symposium devoted to Lake Water Quality and Quantity Management. Co-chairmen for the symposium were Dr. Robert Averett of the U.S. Geological Survey's Denver office and Dr. Heinz Stefan of the University of Minnesota. A total of 16 papers were given during this special session.

Dr. Quinn's presentation focused on Box Butte Reservoir on the Upper Niobrara River in Dawes County and Enders Reservoir on Frenchman Creek in Chase County. Both of these reservoirs are water-short, based on the definition of that term used in the paper. The reasons for the insufficient water supply do differ in each case, however, and these differences provide interesting contrasts between the two impoundments.

The point was made that water planners might well learn from the lessons which previous projects can offer. The Enders experience, for example, cautions about the interrelationship between surface and groundwater, while a review of the Box Butte development stresses the importance of reliable streamflow records. In the case of Box Butte Reservoir, however, and its accompanying Mirage Flats Irrigation Project, history also shows that there are many measures of success and that indeed despite its insufficient water supply, this irrigation project has done much to help stabilize the economy of northwestern Nebraska.

Dr. Quinn is now completing a written version of the paper which will then be submitted for publication. The abstract can be found in EOS, Transactions of the American Geophysical Union, Vol. 58, December 1977, page 1131.

WATER RESOURCES IN NEBRASKA

CONSERVATION AND SURVEY DIVISION

The Conservation and Survey Division will be coring several Sand Hill lakes in Sheridan and Holt Counties sometime this spring or early summer. This investigation is part of a project being carried out in cooperation with NASA to develop techniques to measure lake levels using remotely sensed data. If prior suitable arrangements can be made other researchers may obtain samples of cored material. Field supervisor for the project is Gerald R. Svoboda. Interested researchers may contact him at (402) 472-3471 or write to him at the Conservation and Survey Division, 113 Nebraska Hall, University of Nebraska, Lincoln, Nebraska 68588.

The Conservation and Survey Division has issued an updated publication entitled, "Laws, Rules, and Regulations Pertaining to Groundwater in Nebraska." This report compiled by Gerald R. Svoboda contains the major regulations that govern groundwater use in the state and rules and regulations of groundwater agencies. The 94-page report costs one dollar and can be obtained from the Conservation and Survey Division, 113 Nebraska Hall, University of Nebraska, Lincoln, Nebraska 68588.

FEDERAL HIGHLIGHTS

MANUEL MORRIS NAMED OWRT DEPUTY DIRECTOR

Manuel Morris of Los Angeles, California, has been appointed Deputy Director of the Office of Water Research and Technology (OWRT). As Deputy to OWRT Director Gary D. Cobb, Morris will be directly identified with management and operating decisions affecting water resources research and saline water conversion programs.

Morris returns to federal service following a period (1974 to 1977) in which he was vice-president and technical director of two firms specializing in the manufacture and sales of waterless toilet systems.

Although his federal civilian service began in 1942, his career really began in 1957 when he joined the National Park Service where he was involved mainly in environmental and water resources work.

His federal service included a two-year assignment with the U.S. Army for International Development as Sanitary Engineer/Advisory with the AID mission in Jamaica, where he provided technical assistance and training leading to formation of water management institutions and the design and construction of treatment plants and distribution systems. He was Chief of the National Park Service's Water Resources Division when he left the federal government in 1974.

NATIONAL IRRIGATION WATER STUDY ANNOUNCED

A national study on use and management of irrigation water will be conducted by the U.S. Department of Agriculture (USDA), the U.S. Department of the Interior (USDI), and the Environmental Protection Agency (EPA). An Interagency Task Force on Irrigation Efficiencies, based in Washington, D. C., is scheduled to complete the study report by September 1978.

Secretary of Agriculture Robert Bergland said the task force will identify water use and management problems in farm irrigation systems and in irrigation water delivery systems. It also will recommend federal actions to better coordinate irrigation assistance to farmers from USDA's Soil Conservation Service and Extension Service and USDI's Bureau of Reclamation.

The study follows two recent reports on irrigation by the General Accounting Office. The reports point out the need for detailed knowledge about potential for water conservation through irrigation improvements and about the economic, environmental and social effects of such improvements.

An Interdisciplinary Technical Work Group, with headquarters in Denver, Colorado, has been selected to gather and analyze field data. The work group will solicit information and suggestions from a broad range of public interest groups and natural resource organizations, according to Secretary Bergland. It also will hold meetings before developing recommendations to be considered by the task force.

