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WATER RESOURCES NEWS

NEBRASKA WATER RESOURCES RESEARCH INSTITUTE
212 AGRICULTURAL ENGINEERING BUILDING

THE UNIVERSITY OF NEBRASKA
LINCOLN, NEBRASKA 68503

Volume 1 Number 2 June, 1969

OWRR DIRECTOR RESIGNS

Dr. Roland R. Renne, Director of the Office of Water Resources Research, resigned from his position as of May 17, 1969. He will assume duties related to post-graduate studies and curricula building and research and extension work in resources economics and management at the University of Illinois. At present, Mr. Eugene D. Eaton is Acting Director of OWRR. He was formerly Associate Director under Dr. Renne.

RESEARCH ON URBAN WATER RESOURCES

The Department of Housing and Urban Development is developing an urban water resources research program. The approach is to view urban water sources, use, and management as complex social-natural systems. Emerging from this study is a definition of those elements which have the greatest effect upon urban development and the quality of urban life and which determine the priority areas for research investment. Four such research areas have been identified, they are: water resource planning, urban water use and needs, water system construction, and flood plain management. The focal point for the coordination of this program will be the Office of Urban Technology and Research. The work will be under the direction of Dr. Richard M. Michaels, Director of Utilities Technology and Dr. Arthur J. Zeizel, who is Deputy Director for Water Resources Research.

WASTE GUIDE ON THERMAL POLLUTION

Copies of an "Industrial Waste Guide on Thermal Pollution" may be obtained by writing to: National Thermal Pollution Research, Pacific Northwest Water Laboratory, Corvallis, Oregon, 97330, or Federal Water Pollution Control Administration, Room 805, 633 Indiana Avenue, N. W., Washington, D. C. 20242.

The publication includes major sections on (1) industrial waste-heat loads, (2) the physical, chemical, and biological effects of waste heat, and (3) the control of waste heat.

INFORMATION CENTER ON EUTROPHICATION

Establishment of an Eutrophication Information Center and the development of a provisional algal assay procedure are developments announced by the Joint Industry-Government Task Force on Eutrophication. The proposed Eutrophication Information Center, to be headquartered at the University of Wisconsin, will be closely associated with the major eutrophication research effort at that institution's Water Resources Center, under the direction of Dr. Gerard A. Rohlich.

Funds for the Center will be furnished by FWPCA, Office of Water Resources Research, University of Wisconsin, U. S. Department of Agriculture, and The Soap and Detergent Association. Approximately $90,000 will be required for the first year's operations. Among its specific objectives and goals, the Information Center will: (1) prepare abstracts for both domestic and foreign eutrophication literature and distribute them at regular intervals; (2) prepare, publish and distribute an annual or semi-annual critical review of the international literature on eutrophication; (3) provide a referral and library search service for technical information on specific topics related to eutrophication; and (4) provide a reference room facility to house a collection of international scientific reports, journal articles and other literature on eutrophication for use by the staff and by individuals from universities, industry, government agencies, public organizations, and interested citizens.

A group of international eutrophication experts, representing government, industry and the academic world, met to resolve differing approaches to a standard technique. The result was the Provisional Algal Assay Procedure, copies of which are available from NERP's Corvallis headquarters.

ASSISTANCE ON PREPARATION OF RESEARCH PROPOSALS

The NWRRI may be called upon to provide information on availability of federal funds, federal agencies offering support, types of research likely to be supported, and the mechanics of preparing research proposals for water resources research projects. This information is not limited to Department of Interior research support.

THE NATIONAL WATER COMMISSION

The National Water Commission, a seven-man commission established by Public Law 90-515, approved by the President on September 26, 1968, is undertaking a five year study of water resource problems in the United States. Purpose of the study is to

provide background for policy recommendations to guide the future activity in water-related fields in the United States.

During the course of its studies the Commission will review present and anticipated water problems. It will make projections of the Nation's water requirements, and will identify alternative ways of meeting them. At the same time, the Commission will consider the economic and social consequences of water resources development, its impact on institutional arrangements, on esthetic values, and on regional economic development.

The Commission has formulated a tentative program of studies to provide background for its recommendations, and will seek information and recommendations from the States, other Federal agencies, intergovernmental entities, and private organizations in a series of public meetings to be held in various regions of the country next Fall.

The studies will concern many water-related areas including water conservation, water pollution abatement, technological advancement, economic evaluation of water resource development, re-use of waste water, Federal and regional water programs, inter-basin transfer, and State and Federal water law.

Mr. Theodore M. Schad is Executive Director of the Commission. The address is National Water Commission, Washington, D. C. 20506.

TITLE II OWRR RESEARCH

The Office of Water Resources Research, U. S. Department of the Interior, Washington, D. C. 20240, is now accepting unsolicited research proposals in the field of water resources for consideration for fiscal year 1971 support, beginning July 1, 1970, pursuant to Title II of the Water Resources Research Act of 1964, as amended.

