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Water Current

Millard W. Hall, Director
Volume 7 Number 8

Karen E. Stork, Editor
November/December 1975

FROM THE DESK OF THE DIRECTOR . . .

The distinguished group invited by the university to review its water resources management efforts, as a consequence of the designation of Water Resources Management as an Area of Excellence, has come and gone. Its written report is not yet available. However, certain hints were dropped regarding the contents of this forthcoming report. In general, the review team seemed to look with favor on existing and planned water resources research and extension efforts. They did, however, note that academic programs, which are so vital to the development of the needed water resources manpower in the state and region and to the support of the research and extension areas, need expansion. They were not critical of our existing efforts in this respect, but more concerned that these efforts need greater coordination and need to be considerably increased.

This problem was discussed at the most recent meeting of the NWRI Executive Committee. One of the points made in this discussion concerns the existing graduate program in Water Resources Planning and Management. It was noted that this program has never been very effective in terms of student participation. There has been only one graduate of the program. Currently there are only two persons enrolled in the program, which represents the norm for the years that the program has existed. A number of reasons for the program's lack of success were advanced:

- (1) There is no financial incentive for a student or a faculty member to seek out this program.
- (2) There is no award in the form of a certificate or notation on the diploma that would show that the student had completed this program.
- (3) As presently structured, the student can obtain all the benefits of the program without ever making any formal declaration of program participation.
- (4) There is no continuity, no "togetherness" to the program. Students and/or faculty have little opportunity to communicate with one another regarding water resources planning and management as influenced by the various disciplines that make up the program.

(5) There is a real concern regarding the job market for program graduates.

(6) The program has little visibility.

All of these concerns are well founded and call into account the program's raison d'etre. However, the success or failure of this program is important to the questions raised by the Area of Excellence review team regarding the university's academic programs in water resources. In fact, the existing program in Water Resources Planning and Management could be used as a vehicle to bring together many of the university's efforts regarding water resources education. For example, if this program is ever to fly, it will be essential to build it with UNL undergraduates. Faculty members in all departments, teaching undergraduate courses related to water resources, will have to guide students to this program. This means that communication between these faculty members must be increased. It also means that the program's visibility must be improved. In other words, making the graduate program in Water Resources Planning and Management successful will resolve some of the review team's criticism and will, of necessity, involve increased efforts in undergraduate programs related to water resources.

In light of some of the criticism of this existing graduate program and with a view toward strengthening the university's entire academic effort, the Institute has decided to offer a seminar course in the coming spring semester on "Water Resources Policy." The seminar will focus on international water policy as it relates to the United States, on U.S. federal water policy as it relates to the individual states, and on Nebraska water policy. Speakers will discuss a number of the most important legislative acts relating to water resources planning and management in this country and in this state. We are planning to offer the course as a one or three credit hour course, depending on the degree of student participation.

At the very least, this seminar will address an important issue. It also will bring together university and state personnel to discuss water resources in an open forum. Hopefully, this will serve as an important first step in increasing the magnitude and quality of the university's academic efforts in water resources.

Your comments on this issue will be most appreciated and your suggestions regarding how the university can strengthen these programs will be given every consideration.

ON THE HOMRFRONT

LAST CALL FOR RESEARCH PROPOSALS

Just another reminder--The deadline for filing annual allotment proposals for fiscal year 1977 with the Water Resources Research Institute is December 15, 1975. Prospective principal investigators should make an appointment to discuss their proposals with the Institute Director before they begin writing.

WATER RESOURCES SEMINAR

The Nebraska Water Resources Research Institute will again offer an interdisciplinary Water Resources Seminar during the 1976 spring semester. The intent of these seminars is to bring together upper classmen, graduate students, professional persons, faculty and others interested in water topics.

The general theme of the seminar will be "Water Resources Policy." An announcement concerning seminar topics and speakers is currently being developed and will be distributed within the next two weeks. The seminar will be held in 312 Ag. Hall on East Campus from 3:00 to 5:00 p.m. on Wednesday afternoons beginning January 14,

For further information, contact the Director's Office, Water Resources Research Institute, 310 Ag. Hall, East Campus. Telephone 472-3307.

