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Water Current, Volume 11, No. 3, May/June 1979

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"Water Current, Volume 11, No. 3, May/June 1979" (1979). *Water Current Newsletter*. 123.
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Water Current

Environmental

JUN 11 1979

Gary L. Lewis, Acting Director
Volume 11, Number 3

Programs IANR

Karen E. Stork, Editor
May/June, 1979

FROM THE DESK OF THE DIRECTOR

The Nebraska Unicameral has taken a positive step in establishing Nebraska as a leader in water planning in the 80's. An innovative linkup of water agencies was initiated when the lawmakers recently provided funds to the Natural Resources Commission and other agencies for accelerating the new State Water Planning and Review Process developed last summer and proposed last November. This legislative initiative was accompanied by the formation and confirmation of a Governor's Interagency Water Coordinating Committee to coordinate planning and review activities. The initiative also establishes a Public Advisory Board to advise the agency water planners of general public opinions on use of Nebraska water resources by Nebraska citizens. The Natural Resources Commission continues to be the agency responsible for the process, but the package also now involves all the water-interested state agencies, including the University.

All new funds are earmarked this year for agency use in examining and recommending alternatives for state policies on water. This expenditure has implications affecting all Nebraskans. Feasibilities and impacts of implementing various policies will be evaluated, and recommendations for legislative and administrative changes will be delivered to the legislators and the Governor as early as this fall.

This summer the planners and policy analysts are mainly looking at different state policies on dealing with the water in Nebraska's streams and at alternatives on how to manage the exploding utilization of Nebraska's groundwater. A multi-agency look at water rights and at state policy on water quality will also be initiated this year.

*If you no longer wish to receive the NWRC Water Current,
please clip and return the form on inside back page.*

Now that the Unicameral has acted on the November work plan, the Natural Resources Commission can forge ahead with cooperative agreements with the Other agencies to initiate the policy studies. The late-session funding by the Unicameral means that the planned analyses of alternative state policies on water issues will be late getting started, and it is unlikely that much of the work proposed for FY 1979 will be accomplished before the end of June. The planning teams will need to adjust their schedules and budgets to account for the late start, but the acceleration idea should still have the effect of producing some recommendations for the next legislative session.

While these actions represent an important advance in developing information for establishing statewide policies on various water issues, the funded process focuses on only one of the five elements proposed in the November work plan. The other elements must be activated for continuity and success of the whole planning and review process. Once all five elements are implemented, Nebraska will be able to look proudly upon a comprehensive, integrated process for providing water agency services to the people and government of the state. Other states are looking at Nebraska's process as a model, and the federal government is also looking to Nebraska for help in developing plans to provide additional financial assistance to states for water conservation and planning purposes.

Gary L. Lewis,
Acting Director

- March 14 WATER PLANNING AND MANAGEMENT IN ISRAEL
- Leon Chesnin, Associate Professor of Agronomy, UNL
 - Donald Edwards, Associate Dean, Engineering and Technology, UNL
 - Marvin Twersky, Research Associate, Ag. Engineering, UNL
 - Norman Rosenberg, Ag. Meteorology & Climatology
- March 21 FLOOD PLAIN MANAGEMENT
- Al Mathews, Nebraska Natural Resources Commission
 - George Patenode, U. S. Army Corps of Engineers
- April 4 INSTREAM FLOW VALUES AND NEEDS
- Bill Bailey, Game & Parks Commission
 - Lee Rupp, Game & Parks Commission
 - Wendell Gangwish, Nebraska Farm Bureau Federation
- April 11 UPDATE: ADMINISTRATIVE AND LEGISLATIVE IMPLEMENTATION OF THE NATIONAL WATER POLICY INITIATIVES
- Warren Viessman, Jr., Library of Congress, Washington, D.C.
- April 18 MUNICIPAL WATER PLANNING
- James Knapp, Metropolitan Utilities District
 - Rich Robinson, Lincoln Water System
 - Cliff Summers, State Department of Health
- April 25 WATER PLANNING AND MANAGEMENT ISSUES IN THE MISSOURI RIVER BASIN
- M. Wayne Hall, Chairman, Missouri River Basin Commission

A special thanks is extended to all above speakers for their presentations at the seminar. A proceedings is currently being prepared and hopefully will be ready for distribution within two months.