NEW DIRECTOR AT NEW MEXICO

Dr. Thomas G. Bahr has accepted the position of Director of the New Mexico Water Resources Institute effective March 1, 1978. He replaces Dr. Garrey E. Carruthers who has been Acting Director since mid-1976.

Dr. Bahr had previously headed the Institute of Water Research at Michigan State University for the past four years. He is a specialist in fisheries management and water quality, and his work includes studies on the effects of pesticides and toxic agents on fish, the dynamics of heavy metals in aquatic systems, and nutrient effects and control of eutrophication in surface waters. His most recent work has focused on evaluating and developing alternative management approaches for the treatment of municipal wastewaters.

From 1970 to 1973 Dr. Bahr was Assistant Director of the Institute of Water Research at Michigan State, and prior to that he held a faculty post in zoology at Colorado State University. He received his undergraduate degree from the University of Idaho, and received his M.S. in limnology and biochemistry and his Ph.D. in limnology from Michigan State.

MODEL IMPLEMENTATION PROGRAM (USDA-EPA)

Under the terms of an agreement signed September 16, 1977, the Department of Agriculture and the Environmental Protection Agency are cooperating in a Model Implementation Program (MIP) to demonstrate the effectiveness of a coordinated program to solve nonpoint source water pollution. Under this program, the two agencies agreed to identify three to five geographic areas where the various programs of USDA and EPA can be coordinated and concentrated to install Best Management Practices (BMP) on the area within two to three years.

The Soil Conservation Service state conservationists were notified of the MIP procedure and asked to convene each state USDA 208 Work Group to consider nominating an area for national consideration. The Regional EPA and State and Areawide Planning Agencies were asked to participate in the nominations. The nominations were to be submitted to the National USDA "208" Work Group and the Environmental Protection Agency by November 30, 1977.

Fifty applications were received from 42 states. Initial screening was done by a Task Force of USDA and EPA staff, utilizing a common scoring procedure with each application. Four to six scores were independently developed for each application, then averaged for a final score. The applications were scored on their merit as related to the instructions provided in November, without consultation between the scorer and the people in the state. Scores ranged from around 80 to 163.

On December 15, 1977, the USDA 208 Work Group and EPA staff met to review the resultant rankings. Applications scoring over 130 points were identified. This involved 20 applications from nine EPA regions. The top scorer from the tenth region was added, then EPA requested that four more applications of particular interest to them be kept in for added consideration. As a result, 25 applications remained.

The second screening process consisted of each USDA agency and EPA calling field counterparts to get a better understanding of the details of the proposal, an idea as to the Agency's support, an estimate of the ease with which existing programs or priorities could be focused on the project area, and other details. Following these contacts, each Agency selected its top six to ten nominees.

On January 4, 1978, the 208 Work Group and EPA selected 11 nominations. These nominations were discussed January 9, 1978, in a public interest group meeting where representatives of 30 agricultural, forestry, and environmental public interest groups were invited to meet with EPA and the 208 Work Group.

On January 11, 1978, the following MIP's were selected:

- (1) New York-----Delaware River--West Branch
- (2) South Carolina-----Broadway Lake
- (3) Indiana-----Indiana Heartland
- (4) Oklahoma-----Little Washita
- (5) Nebraska-----Maple Creek
- (6) South Dakota-----Lake Herman
- (7) Washington-----Sulphur Creek

A team of EPA and USDA personnel will visit each selected area in February to assist them in developing a specific work plan.

ASCS withheld \$1-\$1.5 million of their 1978 ACP funds for the MIP. The work plan will provide details about the use of these ACP funds, plus reorientation of other USDA and EPA ongoing programs. Methods of monitoring water quality and keeping records on the land treatment in the watershed will be required so that the impact of the land treatment on water quality can be measured. Follow-up reports will be required for three to four years.

In many of the non-selected areas, water quality oriented conservation work has been or will be accelerated as a result of the MIP exercise. The process of getting all of the agencies to agree on a high priority area, what it needed, and what they could provide toward those needs has resulted in priority shifting in many instances. Several of the areas were either too large to be done in the two to three year MIP timeframe, or had problems so difficult that ongoing USDA and EPA programs may be inadequate. These areas remain prime candidates for attention under other programs, particularly the new program enacted in the Clean Water Act of 1977 as an amendment to Section 208. Many states and regional EPA offices say they plan to implement their MIP's and have been encouraged to do so by USDA and EPA.

