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# Water Current

Conservation & Survey

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## Director's Memo

### Platte River Forum Develops Model

I don't think I've ever seen so much brainpower in one place concentrated on one objective as during the recent Platte River Forum for the Future. Frankly, I didn't know for sure if we would succeed.

We spent the first week of August in Grand Island at the initial meeting of the Platte River Forum. The goal was to develop a mathematical simulation model of the Platte River system. Ralph Cady, Vince Dreeszen, Denis Gilbert, Jim Gilley, Martha Gilliland, Don Hanway, Jim Stubbendieck, Ray Supalla and I were the nine University of Nebraska representatives who were invited to participate in this river-modeling study. The forum also included irrigators, lawyers, state legislators, biologists, agronomists, engineers, hydrologists, environmentalists and others interested in the use of Platte River water.

Monday was a day of getting acquainted with each other and the modeling process. A "core team" of experts from the U.S. Fish and Wildlife Service in Fort Collins, Colo. brought us up to speed and immediately put the group to work by having us suggest possible actions (uses of Platte River water) and indicators to describe the results of taking such actions. Suggested actions were usually the taking of water from various reaches along the Platte River and using it for such purposes as power generation, irrigation, wildlife, recreation and so forth. Indicators of results included crop yields, water table levels, stream flow, nitrate concentrations and others.

To build this model, which shows how the indicators of the results would vary in future years, a great deal of basic data and relationships had to be entered into the computer. Much of the week was spent developing the relationships and gathering needed data. Submodels for stream flow, groundwater, agricultural

production, wildlife and recreational activities, municipal and industrial needs and economic indicators were developed. By Thursday, the relationships between the submodels were formed, and the core team began entering data into the computer and stringing the submodels together into a single model.

By Friday morning, a model was up and running of the Platte River system from the Lewellen gage on the North Platte and the Julesburg gage on the South Platte to the Missouri River. In my opinion, this feat was just short of miraculous. In the opinion of the core team, it was exhausting—most of them had stayed up all night.

The remainder of Friday morning was spent looking at graphical representations of such indicators as stream flow, groundwater levels, nitrate content, etc. These representations were for the Platte River system if no actions were taken, i.e., a baseline condition against which to compare the results of future actions. It was difficult to assess the ability of the model to predict the results of various actions during the short time the indicators were displayed graphically on the TV screen. Before we could look at indicators of results from future actions, the computer went down.

The workshop adjourned Friday afternoon after we agreed to meet again and refine a model that we all felt was a good first generation. Small technical meetings will be held periodically throughout the coming year to refine the model. When the model of the Platte River system is complete, a workshop will be held to present the model to state policymakers.

—Bill Powers  
Director





## Update on Fed Funds

Senate Bill (S.) 2494, reported on in the May/June, 1982 *Water Current*, was recently passed by the U.S. Senate.

The bill, sponsored by Senator James Abdnor (R-SD), would authorize \$8.1 million annually from 1983 through 1987 for the 54 state water institute programs. A comparable House bill, H.R. 6087, still remains in the subcommittee of the U.S. House of Representatives' Interior and Insular Affairs Committee. As soon as a bill similar to S. 2494 is passed by the House, the two bills can go to conference committee for resolution.

Although the prospect of federal funding for the state water institute program in FY 1983 remains uncertain, this legislative progress in the nation's capital offers an encouraging sign, said Bill Powers, NWRC director.

## Pollution Manual Ready

NWRC has recently published a planning manual, *Strategies for Reducing Pollutants from Irrigated Lands in the Great Plains*, to help managers control this source of non-point pollution on an areawide basis.

The guide was written and printed with funding from the Environmental Protection Agency and NWRC. Authors include J.R. Gilley, D.G. Watts, R.J. Supalla, M.-L. Quinn, F.W. Roeth and K.D. Frank of the University of Nebraska, R.R. Lansford of New Mexico State University and Marvin Twersky, a former research associate at NU. M.-L. Quinn, assistant professor of water resources, edited the publication.

Section one of this five-section manual describes the extent of irrigation in the Great Plains and summarizes federal water pollution legislation that pertains to irrigated agriculture. In section two, pollutants in irrigation return flows are described. Section three offers alternative irrigation management options to reduce pollution from irrigation return flows while section four examines the economic effects of the options on farmers. Strategies for implementing alternative irrigation practices are presented in the last section of the manual.