TITLE II AWARD FROM OWRT

The Water Resources Research Institute announces the granting of a Title II award from the Office of Water Research and Technology (OWRT) to the Nebraska Game and Parks Commission for a project entitled "Modeling the Influence of Eutrophication on Trout Habitat in Lake McConaughy."

The objective of this study is to develop and verify a mathematical model that would forecast and evaluate the impact of water quality changes on Lake McConaughy's coldwater fish habitat. Sensitivity analysis will be used to determine the critical factors upon which to concentrate management efforts for improvement and protection of the habitat. Total amount of the grant is \$43,750.

MATCHING GRANT PROPOSALS SUBMITTED TO OWRT

The Water Resources Research Institute has submitted four matching grant proposals to the Office of Water Research and Technology for consideration for funding in fiscal year 1977. A brief description of the proposals submitted is as follows:

"Optimizing Management of Irrigation Agriculture With a Limited Water Supply" --

Principal investigators are Darrell G. Watts, James R. Gilley and Charles Y. Sullivan. The overall objective of this project is to develop criteria for optimizing the use of limited water supplies for irrigation of corn and grain sorghum. More specifically, the project objectives are: (1) to determine the effects of both the timing and degree of physiologic moisture stress on the yield and metabolic response of corn and grain sorghum; (2) to examine the validity of the "stress conditioning" concept as a means of maximizing grain yield under limited irrigation; (3) to improve the accuracy of the crop growth-yield model, which, in turn, will be used as a basis for evaluating alternative management strategies for limited irrigation; and (4) to provide water application-crop yield production functions required for economic analysis of various management strategies.

"Improved Water and Fertility Management for Irrigation Systems - Phase 2"

Principal investigator is Paul E. Fischbach. This proposed project is a continuation of a current matching grant project which will provide needed information on the design capacity and management of automated sprinkler irrigation systems operating in areas of sandy soils. This will be obtained from field studies involving irrigation amount and frequency experiments conducted on corn. These results will be used to design operating and/or management procedures to make optimal use of water that is pumped, i.e., to achieve a balance between the risk of insufficient delivery during extremely hot, dry years and the tendency to over-irrigate with high capacity systems.

"Conjunctive Management of Ground and Surface Water" -

Principal investigators are Maurice E. Baker and Loyd K. Fischer. The objectives of the proposed project are: (1) to determine the economic implications of hydrologic interrelationships between ground and surface water as related to irrigation development in selected areas of Nebraska; and (2) to develop legal and administrative systems which will avoid dissociation of benefits and costs in the development and utilization of ground and surface water. Economic impacts associated with recent development of pump irrigation resulting in declines in stream flows will be ascertained through the use of impact analysis. Alternative legal schemes for apportioning water rights will be determined by exploring the systems available elsewhere in the country. The economic effects of these alternative schemes will be identified through impact analysis. Benefit-cost analysis will be used to identify the effects of developing the Ainsworth irrigation project. Particular emphasis will be placed on the project's effect on groundwater in the area. Computer models will be utilized to estimate the costs of recharging groundwater and the benefits associated with this.

"A Simplified Streamflow Simulator -- Phase II: Application" -

Principal investigator is Alvin J. Surkan. The project objectives are: (1) to apply the streamflow simulator HYDRA (developed under a current matching grant project) to produce new information on the effects of time on watershed responses and on model parameter values for Nebraska watersheds; and (2) to disseminate programs and user manuals and demonstrate both batch and time-shared implementation of the storm event and continuous flow simulator, HYDRA. The proposed project will make operational an easy-to-use method for directly estimating distributed model parameters which take advantage of high-speed computers and newly available high-quality remotely sensed data. This method also provides economies in data preparation that insure reduced demand on the modeler's time and needs for subjective judgments.

OWRC ADVISORY COUNCIL MEETS

The Nebraska Advisory Council on the Old West Regional Commission artificial recharge project held its first meeting on November 19, 1975 at the Nebraska Center. They met with the Director and project staff to discuss the progress to date. This council is charged with providing liaison with their respective agencies regarding project activities.