To allow sufficient time prior to July 1, 1970 for proposal review, contract negotiation, and transmittal to the Congress for a 60-day period as required by Title II of the Act, formal proposals must be submitted to the Office of Water Resources Research by October 1, 1969, in order to be eligible for fiscal year 1971 funding. Although proposals may be submitted to OWRR at any time, those received after October 1, 1969, will be held for future consideration for support.

Further information may be obtained from the Director of the NWRRI. (See following information).

OFFICE OF WATER RESOURCES RESEARCH

EXAMPLES OF PRIORITY RESEARCH SUBJECTS FOR TITLE II SUPPORT

FISCAL YEAR 1971

The Office of Water Resources Research has identified the following major subject areas for primary research support in the fiscal year 1971 program. Some examples of specific research topics within these major subject areas are presented to indicate the range of problems needing research. It is not expected that a given research proposal will cover all or necessarily several of these problems. The problems are listed simply as examples of subjects to which research proposals may be related. In preparing the proposal, the principal subject or problem on which the proposed research is to focus should be identified. No significance should be attached to the order of appearance of the subject areas on the priority list.

1. Analysis of Planning, Managerial, Financial, Operating and Regulatory Policies of Water Resources Institutions. Analysis of water rights doctrines especially as they affect the process of decision making, user attitudes and water management practices and policies. Research is needed on the problems associated with multiple jurisdictions and conflicting objectives in metropolitan and regional water resources planning and management. Also, technological tools for planning water resource development on a regional or basin-wide basis may have advanced beyond our institutional capabilities for implementing the plans. While the many conflicts, discussions, and negotiations involved in finding acceptable plans are truly part of the democratic process, further understanding of the mechanisms of the process could serve to expedite the implementation phase, thus benefiting all parties concerned. Research goals should be to provide a basis for establishment of improved mechanisms including evaluation of alternative means of augmenting and conserving supply, for water resources planning, implementation of plans, and to improve management effectiveness through lessening of conflicts, uncertainties, and confusion among claimants to the resource.

2. Water Resources Policy and Political Institutions. Understanding of policy and institutional problems is indispensable to sound water resources management by both the public and private sectors of the Nation. Research is needed on how institutional arrangements are conducive to sound water management. Among the questions to which research could be directed are those involving current policies and institutions. The river basin as a water management unit needs further evaluation with respect to the compatibility of water resources management objectives and the

needs of regional economic development. How institutional arrangements affect the role of the private sector in water resources development needs to be researched. A very large segment of water resources needs are fulfilled via the activities of the private sector. Comprehensive analysis of the socio-economic water system requires understanding of how the private sector responds to alternative water management institutions. How have Federal policies and alternative state tax and regulatory policies affected the private role in the several functional areas of water service? How have Federal and state grant programs influenced the use of private investment capital in the financing of local water development?

3. Hydrologic Systems Analysis. The application of operations research tools such as mathematical modeling and simulation, optimization and design theory need to be assessed and further explored in relation to hydrologic events and to planning of surface and ground water resources development. Research needs in the area of optimization include a better definition of benefit functions to portray the economic losses incurred during shortages in agricultural, municipal, and industrial water supplies. Rainfall-runoff models applicable to large watersheds and using both deterministic and stochastic approaches are needed. Correlation of mean annual or seasonal runoff with precipitation, evapotranspiration, physiographic and vegetal parameters would be useful in application to similar areas of sparse hydrologic data. Operations research and information theory techniques should be examined for potential application to inflow-outflow problems in hydrology, to flood routing, reservoir operation, data network design, automatic control and monitoring of water distribution systems, etc.

4. Urban and Metropolitan Water Resources Problems. Research is needed on urban hydrology and the effect of man's activities on water. Such research should include evaluation of the impact of urbanization on the frequency of flood peaks, reduction of low flows, decrease in natural ground water accretion, impairment of water quality, erosion, etc., and development of methodology and technology to cope with such problems. Knowledge of the effects of urbanization on drainage, water quality, stream regimen, water yield and flooding are essential to intelligent development and utilization of metropolitan water resources. A study of public acceptance of alternative sources of municipal water supply should be encouraged. Research is needed to define and quantify social, esthetic, and amenity benefits associated with urban waterfront development, location of and recreational use of metropolitan reservoirs, and preservation, protection, and beneficial uses of marshland and estuaries in close proximity to urban regions.

Research is needed in the effects of urban encroachment on the upstream watershed, the effects of changing land use patterns, the economic consequences of the conversion of irrigated land to urban uses and the conversion of irrigation water and water rights to municipal and industrial use. Innovative approaches to water-related recreation and open space in the urban environment are needed. Research is needed on methods to reduce the cost of providing water and sewerage service to new housing. The use of "withdrawals" as a measure of water demand can be misleading when the demand-supply balance in water management and planning becomes critical. A new, rigorous definition of "water requirements" (residential, industrial, commercial and public uses) is needed which will take into account the factors of usage, withdrawal, consumption, recycle, returns and dilution.