The first copy of the manual is available from NWRC at no charge. Each additional copy will be sold for \$4 (make checks payable to the University of Nebraska).

## Dee Creek Study Over

The Dee Creek Study is now complete, and the final report is available from this NWRC study that used computers to assess water quality in an agricultural watershed.

The study began in 1974 with funding from various

sources. During the past three years, the Environmental Protection Agency has solely supported the project, which has been under the direction of Denis Gilbert, NWRC water scientist.

The major goal of the Dee Creek Study was to test in Nebraska a computer model that predicts water quality. Another goal was to use the model to assess the impact of "best management practices" on in-stream water quality in a medium-sized Nebraska watershed.

The HSP-F model, developed by Hydrocomp, Inc. for the EPA and released in 1979, was chosen for study. The model represents about 20 years of research by Hydrocomp.

The title of the final report is the *Development of State Water Quality Management Plan for the State of Nebraska*. Copies are available and can be obtained by contacting NWRC.

## Farewells

We regretfully announce the resignation of staff member Denis Gilbert, effective September 10, 1982. Denis will be joining the consulting firm of Henningson, Durham and Richardson (HDR) in Omaha.

Denis joined the Water Center in 1978 as a Water Scientist and has been active in numerous NWRC research projects since then. His latest assignment, which he assumed in 1980 as principal investigator, was the Dee Creek Project.

We are indeed sorry to see Denis leave. His contributions to NWRC in the last four years have been outstanding. However, we all wish Denis the very best in his future water resources career.

\* \* \*

A farewell is also extended to Darrell Watts, professor of agricultural engineering and a NWRC researcher for many years. Darrell is leaving in September for Morocco, where he will be chief of party for a MidAmerica International Agricultural Consortium project. Five universities, including NU, are members of the consortium.

Darrell tells us that the goal of the project is to establish agricultural research as an institution in Morocco. He will be stationed at the Dryland Agricultural Research Center at Settlat, which is 45 miles south of Casablanca, where he will also continue pursuing his research interests—water use efficiency and water conservation.

Although NWRC and NU are losing a valuable scientist, Morocco, a food-insufficient country with a high birth rate, will tremendously benefit from Darrell's expertise.

Good luck from all of us at NWRC.



## Paper Wins ASAE Award

George Meyer, assistant professor of agricultural engineering and a NWRC researcher, has won a 1982 Paper Award from the American Society of Agricultural Engineers (ASAE).

In "Simulation of the Reproductive Process and Senescence in Indeterminate Soybeans", Meyer wrote that the computer program he helped develop simulates the growth and yield response of soybeans to variations in soils and climate. It also considers the influence of protein, carbohydrate and other nutrients in a soybean plant. Final yields are predicted by estimating the number of pods on each plant, the number of soybeans in each pod and the size of each soybean.

The paper, of which the agricultural engineering professor was principal author with three co-authors, scored highest of 327 entries in the contest. Announcement of the award was made at the recent ASAE Annual Banquet in Madison, Wis.

Meyer is refining the soybean model with NWRC support. He said more research is needed to make the model useful to farmers, who could use the model on a microcomputer to project how much fertilizer and water their soybeans will need to attain a specified yield goal.

## NU Manual Wins Award

A University of Nebraska Extension Service manual, *Irrigation Pumping Plant Performance*, has won a nationwide competition for educational publications sponsored by the American Society of Agricultural Engineers (ASAE).

Paul Fischbach, NU extension irrigation specialist and co-editor of the manual with Mark Schroeder, extension assistant, received the blue-ribbon award for NU at the annual ASAE conference in Madison Wis. recently. The publication received the highest score of 20 entries in the contest category for newsletters, periodicals and manuals.

The 284-page manual was written for professionals who service irrigation pumps. The pump adjustment procedures explained in the report can reduce the energy used to irrigate by as much as 30 percent, Fischbach said.

The manual was published with the support of the Nebraska Energy Office and the Western Area Power Administration. Copies are available for \$15 each from the NU Department of Agricultural Engineering, L.W. Chase Hall, Lincoln, NE 68583.

## Recharge Studied at Lake

A recently constructed reservoir on Big Sandy Creek near Clay Center, Neb. is offering valuable information about ground water recharge, say NU researchers Dean Eisenhauer and Darryll Pederson.