Members of this advisory council are:

Jon Atkinson
Dept. of Environmental Control

Deon Axthelm
Water Extension Specialist
University of Nebraska

James Barr
State Office of Planning
and Programming

Connie Bowen, Exec. Director
Nebraska Wildlife Federation

Vincent Dreeszen, Director
Conservation & Survey Division
University of Nebraska

Patricia Hoffman
League of Women Voters

John M. Jess
State Department of
Water Resources

Robert Kluth
Soil Conservation Service

Floyd Marsh, General Manager
Upper Big Blue NRD

Kenneth Mac Kichan, Dist. Chief
Water Resources Division
U.S. Geological Survey

Deane Manbeck
Dept. of Ag. Engineering
University of Nebraska

Lee Orton, Exec. Director
Nebraska Association of
Resource Districts

Robert Schneider, Board Member
Upper Big Blue NRD

Darrell Watts, Irrigation Specialist
North Platte Station
University of Nebraska

Warren White
State Office of Planning
and Programming

Dayle Williamson, Exec. Secretary
Nebraska Natural Resources Comm.

WATER RESEARCH IN NEBRASKA

With this issue of Water Current, we are establishing a new section on water resources research in Nebraska. The purpose of this section is to improve communication between the various agencies in the state engaged in water research. We will include a short write-up on the current research being conducted by some of the state agencies in each issue.

U.S. GEOLOGICAL SURVEY

As part of the groundwater management study of the Upper Republican Natural Resources District, determination is being made of rates of natural recharge and return flows of applied irrigation water that is not used consumptively. Rates of unsaturated flow of water in the liquid phase only are being investigated where depths to the water table range from less than 10 feet to over 300 feet.

Simulation techniques are being used. These include a monthly moisture balance model of the root zone, and a finite element model for isothermal unsaturated flow in the vertical. The information developed from this investigation will be used as input for calibrating the regional groundwater management model of the District.

CONSERVATION AND SURVEY DIVISION

The Conservation and Survey Division is preparing a finite-element model to be used in the analysis of various groundwater management programs in the Upper Big Blue Natural Resources Districts. A unique feature of the model is the incorporation of a leakage factor from a widespread low-permeability silt and clay unit separating the two principal aquifers in the Upper Big Blue River Basin.

Also, the Conservation and Survey Division is continuing its groundwater investigations to provide information on the configuration of the water table for the entire state of Nebraska. The latest results of these studies have been published in the form of water-table configuration maps of the Scottsbluff and Alliance Quadrangles (1:250,000 scale).

U.S. BUREAU OF RECLAMATION

The Bureau of Reclamation in November 1973 initiated an environmental study of Nebraska Mid-State Division, Pick-Sloan Missouri Basin Program. The information compiled can be utilized to evaluate the environmental aspects of the area.

The environmental study was divided into two major phases. The first phase compiled the existing data, which in effect established the present conditions of the area and identified voids in data. Phase II of the environmental study, although not initiated, would have quantitatively and qualitatively assessed the short- and long-term physical, ecological, and socioeconomic impacts that would occur to the natural and human environment in the future (20 and 40 years).

Phase I was staged in five separate studies contracted with the University of Nebraska-Omaha, Kearney State College, and University of Nebraska-Lincoln. The five separate studies conducted under this phase are: (1) Zoologic Resources (KSC), (2) Vegetative Resources (UN-O), (3) Socioeconomic Resources (UN-L), (4) Geologic, Physiographic, and Soil Resources (UN-L), and (5) Water Resources (UN-L). Reports from contracts (1), (2), and (3) are complete and contracts (4) and (5) will be completed by January 1976.

The general geographic limits of the study area included the Platte River Basin from North Platte, Nebraska, to the confluence of the Elkhorn and Platte Rivers near Waterloo, Nebraska. The specific area of interest was the Mid-State service area and possible locations of major facilities.

The purpose of each contract was to assemble the existing data on its particular subject and to identify the present resources. The contractors also identified voids in the existing data.

A limited supply of the reports are available at the Nebraska Reclamation Office of the Bureau of Reclamation, Second and Locust Streets or P. O. Box 1607, Grand Island, Nebraska 68801.