PUBLICATION ON LAND USE CHANGES

The Nebraska Water Resources Center announces plans to publish, as part of its Occasional Papers Series, a report entitled "Changing Fields: Agricultural Land Use Changes in Nebraska, 1925-1974," by Donald A. Wilhite. The publication depicts agricultural land use changes in the state via a series of maps and graphs which focus on the principal cultivated crops of corn, wheat, sorghum and soybeans. The changes have significantly altered the demands on water resources in the state.

The publication will be available late in June. One copy will be made available free of charge. Multiple copies may be purchased for the cost of postage (\$1.00 each). Copies may be obtained from Donald A. Wilhite, 212 Ag. Engineering Building, University of Nebraska, Lincoln, Nebraska 68583.

NWRC PUBLICATIONS AVAILABLE

The Nebraska Water Resources Center (NWRC) announces the availability of the following publications:

- (1) "Summary - Conference on Water Data Programs and Needs."
This is a summary of presentations made at a conference held September 15, 1978 sponsored by the Nebraska Water Data Coordination Committee and the U.S. Geological Survey and hosted by the Nebraska Water Resources Center.
- (2) "Water Resources Research in Nebraska - Fifth Edition."
This is the fifth edition of NWRC Publication #10 describing water resources research being conducted in Nebraska.
- (3) "Hydrologic Implications of Nebraska Groundwater Management Act--A First Look." This is the final report resulting from a contract with the State Office of Planning and Programming and was written by the principal investigator, Marvin V. Damm.

Copies of these publications may be obtained from the Nebraska Water Resources Center, 310 Ag. Hall, University of Nebraska, Lincoln, Nebraska 68583.

WATER RESOURCES IN NEBRASKA

WATER-USE DATA ACQUISITION FOR NEBRASKA

A project to establish and operate a water-use data system for Nebraska is being conducted by the University of Nebraska Conservation and Survey Division in cooperation with the U.S. Geological Survey. The system will include the collection, storage, manipulation and dissemination of data on water use from government agencies, industrial and commercial establishments, public utility systems, agricultural and irrigation entities and domestic developments, incorporating data on both withdrawals and returns. The need for such a system is realized because the competitive use of available water supplies, both in quantity and quality, is forcing people to take a closer look at inventorying, analyzing and planning the most beneficial use of the water resources. Without adequate data on water use, decision-makers on local, regional and national levels have difficulty formulating water policy or resolving critical water problems.

The water-use data system will be developed to meet the needs of the state and also to satisfy the requirements of the National Water-Use Data System (NWUDS), which is being developed and administered by the U.S. Geological Survey. An advisory committee on water-use data acquisition, which functions as a subcommittee of the State Water Data Coordination Committee, has been established. This subcommittee will advise the water-use data project staff in creating and implementing the water-use data system. It is hoped that coordination among various local, state and federal agencies, who are either

sources of or will be recipients of water-use data, will enable the development of a practical system that will supply the necessary data to better evaluate the use of Nebraska's water resources.

Any persons having questions, comments or suggestions regarding the Water-Use Data Acquisition for Nebraska Project can contact Dennis R. Lawton or Cindy Veys, University of Nebraska Conservation and Survey Division, 113 Nebraska Hall, Lincoln, Nebraska 68588.

FEDERAL HIGHLIGHTS

WATER RESEARCH AND DEVELOPMENT ACT

The Water Research and Development Act of 1978 (P.L. 95-467) provides an expanded water resources program replacing the Water Resources Research Act of 1964 and the Saline Water Conversion Act of 1971. The new legislation, to be carried out through the Office of Water Research and Technology (OWRT), provides support for research and development, technology transfer, impaired water conversion projects and training.

Emphasis in the legislation is clearly on development, with each of the 54 water resources research institutes required to create a research and development plan. In addition, the institutes are also to cooperate with the Secretary of Interior in developing five-year water research and development goals and objectives.