Eisenhauer, an assistant professor of agricultural engineering, and Pederson, a research hydrogeologist with the Conservation and Survey Division, are estimating the amount of water that can seep into the underlying water table from this 250 acre man-made lake. It was built to control floods and recharge the underlying aquifer that farmers heavily depend upon as a source of water for irrigation.

The purpose of the recharge project is to obtain information that can be used to develop design standards for obtaining maximum seepage of water from multipurpose reservoirs, Eisenhauer said.

The study began two years ago when the scientists started measuring water levels in observation wells near the proposed reservoir. With the impoundment now full, Eisenhauer and Pederson will continue measuring water levels for two more years.

This before-and-after comparison will enable them to predict how much of the rise in the water table is due to seepage from the reservoir, Eisenhauer explained. Seepage rates of as much as 125 acre-inches per day from the 250 acre impoundment may be observed, he said. An acre-inch is the amount of water required to cover an acre with one inch of standing water.

The Little Blue Natural Resources District built the reservoir and is funding the study, Eisenhauer said. The impoundment is located on the grounds of the U.S. Meat and Animal Research Center near Clay Center.

## ET Program Available

A new AGNET program offers irrigators the most accurate and current estimates of evapotranspiration (ET) that have previously been available only to NU scientists.

The heart of the ET program is a network of 10 automated weather stations in Nebraska. The NU Center for Agricultural Meteorology and Climatology (CAMaC) installed the stations recently and plans to add more to the network.

Paul Fischbach, extension irrigation specialist, and Thomas Thompson, professor of agricultural engineering, developed the program.

Once each day, CAMaC's computer calls each weather station and reads hourly records of temperature, relative humidity, wind run, solar intensity and rainfall. The computer sends the readings to AGNET's computer, which uses the records to calculate potential ET for each station. The results are available to any AGNET user interested in the information.

The ET program estimates evapotranspiration for the previous day, three days and week, Fischbach said. It also projects how much water the crop will use in the coming week. Estimates are made for corn, soybeans, sugar beets, dry edible beans and alfalfa at various emergence dates.



According to Fischbach, news media that broadcast or publish evapotranspiration information also could use the new AGNET program.

The charge to use the ET program will be less than \$2 per computer hookup, with the exact amount depending on how much computer time is used, Thompson said. A computer terminal and phone hookup equipment to use the more than 200 AGNET programs can be purchased for between \$750 and \$1,500.

For information on how to use AGNET, Thompson and Fischbach recommended contacting a local extension office or AGNET at 105 Miller Hall, East Campus, University of Nebraska, Lincoln, NE 68583-0713. The phone number is (402)472-1892.

## NWRC at Conference

WRC staffers will give papers at the Oct. 10-15 American Water Resources Association Conference in San Francisco.

M.-L. Quinn, assistant professor of water resources, will present "Water Short Reservoirs in Nebraska: Enders and Box Butte". "Interbasin Diversions for the Public Interest Within the State of Nebraska", written by Denis Gilbert, water scientist, and Susan Miller, water technician, will be presented by NWRC director Bill Powers.

The theme of the AWRA conference is "Water—Are We Running Out?". For more information, or to register, contact AWRA at St. Anthony Falls Hydraulic Laboratory, Mississippi River at 3rd Avenue, S.E., Minneapolis, MN 55414. Telephone: (612) 376-5050.

## Research Review

Project Title: Improvement of Irrigation Scheduling Techniques for Corn With Variable Crop Maturity Range, Plant Population and Water Supply Availability

Principal Investigator: Darrell G. Watts, Professor, Dept. of Agricultural Engineering, University of Nebraska-Lincoln

Two major questions are heard repeatedly from both the producers and the people directly responsible for irrigation scheduling. The first asks how much water can be saved by seeding so as to reduce plant populations below those normally used under full irrigation. (The hypothesis is that reduced population is equated with reduced leaf area index and therefore with reduced transpiration.) The second question is how the crop coefficient curve may be better adjusted to follow changes of the crop growth rate as the weather alternates between warm and cold during the early part of the growing season, and how the shape of

the curve changes in the last half of the season when very early or very late maturing varieties are utilized.