CONFERENCES

WORKSHOP ON STORM SEWER DESIGN

The second workshop on Storm Sewer Design will be held May 31 - June 2, 1978 at the University of Illinois at Urbana-Champaign, co-sponsored by the University of Illinois, Illinois State Water Survey, and American Society of Civil Engineers Central Illinois Section. The major purpose of the workshop is to acquaint participants with the latest computer-aided methods for design of storm sewers, including the ILLUDAS, SWMM and ILSD models. Conventional methods such as the rational and Chicago methods will also be discussed.

The workshop is intended for engineers with public agencies and in private practice as well as others interested in urban storm water drainage planning, management and design. The emphasis is on the procedures for designing the size, slope, and layout of sewers. Participants will work out example sewer system designs using the computer models, and each participant is encouraged to bring specific data for a problem that they would like to solve.

Registration fee of \$225 covers all session costs, lecture notes, user's manual for selected computer programs and computer time for design example. Space is limited and advanced registration is suggested. This workshop will not be repeated in the near future as workshops on other topics are being planned.

For enrollment write: University of Illinois Office of Continuing Education and Public Service, 116 Illini Hall, Champaign, Illinois 61820. Telephone (217) 333-2884. For more information, contact Workshop Coordinator, Dr. Ben C. Yen, Department of Civil Engineering, University of Illinois, Urbana, Illinois 61801. Telephone (217) 333-4934.

AWRA CONFERENCE

The American Water Resources Association (AWRA) announces its Fourteenth Annual Conference on "Water and--Energy, Environment, Economics" to be held in Disney World Village (near Orlando), Florida on November 6-10, 1978. Papers are invited related to any aspect of water resources planning, development, management, education and information systems.

For a paper to be considered by the Program Committee, authors should submit detailed abstracts of their paper no later than March 31, 1978. Abstracts should not exceed 200 words in length and are to include the paper's title, author(s) name(s), and affiliations(s). The senior author should be annotated with an asterisk. Typing should be single-spaced with a left-hand margin of one inch and other margins not less than half an inch. Paragraphs are to be indented five spaces and should be separated by one blank line. Five copies of the abstracts should be sent, one of which should be the original. Authors must also enclose on a separate page their full mailing address (including position, firm or institution, department, and telephone number for all authors of the paper), and the appropriate topic area for the paper. Papers selected for presentation may be submitted for possible publication in the Water Resources Bulletin.

Upon acceptance of the paper, the senior author will be asked for a copy of the abstract for direct reproduction. Instructions for format will be provided.

Abstracts should be sent to the Chairman of the Technical Program Committee: Dr. Bent Christensen, Department of Civil Engineering, University of Florida, Gainesville, Florida 32601. Phone (904) 392-0952.

PAPERS SOLICITED FOR ASAE MEETING

Papers are being solicited by the Hydraulics and Transport Processes Committee of the American Society of Agricultural Engineers (ASAE) for a technical session on "Transport in Watersheds--Analysis and Modeling" at the 1978 winter meeting in Chicago. Papers covering surface or subsurface transport are welcome. Focus may be on either a single transport component or on coupling among components (such as sediment and chemical movement, fertilizer leaching, nutrient balance in the watersheds, etc.). Analysis and/or modeling are both appropriate.

Deadline for receipt of the paper proposal form is March 1, 1978. For additional information, contact: Dr. Allen R. Overman, Agricultural Engineering Department, University of Florida, Gainesville, Florida 32611.

SHORT COURSE ON UNSTEADY FLOW IN PIPELINES

A short course on fluid transients in piping systems will be presented at the University of Michigan July 10-14, 1978. The course is intended for practicing engineers who desire an understanding of transient flow in fluid systems and who wish to acquire a capability in problem solutions with the digital computer. Emphasis will be placed on the solution of practical problems in a variety of fields such as fluid transportation systems, cooling water condenser systems in power plants, and complex piping systems that include various boundary conditions.

Topics will include concepts of transient flow; derivation of basic equations for liquids and transformation by method of characteristics; series, branching, and looped systems; boundary conditions such as turbo-machines, valves, air chambers, surge devices, condensers, etc.; vapor column separation; natural gas unsteady flow in pipeline systems, transients in liquified natural gas systems.