FEDERAL HIGHLIGHTS

NEW INTERIOR SECRETARY CONFIRMED

Thomas S. Kleppe was recently confirmed as new Secretary of the Department of Interior. He is a native of North Dakota and comes from a farming family. In 1950 he was elected mayor of Bismarck and served four years. He won a seat in the House of Representatives in 1966 and served two terms. Since 1971 Kleppe has been Administrator of the Small Business Administration.

In his confirmation hearings before the Senate Interior and Insular Affairs Committee, Kleppe noted "As we attempt to strike the delicate balance between resource use and resource protection, we must keep in mind that the economic penalty for an error in the direction of over-protection can always be corrected, while the damage from resource abuse may be irreparable. At the same time, we must not permit the proper development of our natural resources to be paralyzed by baseless fear of damage to the environment."

"WRC LEGISLATION SIGNED BY PRESIDENT FORD"

Warren D. Fairchild, Director of the U.S. Water Resources Council, has announced that President Ford has signed the W.R.C. legislation, Public Law 94-112. The legislation, which amended the Water Resources Planning Act (Public Law 89-80), affected appropriations for the Council, changed the membership in the Council and changed the amount paid to consultants.

The membership of the Council was changed by the legislation to bring it in line with the present responsibilities of the Executive Branch. The Secretary of Health, Education and Welfare was dropped from full membership, and the Secretaries of Commerce, Housing and Urban Development and Transportation and the Administrator of the Environmental Protection Agency were elevated to full membership from associate membership. In addition to the previously mentioned members, the Council is composed of the Secretaries of Interior, Army and Agriculture and the Chairman of the Federal Power Commission. The Attorney General, the Director of the Office of Management and Budget, the Chairman of the Council on Environmental Quality, and the Chairman of the Tennessee Valley Authority and the Chairmen of the River Basin Commissions and Basin Interagency Committees also participate in the Council.

In terms of appropriations, the Act extends authorization for State planning grants for fiscal years 1977 and 1978 at a total level of \$5,000,000 annually, the same amount as in past years. It provided \$1,500,000 annually for operation of the W.R.C. itself, as in past years. The Act extends authorization for national assessments and coordination of River Basin plans in the total amount of \$10,000,000 for fiscal years 1976 and 1977. Previously, there has been supplemental authorizations of \$3,500,000 for this function. Finally, the Act provides \$6,000,000 annually for the Federal share of the cost of operating the River Basin Commissions.

The legislation also amends the Water Resources Planning Act to authorize compensation of expert consultants to the Council and the River Basin Commissions at the prevailing salary for GS - 18 instead of the flat rate of \$100 per day previously authorized.

WATER RESEARCH AND TECHNOLOGY ADVISORY PANEL MEETING

The fall meeting of the Water Research and Technology Advisory Panel was held in the Department of the Interior Building, Washington, D.C., on October 29-30, 1975.

The Panel is appointed and convened by the Secretary of the Interior in accordance with the provisions of Public Law 88-379 as amended, and is composed of outstanding scientists, engineers, and laymen experienced in public affairs related to water resources.

The Panel is charged with reviewing the current activities of the Office of Water Research and Technology and with providing advice relative to future operations and planned programs. The meeting is open to public observation.

Membership of this year's Panel is as follows:

Mr. Henry J. Graeser (Chairman)
Director, Water Utilities Dept.
City of Dallas, Texas

Dean Earnest F. Gloyne
Dean, School of Engineering
The University of Texas at Austin

Mr. Lawrence K. Cecil
Consulting Chemical Engineer
Champaign, Illinois

Dr. Norman I. Wengert
Department of Political Science
Colorado State University
Fort Collins, Colorado

Mrs. Jean Auer
California State Water Resources
Board
Sacramento, California

Mr. John Leuberger
Chairman, Missouri River
Basin Commission
Omaha, Nebraska

Mr. Leon W. Weinberger
President, Environmental
Quality Systems
Rockville, Maryland

Mrs. Cristine M. Carlson
Chairman, Environmental Programs
League of Women Voters of Ohio
Yellow Springs, Ohio

Mr. Jack W. Pepper
Director, Mississippi Board
of Water Commissioners
Jackson, Mississippi

CONFERENCES

EGYPT TO BE SITE FOR ARID-LANDS IRRIGATION SYMPOSIUM

The Committee on Water Research (COWAR) of the International Council of Scientific Unions will convene an International Symposium on Arid-Lands Irrigation in Developing Countries, to be held at Alexandria, Egypt on February 16-21, 1976. This multidisciplinary symposium is being organized jointly by COWAR, UNESCO, and the Academy of Sciences and the Ministry of Irrigation of Egypt, and is in cooperation with the International Association of Hydrological Sciences (IAHS), International Association of Hydrogeologists (IAH), International Society of Soil Science (ISSS), and many other scientific organizations.