Four major titles in the Act describe a number of programs for research participation by universities and other entities. Title I includes the Annual Cooperative Program (formerly the annual allotment program), which now includes the provision of at least one non-federal dollar for every two federal dollars--\$110,000 per institute; the Matching Grant Program (which still has a one-for-one non-federal to federal matching provision; and a national water research and development program ("focused area" program) which is open to academic, private or local government researchers. Title II provides for the "development of technology for the conversion of saline or other impaired waters for beneficial use." Title III describes the national technology transfer and information dissemination program which has been designed to support projects keyed to two general areas--educating users and documenting research. Title IV contains provisions for the implementation of the Act.

As a result of the new Act, OWRT has been reorganized into five major groups, each headed by an assistant director and a coordinator. Hopefully, this will create a more efficient structure for OWRT to interact with the state water institutes.

For additional detailed information on the new Act and its provisions, contact the Nebraska Water Resources Center, 310 Ag. Hall, University of Nebraska, Lincoln, Nebraska 68583.

OWRT APPROVES 16 RESEARCH GRANTS

The Office of Water Research and Technology (OWRT) has approved \$766,980 for 16 water resources research proposals, bringing the 1979 total to 105 projects funded in a program aimed at solving local and regional water problems. These approvals will fully commit the program's 1979 budget of nearly \$5 million.

The dollar-for-dollar matching grant program is open to water resources scientists and engineers at colleges and universities through the 54 water research and technology institutes located at land grant universities in every state, District of Columbia, Guam, Puerto Rico, and the Virgin Islands.

The states receiving funds for the projects are:

<u>State</u>	<u>Project</u>	<u>Federal Funds</u>
Arizona	Water use by riverine vegetation in the Southwest	\$71, 244
Colorado	Water management and storage	53,460
Illinois	Monitoring surface and drinking water for mutagenic compounds	36,670
Iowa	Toxic substances models for the Upper Mississippi and Missouri Rivers	37,472
Louisiana	Hydraulic conductivity of rockfill	17,975
Massachusetts	Water pollution abatement and changing real estate values	43,342
New Jersey	Assessing phosphorus behavior in lakes and streams	51,491
New York	Treatment of Adirondack acid lakes	45,840
North Dakota	Electrochemical detection of phenols in surface and groundwater	53,676
Ohio	Controlling aquatic algae with bacteria	77,797
Oklahoma	Analysis of irrigation in the Central Ogallala region	64,730
Oregon	Irrigation systems in Oregon	75,000
South Carolina	Measuring radium levels in South Carolina groundwater	10,879
Tennessee	Role of surface-active cations in water treatment	41,502
Washington	Irrigation projects and wildlife management	44,885
Wyoming	Evaluation of fisherman benefits using special fish management programs	<u>38,017</u>
	Total	\$766,980

STUDIES TO PINPOINT URBAN STORMWATER POLLUTION PROBLEMS

Intensified studies of runoff of stormwater in urban areas, a major but largely undocumented source of water pollution, are underway as part of a joint effort by the U.S. Geological Survey, Department of Interior and the Environmental Protection Agency.

Pilot studies have been or are being conducted by USGS hydrologists in Philadelphia, Pa., Denver, Colo., Portland, Ore., and the Miami and south Florida area.

The major objectives of the program include: establishment of a consistent, accessible and readily usable data base for typical urban watersheds in each study area; determination of the magnitude and frequency of storm-runoff loads of water-quality constituents from typical urban watersheds; development of methods for estimating storm and annual loads of water-quality constituents for unsampled watersheds; and testing the effectiveness of storm-water management alternatives such as street sweeping and detention storage.

Program plans call for studies of 10 or more urban areas throughout the country covering 5 to 10 watersheds in each study area, with each study lasting 3 to 5 years.

Recently completed USGS pilot studies have demonstrated the ability of hydrologists to collect reliable data and provide analytical products useful to local officials in assessing the quality of stormwater from differing land use areas. One such study in Denver, Colo., concluded that urban storm runoff may contribute significant amounts of ammonia nitrogen, total nonfilterable residue, copper, iron, lead, and zinc to local streams. The study also showed that winter snowmelt runoff may add significant amounts of sodium and chloride from street de-icing chemicals to local streams.