For further information, contact Professor E. Benjamin Wylie, Department of Civil Engineering, University of Michigan, Ann Arbor, Michigan 48109.

PUBLICATIONS

PROCEEDINGS AVAILABLE FROM NWRC

The Nebraska Water Resources Center (NWRC) announces the availability of two publications. The first is the Proceedings of the 1977 Interdisciplinary Water Resources Seminar on "Water Resources Planning and Management." This is a publication of presentations by speakers at the seminar series and includes such titles as: "An Introduction to Nebraska Water Rights Law" by J. David Aiken; "Water and the Economy" by Raymond Supalla; "Water Resources of the Missouri River Basin" by Warren Viessman, Jr.; "Major State Water Issues" by Senator Maurice A. Kremer; and "The Economics of Local Administration and User Finance for Water Resource Investments" by Steve H. Hanke.

Also available is the Proceedings of a conference held in November 1976 entitled "Water Problems in the Rural Environment--Alternative Solutions for Water Supply and Wastewater Disposal." The purpose of this conference was to describe the current rural water situation. Rural water supply and wastewater disposal problems including both quantity and quality were considered. The socio-economic and technological aspects of alternative solutions to rural water problems and the various impacts involved in changing or improving the current situation were examined. Future research and related needs to solve various rural water problems were outlined.

Copies of both publications may be obtained by contacting the Nebraska Water Resources Center, 310 Agricultural Hall, University of Nebraska, Lincoln, Nebraska 68583.

POSITIONS AVAILABLE

DIRECTOR SOUGHT

The University of Massachusetts at Amherst is seeking a Director for the Institute for Man and Environment. The position is to be filled no later than July 1, 1978. The Institute for Man and Environment conducts an on-going University program of research, education and public service directed to problems in man-made and natural environments. The Institute's research is interdisciplinary, and is conducted by its Centers, each of which focuses on a problem of major importance. Support for research is provided by contracts with and grants by federal, state and regional agencies and private organizations. The Institute responds to a maximum degree to requests for public service. The Institute places major emphasis on strengthening educational programs in relevant disciplines, and cooperates with the University departments to accomplish this objective.

The Director is responsible for providing leadership to the University in strengthening environmental programs of research, education and public service, and should be able to perceive needs in each of these areas. He is expected to advance the relevant interests of the University components and stimulate their participation in Institute programs. He must maintain

effective working relations with public and private agencies. He must be able to integrate effectively the contributions of specialists in the natural and social sciences, and in environmental design. The Director should have experience as a generalist in environmental studies, and a specialist's background in a related academic discipline.

Applications and resumes should be forwarded by February 15, 1978, to Screening Committee for Director, Institute for Man and Environment, Room 211A Graduate Research Center, University of Massachusetts, Amherst, Massachusetts 01003.

GRADUATE RESEARCH ASSISTANTSHIPS IN WATER RESOURCES AND HYDRAULICS

The St. Anthony Falls Hydraulic Laboratory, Department of Civil and Mineral Engineering, University of Minnesota, invites applications for graduate study and research in water resources, hydrology, hydraulic engineering, and fluid mechanics leading to M.S.C.E. and Ph.D. degrees. Stipend for academic year approximately \$5,000 plus resident tuition rates for non-residents. Summer research work usually available. Attractive fellowships with supplemental support also available through the Department.

For details and application forms write to Director, St. Anthony Falls Hydraulic Laboratory, Mississippi River at 3rd Avenue, S.E., Minneapolis, Minnesota 55414.

FACULTY POSITION IN ENVIRONMENTAL ENGINEERING

The Department of Environmental Sciences and Engineering of the University of North Carolina at Chapel Hill has an opening in Water Resources Engineering at the Assistant Professor level. Applicants should have a Ph.D. in applied fluid mechanics and be interested in research and graduate teaching in flow phenomena pertinent to water supply, water and wastewater treatment, wastewater discharge, or natural aquatic systems.

Send vitae, references, and pertinent publications to Dr. Philip C. Singer, Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina, Chapel Hill, North Carolina 27514. The University of North Carolina is an equal opportunity/affirmative action employer.

CIVIL ENGINEERING ASSISTANT/ASSOCIATE PROFESSOR, UNIVERSITY OF NEBRASKA

A tenure-track faculty position will be available in the environmental-sanitary engineering area beginning August, 1978. A Ph.D. is required with the bachelors degree being in civil engineering. Professional registration is desirable. Duties include undergraduate and graduate teaching and the development of funded research programs. Primary assignment will be to the Omaha campus.