The symposium will survey world experience and research and application in arid-land irrigation, with emphasis on water use and on environmental problems and effects. In addition to seven technical sessions, a one-day field trip will be held during the symposium. The paper sessions will present case studies, descriptions of irrigation areas and methods, and discuss such subjects as influence of irrigation on hydrologic processes (quantity and quality), land use, soil problems and control, water quality, effects of irrigation on biological balances, irrigation efficiency, and human problems in irrigation areas.

Those desiring more information on this symposium should contact Mr. Arnold I. Johnson, Chairman, U.S. National Committee for IAHS, U.S. Geological Survey, National Center, MS-417, Reston, Virginia 22092, U.S.A.

AFS/ASCE CONFERENCE ON INSTREAM FLOW NEEDS

The Western Division of the American Fisheries Society and the Power Division of the American Society of Civil Engineering announces a Symposium and Specialty Conference on "Instream Flow Needs" to be held May 3-6, 1976 at Boise, Idaho. The theme of the conference will be "solutions to technological, legal and social problems caused by increasing competition for limited stream-flow."

The objectives of the conference are to address various major topics and subtopics through many forms of discussion and information transfer and to develop a useful proceedings for practitioners. The overall goal is to achieve a meaningful interface for dialogue between the various disciplines associated with instream and offstream uses of streamflow including fisheries experts, design engineers, hydraulic engineers, hydrologists, water resources planners and managers, lawyers, state and federal agency personnel, political and social scientists and recreationists.

For additional information, contact: John F. Orsborn, Program Chairman, AFS/ASCE Instream Flow Needs Conference, Albrook Hydraulics Laboratory, Washington State University, Pullman, Washington 99163.

PUBLICATIONS

NONPOINT SOURCES OF WATER POLLUTION

The Virginia Water Resources Research Center announces publication of the proceedings of a conference held May 1-2, 1975 entitled "Nonpoint Sources of Water Pollution." The proceedings includes papers presented by 21 speakers at the conference who reviewed the latest developments, findings and thinking concerning assessment, research, management and enforcement programs in the field.

Individual copies of the proceedings may be ordered for \$8.00 each, payment with order, from the Virginia Water Resources Research Center, 225 Norris Hall, Blacksburg, Virginia 24061. Checks should be made payable to Virginia Polytechnic Institute and State University (VPI & SU). If you order now for billing later, the cost per copy is \$10.00.

PUBLICATION ON WATER RESOURCES PLANNING

Volumes I and II of Multiple Objectives: Planning Water Resources report the proceedings of a workshop and conference conducted to identify various problems existing in implementing multiple objective planning and decision-making for water resources planning and development. The workshop was organized to provide a maximum exchange of ideas between federal agency planners and university researchers interested in the areas of water resources planning.

Among the topics addressed by workshop papers in Volume I are: (1) the relationships among environmental, social and economic accounts; (2) problems related to measuring the components of the objectives; (3) the possibility of developing indexing procedures to relate environmental, social and economic parameters and to weigh their importance vis-a-vis each objective; and (4) the problems of making trade-offs and choices between and among the accounts.

The conference, reported in Volume II, provides insights, methods and procedures to address the problems identified at the workshop.

Copies of this publication may be ordered for \$3.50 per single volume or \$6.00 a set from the Idaho Research Foundation, Inc., University Station Box 3367, Moscow, Idaho 83843.

POSITIONS AVAILABLE

CIVIL ENGINEERING POSITION AVAILABLE

Stanford University announces an opening in their Civil Engineering faculty. The person selected will have full responsibility for the hydrology activities in the water studies program. The appointment will be at the Assistant or Associate Professor level. Rank and salary will depend upon the qualifications of the individual. Preferred starting date is September 1976.