Results of the urban hydrologic studies will be published as they become available. For additional information contact: Philadelphia (Tom Ross, Malvern, Pa., 215-647-9008); Denver (Sherman Ellis, Lakewood, Colo., 303-234-3815); Portland (Stuart McKenzie, Portland, Ore., 503-231-2016); and Miami (Albert La Sala, Miami, Fla., 305-350-5382).

CONFERENCES

UCOWR ANNUAL MEETING

The Annual Meeting of the Universities Council on Water Resources (UCOWR) will be held at Rutgers - The State University, New Brunswick, New Jersey, July 29 through August 1, 1979. The theme of the meeting is "Significance of University Water Research and Education." The objectives of the meeting are to further advance and encourage university research and education in fields related to water resources utilization and development by (1) bringing together delegates from member universities to share creative ideas and success stories on research

and education, and (2) evaluating recent university contributions and future potentials for enhancing water research and education through concerted and organized university action.

Speakers will include Joseph S. Cragwell, Chief Hydrologist, U.S. Geological Survey; Guy R. Martin, Assistant Secretary of Interior for Land and Water Resources; and Harvey Banks, President, Water Resource Division, Camp Dresser McKee, Inc.

For additional information, contact: UCOWR Executive Secretary's Office, 310 Ag. Hall, University of Nebraska, Lincoln, Nebraska 68583.

WATERPOWER '79

"WATERPOWER '79", the first international symposium on small scale hydro-power and its potential, will be held October 1-3, 1979 at the Washington Hilton Hotel in Washington, D.C. The conference is sponsored by the U.S. Army Corps of Engineers and the U.S. Department of Energy.

The conference will provide a comprehensive examination of an increasingly important alternative energy source. General topic areas will include: (1) technology-equipment, innovations, power systems, applications; (2) policy--regulation, development, societal considerations; and (3) science--research, information gaps, new knowledge.

The registration fee is \$99. Deadline for submission of abstracts is June 29, 1979.

For additional information about the program, contact: WATERPOWER '79, 1129 - 20th Street, N.W., Suite 511, Washington, D.C. 20036. Telephone: (202) 466-7290.

AWRA CONFERENCE

The American Water Resources Association (AWRA) will hold its Fifteenth American Water Resources Conference September 24-28, 1979 in Las Vegas, Nevada. The theme of the conference is "Water Resources Management in a Changing Society." A National Symposium on "The Use of Scientific Information in Planning for Environmental Quality Objectives" will be held in conjunction with the conference.

For additional information, contact: Dr. J. Paul Riley, General Chairman, Utah Water Research Laboratory, UMC 82, Utah State University, Logan, Utah 84322. Telephone: (801) 752-4100, ext. 7961 or 8391.

CALL FOR PAPERS

A "National Symposium on Urban Stormwater Management in Coastal Areas," sponsored by the Hydraulics Division, American Society of Civil Engineers, will be held June 19-20, 1980 at Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

The symposium will deal with problems associated with the design and operation of any type of drainage system or management scheme including hydraulic, hydrologic, water quality, sociological, legal, and economic problems. Presentations on case study are encouraged. Suggested topical areas are:

- (1) Joint probability of tide and rainfall event.
- (2) Practicality of detention basin in coastal area.
- (3) Trade-off between open channel and pipe system.
- (4) Tidal hydraulics computation in the design of canal or canal system.
- (5) Mathematical storm runoff quantity and quality models applied to the coastal area.
- (6) Alternative management scheme related to social, economic, and legal problems.
- (7) Coastal flooding due to hurricanes.

Following are deadlines for submittal of papers for the conference:

November 1, 1979: Deadline to submit five copies of 250 word abstract

December 15, 1979: Notification of paper acceptance

March 15, 1980: Deadline to submit eight page paper for proceedings.

For additional information and abstract submission, contact: Dr. Chin Y. Kuo, Department of Civil Engineering, Virginia Polytechnic Institute & State University, Blacksburg, Virginia 24061.

ASCE CONFERENCES

The American Society of Civil Engineers (ASCE) announces the following upcoming conferences and conventions:

- (1) "Irrigation and Drainage in the 1980's," Albuquerque, New Mexico, July 17-21, 1979.
- (2) "Conservation and Utilization of Water and Energy Resources," San Francisco, California, August 8-10, 1979.
- (3) "Third Engineering Mechanics Specialty Conference," Austin, Texas, September 17-19, 1979.
- (4) Annual Convention and Exposition, Atlanta, Georgia, October 22-26, 1979.