Applicants are invited to send resume with transcripts of graduate and undergraduate records and a list of references before April 1, 1978 to Dr. Joseph V. Benak, Vice-Chairman Department of Civil Engineering, University of Nebraska, P.O. Box 688, Omaha, Nebraska 68101. An equal opportunity/affirmative action employer.

FACULTY POSITION AVAILABLE IN ENVIRONMENTAL PLANNING

The Department of City and Regional Planning at the University of North Carolina at Chapel Hill announces an opening in Environmental Planning. Initial appointment level on a tenure track beginning fall 1978. Women and minority applicants are especially encouraged to apply.

The person's primary strengths should be in theory, methods and practice of natural resources planning. A strong supplementary background in regional development, natural science, and resource economics is highly desirable.

The position involves teaching in both a professional masters degree program and a Ph.D. program. The professional program is organized in three major areas: physical development planning, environmental planning and socio-economic development planning. This position falls in the second area, and the primary teaching will be environmental quality and resources management. In addition, the person selected will be expected to relate to other topics taught in the Department such as regional economic development and regional land use planning. Special consideration will be given to applicants with background in energy resources.

Applicants should have a commitment to research as well as teaching, and a strong orientation to public policy and the analysis, formulation and evaluation of operational programs at the state and regional level. A Ph.D. in planning is preferred; professional experience is desirable.

Interested applicants should contact: George C. Hemmens, Department of City and Regional Planning, New East Building 033A, University of North Carolina, Chapel Hill, North Carolina 27514.

VISITING PROFESSOR PROGRAM

A new visiting professor program at the Yale School of Forestry and Environmental Studies has been established by a recent grant from the Andrew W. Mellon Foundation of New York.

The purpose of the program is to encourage interdisciplinary attention to natural resources problems and to build effective linkages between scholars, scientists and their respective institutions. The visiting professorships are particularly suited to academics on research or sabbatical leave.

Mellon Professors are entitled to stipends inclusive of living, travel, and research expenses. They can visit for a semester or a full year. They will be encouraged to teach graduate level courses, pursue research of their own choosing, and serve generally as scholars in residence. A modest supplemental grant will be available during the succeeding year to permit activities of a continuing nature.

Interested individuals should write a simple letter of inquiry stating the purposes and requirements of a visit, and enclosing a curriculum vitae. Letters should be sent to: Charles H. W. Foster, Dean, School of Forestry and Environmental Studies, Sage Hall, Yale University, New Haven, Connecticut 06511. For the 1978-79 academic year, this should be done by April 1, 1978.

Each inquiry will be given immediate and careful consideration by a Committee on Visiting Faculty.

RESEARCH REVIEW

PROJECT TITLE: Nitrogen Losses From Sprinkler Applied Nitrogen Fertilizer

PRINCIPAL INVESTIGATOR: Gary W. Hergert, Assistant Professor of Agronomy
North Platte Station
University of Nebraska

Irrigation development is continuing at a steady pace on sandy soils in several regions in the United States as well as Nebraska. Most of the irrigation on sandy soils is provided by center-pivot systems. The sandy soils are well suited to this irrigation method because of rapid water infiltration.

The expansion of irrigation for crop production dictates fertilizer use for maximum crop yields and economic return. The crop nutrient required in the greatest amount is nitrogen. Any nitrogen applied to soils eventually is transformed to the nitrate form (anion) which is mobile. Because sandy soils are very permeable to applied water the nitrate form of nitrogen moves readily with infiltrating water. Leaching losses of nitrogen make up the largest amount of unaccounted for nitrogen from nitrogen applications on sandy soils.

To reduce nitrogen losses from leaching most producers apply the bulk of their nitrogen with the irrigation water several times during the growing season. Individual applications range from 20 to 40 kilograms of nitrogen per hectare. Producers apply a total of 100 to 250 kg of N per hectare this way. Urea ammonium nitrate solution is the fertilizer nitrogen source used. This method of supplying nitrogen to the crop just before actual crop uptake should reduce nitrogen losses from leaching and hopefully increase nitrogen use efficiency.