The candidate chosen would be responsible for teaching graduate and undergraduate courses in surface hydrology and hydrologic simulation and would be expected to develop an advanced course or two to complement courses taught by other faculty in the water studies and planning groups.

The water studies program at Stanford, which consists of seven full-time faculty members, deals with water quality, hydraulics, hydromechanics, hydrology, and environmental and water resources planning; the latter two areas are augmented by a departmental program in civil engineering planning. The program is further complemented by teaching and research in groundwater hydrology in the School of Earth Sciences. The water studies program is heavily oriented towards educating students to the Master's and Doctor's level. A doctoral degree and excellence in teaching and research are prerequisites for the position.

Interested candidates should send a curriculum vitae including names of references to: Dr. Perry L. McCarty, Chairman, Search Committee, Department of Civil Engineering, Stanford University, Stanford, California 94305.

FACULTY POSITION IN CIVIL ENGINEERING

West Virginia University announces an opening for a faculty position in the Department of Civil Engineering beginning in January 1976 or August 1976. Rank and salary will be commensurate with qualifications.

Applicants should possess a doctoral degree with an undergraduate degree in civil engineering or an appropriate allied field of engineering. Responsibility will include teaching at the undergraduate and graduate levels and the initiation and direction of sponsored research. Teaching and/or previous experience in the practice of engineering as well as professional registration or potential for registration are desirable.

Applicants should have a strong interest in systems analysis and modeling as related to water resources and environmental engineering and be interested in teaching various aspects of water resources engineering at the undergraduate and graduate levels and interaction with other members of the environmental group concerned with water pollution, air pollution and solid waste disposal.

Qualified applicants should send a complete resume, preferably including both courses taken and courses taught, along with names and addresses of three references, to: Dr. William J. Wilhelm, Chairman, Department of Civil Engineering, West Virginia University, Morgantown, West Virginia 26506. Telephone: (304) 293-3031.

West Virginia University is an Equal Opportunity - Affirmative Action employer.

NEW INSTITUTE DIRECTOR SOUGHT AT NEW MEXICO STATE

New Mexico State University announces an opening for the Director of the New Mexico Water Resources Research Institute. The position will be open on July 1, 1976.

Applicants must have an earned doctorate degree or equivalent experience. Experience must include research in the natural resources field; an established interest in multiple aspects of water research; teaching experience highly desirable; and administration of research preferable.

The Director is appointed by and is directly responsible to the President of New Mexico State University. He is responsible for the successful maintenance and enhancement of the on-going programs of the Institute and is responsible for the administration of all state and federal funds assigned. The Director is expected to provide leadership in stimulating water-related research and educational programs, and he should act as a coordinator for such activities in a liaison role with federal, state, regional and local agencies and groups. The salary for this position is negotiable.

The deadline for nominations is January 1, 1976; February 1, 1976 for applications. Nominations and applications should be directed to: John W. Hernandez, Chairman, Search Committee, Box 3167, New Mexico State University, Las Cruces, New Mexico 88003. Telephone: (505) 646-4337.

New Mexico State University is an Equal Opportunity - Affirmative Action employer.

DIRECTOR OF THE UTAH WATER RESEARCH LABORATORY (UWRL) AND DIRECTOR OF THE UTAH CENTER FOR WATER RESOURCES RESEARCH (UCWRR)

Applications from qualified individuals are invited for the position of Director of UWRL and UCWRR at Utah State University. Applicants must have an earned Ph.D. (or equivalent) in a water-related field and have demonstrated administrative ability and experience to provide leadership in procurement, management and conduct of research. National or international recognition accompanied by a proven research record with publications is necessary. Academic experience (teaching) is desirable. Applicants should be knowledgeable of research funding sources and have been successful in generating programs

and financing them. They should have the ability to set goals and priorities and accomplish objectives according to established time schedules. Director must provide stimulus to staff and students and effectively communicate with and gain support of the University administration and the public. The Director is expected to have an individual research program and will be expected to achieve a thorough knowledge of Utah's water problems, the state administrative structure, and the legislative appropriation process.