For additional information on these conferences, contact: ASCE, 345 East 47th Street, New York, New York 10017.

PUBLICATIONS

MISSOURI BASIN REGION HAS 30 TIMES MORE WATER STORED UNDERGROUND THAN ABOVE

An estimated million billion gallons of groundwater are stored in the Missouri Basin region, an amount about 30 times larger than the total capacity of surface-water reservoirs in the region, according to a new U.S. Geological Survey, Department of the Interior, report.

The USGS report also notes that the total amount of groundwater in storage was equal to more than 60 years of average flow of the Missouri River -- enough to cover the entire region to a depth of more than 10 feet.

The Missouri Basin region covers 519,000 square miles in the north-central part of the country -- about one-sixth of the conterminous United States -- and includes parts of Montana, Wyoming, North Dakota, South Dakota, Minnesota, Iowa, Colorado, Kansas, Missouri, and all of Nebraska as well as 9,700 square miles of Alberta and Saskatchewan, Canada. Among the large cities in the basin are Denver, Kansas City, Rapid City, Casper, and Omaha.

The USGS report states that many different types of aquifers (underground water-bearing rock units) containing large supplies of water are numerous and widespread in the region.

From 1965 to 1975, groundwater withdrawal in the region jumped nearly 300 percent while total water use including surface water increased just 75 percent. Surface-water withdrawal alone increased 64 percent.

The 41-page report covers the occurrence, characteristics and behavior of groundwater resources in the region; indicates areas where more data and investigations are needed; suggests preliminary ways to make full use of groundwater; and explains proven methods for the investigation and use of groundwater supplies.

Copies of the report, "Summary Appraisals of the Nation's Groundwater Resources -- Missouri Basin Region," by O. James Taylor, published as USGS Professional Paper 813-Q, are available for \$3.00 from the USGS, Branch of Distribution, 1200 South Eads Street, Arlington, Virginia 22202. Orders must include check or money order payable to the U.S. Geological Survey.

The report is the latest in a series of reports in a USGS program to publish regional appraisals of the Nation's groundwater resources. These appraisals provide the first broad-scale analysis of the quantity and quality of groundwater in each of the Nation's 21 water resource regions. Other reports in the series published thus far cover these regions: South Atlantic-Gulf, Mid-Atlantic, Souris-Red-Rainy, Texas-Gulf, Upper Colorado, Ohio River, Rio Grande, Upper Mississippi, California, Arkansas-White-Red, Great Basin, Hawaii, Alaska, and Tennessee.

REPORT ON THE WATER CONSERVATION OPPORTUNITIES STUDY

The Report on the Water Conservation Opportunities Study has been published by the United States Department of the Interior, Bureau of Reclamation and Bureau of Indian Affairs.

The study was performed pursuant to the Emergency Drought Act of 1977 (Public Law 95-18) and evaluates measures that could be used to mitigate the effects of future droughts. The study also responds to the urgent need for accelerating efforts to conserve the precious and limited water resources of the Nation.

The study represents a joint effort of the Bureau of Indian Affairs and the Bureau of Reclamation to evaluate proposals for modifying water management practices and facilities on a number of federally constructed irrigation projects in the Western United States. Additional detailed study of the various proposals, as needed to justify implementation, will be undertaken if sufficient local support is demonstrated.

The report is available from the Chief, Division of O&M Technical Services, Engineering and Research Center, Building 67, Denver Federal Center, Denver, Colorado 80225.