To understand the fate of nitrogen used in crop production, a nitrogen budget or balance sheet approach must be used. The inputs and losses of nitrogen in the system must be quantified to develop management and practices for nitrogen application. Losses from leaching, denitrification and volatilization must be assessed to determine nitrogen use efficiency.

The objectives of this research were (1) to quantify leaching and volatilization losses of nitrogen from sprinkler applied nitrogen fertilizer and (2) to develop management practices that provide optimum corn yields while reducing nitrate losses from leaching.

Research Findings

Soil, plant and soil solution samples were taken from the experiment in 1976 and 1977.

Two nitrogen sources and two irrigation levels were used in this experiment with corn. The nitrogen sources were urea-ammonium nitrate (UAN) and calcium nitrate ($\text{Ca}(\text{NO}_3)_2$). The irrigation rates are based on actual crop water use or evapotranspiration (ET) from corn grown in lysimeters. The watering rates in this work as a percentage of ET are 85% and 130%. The .85 ET level is a slight deficit irrigation where as the 1.3 ET level is a leaching irrigation. The nitrogen rate was the same for all treatments, 210 kg of nitrogen per hectare.

Dry Matter Yields

Minimizing nitrogen loss is one part of this research but maintaining economic levels of crop production is equally important. Grain yields were determined to show effects of the different treatments.

No significant effect of either nitrogen source or water level was shown for grain yields either year (Table 1). The lack of a treatment effect, especially for the water variable, is encouraging because it indicates that producers may attain optimum yields with somewhat limited water applications.

Leaching Losses of Nitrogen

Concentrations of nitrate-nitrogen in extractor samples of soil water ranged from very high to very low for different plots (Figures 1 and 2). There seemed to be no relationship between nitrate-nitrogen concentration and leaching amount or between nitrate concentration and irrigation treatment. In general, nitrate-nitrogen concentration remained constant during the season or increased with time in 1976.

In 1977 nitrate concentrations started off very high then declined. During the season concentrations remained at a constant level or increased slightly.

An average nitrate-nitrogen concentration for leachate from each plot can be calculated by determining the total nitrate-nitrogen loss during the season and dividing by the total amount of leachate collected. These data show that all of the nitrate concentrations in the leachate samples were quite high (Table 2). There was definite nitrate enrichment of deep percolating soil water due either to application of N fertilizer or residual soil nitrate. Although these concentrations are high it is important to remember that the total amount of nitrogen per hectare moved below the root zone is the main consideration. A small amount of high nitrate content leachate will still have little effect on ground water quality.

The extractor data show the importance of good nitrogen fertilizer and irrigation practices. Control of irrigation during the growing season is important to reduce losses of N. Losses occur even if the N is applied several times during the growing season if water applications exceed crop water use and soil water holding capacity (Table 3, 1976 data).

The 1977 data point out the other equally important aspect of management on sandy soils. In 1976 the low water treatments lost only 26 kg/ha of $\text{NO}_3\text{-N}$ (Table 3). In 1977 the limited irrigation plots lost almost as much N as the overirrigated plots (Table 3). For both water treatments in 1977 about 85 kg/ha $\text{NO}_3\text{-N}$ was lost by June 20. This was before full irrigation began. Why such large losses when good irrigation management had been practiced both years for the low water plots? Precipitation during the winter and early spring of 1977 was sufficient to fill the soil water storing capacity and leaching resulted. Because residual $\text{NO}_3\text{-N}$ was present in all plots it was leached out with percolating water. The 210 kg/ha N rate was more than the crop needed. Nitrogen applications must be closely matched to crop uptake and yield potential to reduce nitrate carryover. For corn at this location this is somewhere between 160-180 kg/ha. Nitrogen rates above this would generally not increase yields, but would leave excess $\text{NO}_3\text{-N}$ which would be subject to leaching the spring of the next year.

Leaching losses of nitrogen from sandy soils can be minimized. The keys to nitrogen management are the amount and timing of irrigation water and the amount of nitrogen applied. Irrigation scheduling can help provide information for better water control. Good water control does reduce N leaching during the season. Knowing the yield potential of corn for a given location then matching nitrogen rates to produce than yield should help reduce carryover of nitrate-nitrogen. More work is needed to determine proper nitrogen rates for optimum production on sandy soils in Nebraska.

The practice of applying nitrogen through the irrigation system works well because nitrogen applications do come when crop demands for nitrogen are high. Other work at the University of Nebraska Sandhills Ag Lab (B.R. Bock, D.H. Sander, G.W. Hergert) has shown that the source of N used or the timing of the N application was not critical when water application was controlled.