5. Environmental Considerations in Water Resources Planning and Management. Increased knowledge of ecological processes and principles and intelligent use of ecological information can result in more enlightened resource planning and management and help maintain or improve the quality of the environment for man's well-being. Planning and management methodologies need to be developed in the context of sound ecology in which man is regarded realistically as part of the ecosystem. The methodologies would provide for use of water and related resources with minimum degradation of the environment or, preferably, improvement of the environment. Questions will continue to arise regarding the feasibility and capability of restoring degraded environments to a more natural and more balanced state. Of what value is a relatively unpolluted, naturalistic aquatic area in comparison with one which has been enriched by man and used extensively for mass recreation or other purposes? What are the long-term ecologic implications of man's use of an area? What criteria can be used to judge the extent to which an area can be altered without unplanned irreversible changes made in the ecology, such as loss of a rare species of fish? Research is needed to identify and determine the ecological processes, types, and functioning of aquatic ecosystems with which man can live most harmoniously and to develop means for predicting the ecologic impacts of water development. Special consideration will be given to innovative, but positive and rational approaches to solving current problems or avoiding future water problems involving the quality of the environment, whether stemming from waste disposal, dredging, filling, drainage, irrigation, or other water development activities. One approach might be development of ecosystem analysis to a point permitting incorporation of ecological information into engineering-economic-legal-political systems analyses. This would enable decision-makers to use ecological information in conjunction with public preferences and socio-economic, political, and legal constraints, and to decide which of several possible alternative courses of action to take.

6. Evaluation of Economic Importance of Various Uses of Water, Cost Allocation, Cost Sharing, Pricing and Repayment. Allocation of water resources to specific competing uses is made difficult because market pricing techniques customarily do not reflect certain values which are recognized by the public in the areas of recreation and conservation. Study is needed of methods allocating costs among the various functions of multiple purpose water resource projects. Research is needed to develop alternatives to market pricing for quantifying esthetic, recreation and fish and wildlife benefits. Research is needed for improving the methods used in evaluating primary and secondary benefits of municipal, industrial, and agricultural water uses. Also, research is needed to identify recipients of esthetic, amenity and recreation benefits, to establish methods for determining attitudes and public preferences with respect to competing demands on the water resource, and the ability and willingness to pay for such benefits. Currently economic analysis concentrates heavily on engineering data; no satisfactory way has been developed to introduce social, esthetic, cultural, etc., costs into the economic analysis. Research efforts directed to this problem would be beneficial to both planners and resource managers.

7. Evaluation of Social Objectives in Water Policy. Benefit-cost analysis is the principal tool for analysis of public investment programs, including watershed and water resources programs It ranks projects and programs only in terms of economic efficiency. Research is needed to determine appropriate alternative objectives and to develop methods to evaluate the benefits in relation to costs for the different objectives, such as alleviation of poverty, improved distribution of population, environmental quality, and other social values.

RESEARCH REVIEW

Beginning with this issue of the newsletter, a brief review of one or more water-related research projects will be given each month. These reviews are intended to publicize the nature of the projects currently being conducted.

Project Number:	A-007-NEB
Project Title:	Brackish Water Purification by Biological Fuel Cell Powered Electrodialysis
Principal Investigator:	Dr. William A. Scheller
FCST Category:	III - A
Dates:	July 1965 to June 1970

The objective of this project is to investigate the requirements for desalinating small quantities (1000 gpd) of

brackish water in rural areas by electrodialysis using electric power supplied by a fuel cell. The fuel for the cell is to be produced by the action of microorganisms on waste products, especially those containing cellulose. The non-fuel products from the fermentation could hopefully find use as a cattle feed.

Samples obtained from four brackish wells in eastern Nebraska were used in conjunction with a laboratory electrodialysis unit to establish the process parameters necessary for estimating the desalination costs. Investment and maintenance estimates for a 1000 gpd electrodialysis unit were also obtained. The cost of fresh water produced from brackish waters (30 to 202 ppm of total solids) was $1.68 to $4.86 per 1000 gallons exclusive of return on the investment. At a typical rural consumption of 60 gallons per person per day, the above fresh water costs are equivalent to 10.5 cents to 30.4 cents per person per day. These figures assume electric power is available at 3.3 cents/kwh, a typical rural Nebraska rate. If the electrodialysis unit is supplied with brackish water from an existing pressurized water system with its reduced maintenance costs, the desalinated water costs would be reduced by about 55 cents per 1000 gallons (3.4 cents per person per day).

A membrane type fuel cell using platinized nickel electrodes was developed and operated successfully with air and pure component fuels. A number of cultures of microorganisms capable of producing good fuels for use in the fuel cells have been grown. These include two strains of yeast, rumen organisms and silage organisms. Voltages ranging from about 0.6 to 1.0 have been obtained using the fermentation products directly from the cultures as fuels. Extended operation of a fuel cell (cumulative time about 3 months) on rumen liquor indicates no deterioration of the membrane or electrodes. Analyses are presently being made to determine the fermentation products and the extent of their oxidation in the fuel cells. Estimates of the cost of power produced by these fuel cells will be made and used in conjunction with the electrodialysis information to determine fresh water costs.

NEWSLETTER ITEMS

Newsletter items and inquiries should be sent to: Dr. Warren Viessman Jr., Director, Water Resources Research Institute, 212 Agricultural Engineering, East Campus.