PUBLICATIONS AVAILABLE

The Department of Hydrology and Water Resources at the University of Arizona is offering a number of reports at a greatly reduced price. Following is a list of reports for sale at \$2.00 per copy, postage paid, when check accompanies order:

- #7 "A Random-Walk Simulation Model of Alluvial Fan Deposition,"
W. E. Price, Jr., June 1972.
- #11 "Spatial Variability of Precipitation in the San Dimas Experimental
Forest and its Effect on Simulated Streamflow," C. A. Phanartzis,
May 1972.
- #12 "Water Quality in the Lower Colorado River and the Effects of
Reservoirs," G. C. Slawson, Jr., July 1972.
- #14 "Bayesian Decision Analysis of a Statistical Rainfall/Runoff
Relation," H. A. Gray, October 1972.
- #16 "Bayes Risk Analysis of Regional Regression Estimates of Floods,"
W. A. Metler, February 1973.
- #18 "A Stochastic Approach to Space-Time Modeling of Rainfall,"
V. K. Gupta, June 1973
- #19 "Design of Water Resources Systems in Developing Countries: The
Lower Mekong Basin," K. Chaemsaithong, June 1973.
- #20 "A Cost-Effectiveness Study and Analysis of Municipal Refuse
Disposal Systems," M. L. Popovich, June 1973.
- #21 "Eutrophication: A Mathematical Model," J. H. Friedman, June 1973.

- #22 "Planktonic Dynamics as an Indicator of Water Quality in Lake Mead," R. D. Staker, June 1974.
- #23 "Coal-Fired Energy Development on Colorado Plateau: Economic, Environmental and Social Impacts," T. G. Roefs and R. L. Gum (Editors), July 1974.

To order copies of any of the reports listed, contact Diane Landis, Department of Hydrology and Water Resources, University of Arizona, Tucson, Arizona 85721.

POSITIONS AVAILABLE

DEAN, COLLEGE OF AGRICULTURE

The University of Missouri -- Columbia is seeking a Dean for the College of Agriculture.

The Dean is the principal administrative officer in the College of Agriculture, and is responsible to the Provost for the operation of the College of Agriculture, the School of Forestry, Fisheries and Wildlife, the Missouri Agricultural Experiment Station, and Agriculture Extension. The Dean is responsible for and provides leadership in: (1) the maintenance and enhancement of quality undergraduate and graduate instruction programs; (2) the support of research, the fostering of quality research, and the evaluation of research performance; (3) the continuation and augmentation of effective agricultural extension programs; (4) the development and support of quality programs in international research, teaching and extension programs; and (5) the development and maintenance of effective relationships with other segments of the University and with local, state, regional, national and international organizations and agencies.

Qualifications include: (1) an earned Ph.D. or equivalent degree; (2) meaningful administrative experience; and (3) demonstrated competence in direction of personnel, fiscal responsibility and budget management. Salary will be commensurate with experience and qualifications.

Nominations should be sent to:
 Raymond A. Schroeder, Chairman, Search Committee for Dean of Agriculture; Office of the Chancellor, University of Missouri, Columbia; Columbia, Missouri 65211.

The University of Missouri is an affirmative action institution. Minorities and women are encouraged to apply.

OPENINGS FOR ENVIRONMENTAL ENGINEERS

Utah State University is seeking qualified individuals for the following positions:

mental scientist with academic training in water chemistry, aquatic microbiology, aquatic chemistry, aquatic biology or limnology. The other position will be an environmental engineer, chemical or sanitary engineer.

The positions entail research and teaching environmental engineering courses at the graduate and undergraduate level and require initiation, solicitation, performance and management of environmental research grants, contracts and projects by university and non-university sources. These will be joint appointments between the Utah Water Research Laboratory and the Division of Environmental Engineering. Each position may be converted to a tenurable position (depending on administrative approval and resource availability) prior to the selection of successful candidates.

Qualifications include a Ph.D. degree in environmental science and/or engineering, limnology, aquatic chemistry, aquatic microbiology or related field for the first position, and a degree in environmental, chemical, sanitary, civil engineering, or related field for the second position. Salary is negotiable depending on qualifications.

Applicants should send a resume and names of three references, by August 1, 1979, to: Dr. James H. Reynolds, Head, Division of Environmental Engineering, UMC 41, Utah State University, Logan, Utah 84322.

Utah State University is an Affirmative Action/Equal Opportunity Employer.

ASSISTANT PROFESSOR--ENVIRONMENTAL ENGINEERING

The Department of Civil and Mechanical Engineering at Southern Methodist University has a tenure track, junior level faculty position available in environmental engineering or closely aligned field.