Purposes of the Utah Center for Water Resources Research are: (1) To coordinate University-wide research in the field of water resources as described by "The Water Resources Research Act of 1964," (2) to administer the provisions of the Water Resources Research Act as they relate to USU and the State of Utah, (3) to encourage and foster the development of interdepartmental research and educational programs to the water resources field.

Letters of Application and resumes should be submitted in confidence to: Dr. Doran Baker, Chairman of the Screening Committee, College of Engineering, Utah State University, Logan, Utah 84322, prior to December 31, 1975.

Utah State University is an equal opportunity employer (M/F). The salary is negotiable.

RESEARCH REVIEW

Project Title: Application of Enzyme Methods to the Determination of Pollutants in Water

Principal Investigator: K. M. Shahani, Professor
Department of Food Science and Technology
University of Nebraska-Lincoln

While the composition of domestic wastes remains fairly constant, the constituents of industrial wastes vary with the nature of the industry. For example, dairy effluents contain large quantities of lactose and milk solids; whereas, meat processing plants are responsible for wastes containing high organic nitrogen contents. The presently available and commonly used methods for quantitating or identifying specific pollutants in water systems are non-specific, time-consuming, cumbersome or expensive. On the other hand, enzymic assays of substances have the inherent advantages of being specific, sensitive, rapid and simple, besides yielding quantitative data. Using an enzyme phosphate (which breaks down orthophosphoric esters) as little as 5 μ g phosphate per liter can be quantitated. Similarly, the detection of other compounds such as phenols, lactose, and nitrogenous compounds can be accomplished by enzymic methods.

The specific objectives of this project are: (1) to study the use of enzymes in detecting specific pollutants in effluents, such as lipids, nitrogenous compounds, phosphates, proteins and lactose; and (2) to study the application of crude enzyme extracts or immobilized enzymes to wastewaters as a means of reducing the organic strength. It is hoped that the results of this study will assist in evaluating more rapidly and accurately the pollutant nature and contents of wastewater and consequently may help in designing more economic methods for effluent treatment.

Composite samples of effluent from a local dairy plant were collected over a 24-hour period and then analyzed for their fat, protein, ash and carbohydrate contents. Simultaneously, the pH and biochemical oxygen demand (BOD₅) were determined and the contribution of effluent constituents to total BOD₅ was calculated. Lactose was observed to contribute 60% of the BOD₅; whereas, proteins and fat were responsible for 25 and 15% of the observed BOD₅, respectively. Since lactose was found to be a single major contributor to the BOD of dairy effluents, lactose was hydrolyzed to its constituent monosaccharides (glucose and galactose) by the enzyme lactase. Samples of hydrolyzed lactose effluents were used for BOD determination and then compared with untreated samples. The BOD after 5 days of incubation for both types of samples were essentially the same. However, oxygen consumption or BOD during the first 3 days of incubation was significantly higher for the hydrolyzed lactose samples when compared with untreated samples. In fact, the final observed BOD value of 270 mg/l was reached within 3 days of incubation for the hydrolyzed lactose samples compared with 5 days required for the untreated samples. Similar experiments with hydrolyzing proteins and lipids with enzymes are in progress.

Preliminary studies seem to indicate that enzymic hydrolysis of dairy effluents may aid in the reduction of time required to treat such wastes. Further work dealing with the feasibility of using immobilized enzymes to degrade dairy effluents is in progress.

QUESTIONS AND INQUIRIES

Newsletter items and inquiries should be sent to: Editor, Nebraska Water Resources Research Institute, 310 Ag. Hall-East Campus, University of Nebraska, Lincoln, Nebraska 68583; or phone (402) 472-3307.

NEWSLETTER ITEMS SOLICITED

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.

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Programs for up-coming conferences, employment opportunities or other items.
The major current newsletter will be published, without charge, semi-annually.

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Persons who have a degree or diploma (M.S. or Ph.D.) in hydrology, water resources, or related subjects should send their resumes to: Editor, Nebraska Water Resources Research Institute, 310 Ag. Hall - East Campus, University of Nebraska, Lincoln, Nebraska 68503.

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Water Resources Research Institute
310 Ag. Hall - East Campus
University of Nebraska
Lincoln, Nebraska 68503

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