This project has attempted to provide information to help answer these questions. We have examined the effect of plant population on evapotranspiration by irrigated corn. We have looked at alternative ways of presenting the crop coefficient function so that it better responds to changing weather conditions, and we have looked at the shapes of the curves for different maturity classes.

The basic goal of this work was the development of improved crop coefficient functions as an aid in calculation of evapotranspiration in scheduling the irrigation of corn. Hydraulic lysimeters were installed at the University of Nebraska's Sandhills Agricultural Laboratory in west-central Nebraska. They were seeded to three maturity ranges of corn and with four populations of each maturity during the growing seasons of 1978, 1979 and 1980. The results are based primarily on the 1978 and 1980 growing seasons as hail in 1979 greatly limited the amount of useful data obtained.

The ratio of crop evapotranspiration to potential evapotranspiration was calculated to estimate points on the crop coefficient function at different stages during the growth cycle. The potential evapotranspiration was computed using a modified Penman equation previously calibrated in the region. Comparison was made with ET by alfalfa that was planted in two lysimeters. The crop coefficients were expressed as a function of accumulated growing degree days from planting, rather than as a function of time. This is considered to be a significant procedural improvement in that it describes the increase of the crop coefficient function equally well in cold, wet springs or during warm, dry ones, whereas a time-based function is more prone to error and requires more guesswork in its use.

Plant population had no significant effect on ET levels. The partitioning of water use between evaporation and transpiration was altered as populations increased, with more water use being attributed to transpiration with increasing plant density. This provides for an increase in efficiency of water use but makes little difference in terms of irrigation scheduling.

The relationship between the crop coefficient function and leaf area index was analyzed. Maximum coefficient values appeared to be more closely related to the stage of growth of the crop rather than to the leaf area index.

The results from this project will be combined with those from an ongoing project near Lincoln, Nebraska and will be reported in a research publication that can be used directly by commercial irrigation scheduling consultants. These results should offer a substantial improvement over the present procedure. In addition, the crop coefficients developed in this project are now being incorporated in the AGNET irrigation schedul-



ing program offered by the University of Nebraska. The crop coefficients will also be made part of the information disseminated to farmers and commercial schedulers at the University's Irrigation Scheduling Courses each year. This information should have direct impact on the scheduling of irrigation on two million or more irrigated acres in Nebraska and will find use outside of the state as well.

## Job Announcements

**DIRECTOR FOR WATER RESEARCH CENTER - UNIVERSITY OF WYOMING:** The University of Wyoming invites applications for director of the Wyoming Water Research Center, a newly established water research program that began operating July 1, 1982.

Qualifications for the position include a Ph.D. with several years of experience in water resources research. A record of effective interaction with governmental entities is desired. Successful development of contract and grant programs, and an outstanding publication record and excellent communication skills are essential. Research administration and graduate level teaching experience are also desired.

Applications will be received until October 1, 1982. For additional information and a complete job description, contact: Dr. J. L. Smith, Search Committee Secretary, Department of Agricultural Engineering, 152 Vocational Annex Building, The University of Wyoming, Laramie, Wyoming 82071.

**EXECUTIVE DIRECTOR OF WATER RESOURCES CENTER - UNIVERSITY OF NEVADA:** The Desert Research Institute, a division of the University of Nevada, is seeking applications and nominations for the position of Executive Director of its Water Resources Center. Qualifications include Ph.D. degree (or equivalent experience) in a water resources field; demonstrated research management ability; and a demonstrated ability to obtain funds for research and program development.

Applications will be accepted until November 1, 1982 or until a suitable candidate is found. To obtain

a complete job description or submit an application or nomination, contact: The Executive Director, Search Committee, Water Resources Center, Desert Research Institute, University of Nevada System, P. O. Box 60220, Reno, Nevada 89506.

**EXTENSION WATER MANAGEMENT SPECIALIST - UNIVERSITY OF ARIZONA:** The University of Arizona Cooperative Extension Service is seeking an extension specialist in water management. A Ph.D. in agricultural engineering, soil physics or a closely related discipline is required. Applications will be accepted until September 15, 1982. For a complete job description write to I.L. Pepper, Chairman Search Committee, Soils, Water and Engineering Department, 401 Agricultural Sciences Bldg. 38, The University of Arizona, Tucson, Arizona 85721. The announcement number is 82-05.

## WATER CURRENT

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