Applicants must have or soon to have Ph.D. degree. Responsibilities include teaching at undergraduate and graduate levels, direction of Master's and Ph.D. candidates in Civil and Environmental Engineering, development of research support, and/or ability to interact effectively with regional industry. The position will be available beginning either fall semester, 1979, or spring semester, 1980. The salary is competitive and commensurate with qualifications.

Applications with resume and names and addresses of at least three references should be sent to Dr. Paul Packman, Chairman, Department of Civil and Mechanical Engineering, School of Engineering and Applied Science, Southern Methodist University, Dallas, Texas 75275.

Southern Methodist University is an Affirmative Action/Equal Opportunity Employer.

RESEARCH REVIEW

PROJECT TITLE: Remotely Sensed Crop Temperature for Water Resource Management

PRINCIPAL INVESTIGATOR: Blaine L. Blad, Associate Professor
Center for Ag. Meteorology & Climatology
University of Nebraska - Lincoln

The objectives of this study are (1) to determine, under varying climatic and moisture conditions, the temperature response of major agronomic crops; (2) to test methods based on crop temperature and/or other readily measurable meteorological parameters for accurately estimating crop water and heat stress conditions; and (3) to determine the feasibility of using crop temperature data as a guide for irrigation scheduling.

As long as plants have an adequate supply of water to meet transpiration demands they will remain relatively cool. However, as water becomes limiting, energy which would have been consumed in transpiration is used to heat the plant--thereby causing an increase in the plant temperature.

Crop temperature can be measured by attaching thermocouples directly to plant leaves, by using infrared thermometers, or by obtaining surface temperature imagery from thermal scanners on aircraft or satellites. Each of these methods will be utilized in this study.

In 1978 studies were conducted at the Mead Field Laboratory and at the Sandhills Agricultural Laboratory (SAL) near North Platte. Because of adequate rain at Mead, non-irrigated plots of corn, sorghum and soybeans experienced only very minor stress and were seldom any warmer than irrigated plots. At SAL, however, we were successful in establishing different levels of soil moisture utilizing an irrigation technique which applied continuously decreasing amounts of water across a plot. Plants near the irrigation line were always well-watered while those at about 24 rows from the line received no supplemental water. Water stresses ranging from no stress to moderately severe stress were obtained.

We were able to detect temperature differences as large as 10-12 C and 5-6 C between the fully-irrigated and non-irrigated corn and sorghum, respectively, during mid-day periods. With increasing amounts of water, temperature differences between the fully-irrigated and partially-irrigated plants decreased. Estimates of the effect of plant water stress on crop production and yield were highly correlated with sums of the daily differences between maximum and minimum crop temperature or differences between mid-day crop and air temperature. The study also established that the phenological stage of crop development could be predicted using crop temperature data.

During 1979 studies will be conducted at SAL to supplement 1978 studies to further elucidate crop temperature-plant water status relationships. An additional study will use crop temperatures to schedule irrigations. The amount of water used when irrigation is scheduled based upon crop temperature measurements and the yields produced under various irrigation schemes will be compared with those in

plots scheduled in traditional ways. Four different irrigation treatments based on crop temperature are planned: (1) irrigate at first sign of stress as indicated by crop temperature; (2) irrigate when crop temperature is about 1 C warmer than a well-watered crop; (3) irrigate when crop temperature is 2-3 C above the well-watered crop.

Arrangements have been made with NASA to provide overflights of our research plots throughout two days in 1979. These flights will provide multi-spectral imagery, including thermal scans, of SAL and the surrounding area from low level aircraft. In addition, IR photographs of the research area will be made from an airplane on a weekly basis during the growing season.

The Water Current Newsletter will publish, without charge, announcements, programs for up-coming conferences, employment opportunities or other newsworthy items on hydrology, water resources or related topics. We will be happy to help advertise any water-related job openings in this newsletter. Please send any job openings you would like to have published to the editor, and we will see that they are advertised.

QUESTIONS AND INQUIRIES

Newsletter items and inquiries should be sent to: Editor, Nebraska Water Resources Center, 310 Ag. Hall - East Campus, University of Nebraska, Lincoln, Nebraska 68583; or phone, (402) 472-3305.