Table 1. Grain yields of corn

	Irrigation			
	0.85 ET		1.30 ET	
Fertilizer	1976	1977	1976	1977
	----kilograms per hectare--			
UAN	7878	9126	7288	9182
Ca(NO ₃) ₂	<u>7928</u>	<u>8906</u>	<u>7991</u>	<u>9634</u>
Average	7903	9016	7640	9408

Table 2. Average NO₃-N concentration in extracted soil water

Irrigation	1976	1977
	-----ppm-----	
0.85 ET	72.0	76.9
1.30 ET	106.7	69.7

Table 3. Average NO₃-N losses for the irrigation treatments

Irrigation	1976	1977
	-----kg/ha leached -----	
0.85 ET	26	101
1.30 ET	186	123

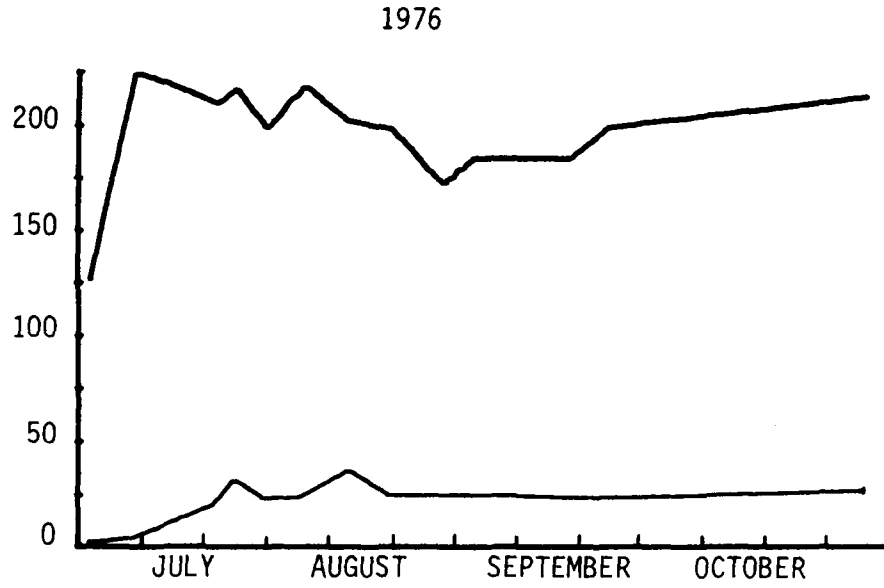


Figure 1. Nitrate-nitrogen concentrations in extractor samples of soil water, 1976.

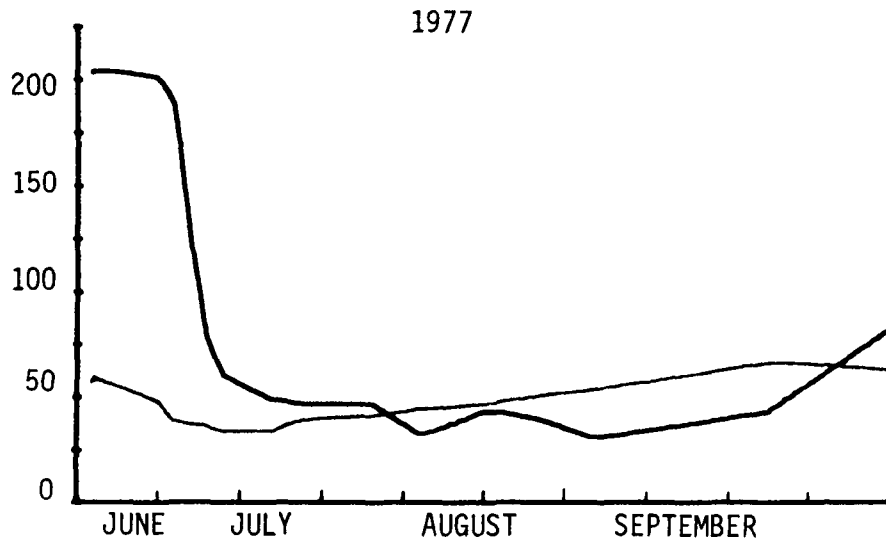


Figure 2. Nitrate-nitrogen concentrations in extractor samples of soil water, 1977.