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WATER RESOURCES NEWS

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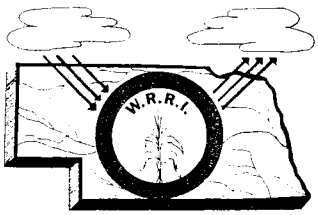

Volume 5 Number 10 October 1973

FROM THE DESK OF THE DIRECTOR . . .

The energy crisis facing the nation is multi-faceted. Water's role is an important one but often misunderstood. There are two sides to the energy-water coin. The most well-known is the energy production side exemplified by hydro-electric facilities. The other side, somewhat less obvious but exceedingly important, is energy consumption as it relates to the use of water in cities, industries and agricultural areas.

Meeting the water needs of a metropolitan and industrial society imposes many demands on energy. For example, a variety of energy sources are used to pump, treat and transport municipal water supplies. Industries use energy to move water through processing systems and to heat and cool waters for various uses. The opportunities for reducing energy requirements through better management, application of new processes, modernization and other mechanisms are exciting.

A primary energy consumer in the agricultural field is irrigation. During 1973 more than 5 million acres were irrigated in Nebraska with more wells being drilled all the time. Research conducted at the University of Nebraska indicates that if available irrigation technology is used wisely, total energy requirements can be reduced by about one-half. This would require changes in irrigation practices and installation of new types of irrigation systems, but the payoff strongly suggests that steps in this direction should be taken.

Processing water to meet water quality standards also consumes large amounts of energy. With the passage of the amended Water Pollution Control Act of 1972, very strict limits have been established and compliance will require even higher levels of energy output. Perhaps a reasonable compromise with environmental issues will be necessary in this time of energy shortage until new or additional sources of energy are developed. The question is difficult and very much on everyone's mind.

It is clear that uses of energy and water are highly interrelated. If more water is used for irrigation, industry, cities or pollution control, more energy will be required. Ways must be found to reduce amounts and rates of water used and energy consumed through new manufacturing processes, improved irrigation practices, better management and other procedures. To do this will require setting priorities and making difficult management decisions. The water fraternity can play a major role in alleviating the energy crisis we face.

INSTITUTE ACTIVITIES

Call For Proposals - OWRR Title II Program FY 1975

The Title II research program of the Office of Water Resources Research will be directed primarily toward support of certain current priority objectives of the Department of the Interior. These include:

(1) Solving of Energy Problems.

(2) Encouraging Indian Self-Determination and Improvement in the Quality of Life on Indian Reservations.

(3) Solving Land Use Problems.

(4) Promotion of Efficient Allocation and Conservation of Scarce Water and Water-Related Resources in a Manner Compatible with Environmental Considerations. Developing means of achieving more efficient resource management such as reuse and recycling of water, reassessing the economic value of additional agricultural development and improved irrigation efficiencies in order to save resources, thus reducing the need for large capital investments of the future.

(5) Improving the Quality of our Physical Environment.

The deadline for submission of Title II proposals for fiscal year 1975 is January 11, 1974. Principal investigators should contact the Institute Director to discuss research ideas before proposal preparation.

Title II Grant To Bob Olson

The Office of Water Resources Research has announced additional Title II grant selections. One of the projects selected is entitled "Environmentally Compatible Practices for Intensive Irrigation Development" by Professor Robert Olson, Department of Agronomy. The overall objective of this project is to evaluate the environmental impact of introducing intensive irrigation agriculture to the Sandhills region of Nebraska and to formulate the combination of irrigation, cropping, fertilization, tillage and pest control practices required to prevent overdevelopment and pollution of the water resource of the area.

Other personnel working on the project will be John Addink and B.R. Somerhalder, Ag. Engineering, Vincent Dreeszen, Conservation and Survey Division, Ralph Marlette, Department of Civil Engineering, W.J. Molina, Agronomy and K.P. Pruess, Department of Entomology.

Energy Conference

On October 23-24 the Nebraska Institute sponsered a conference on "The Role of Water in the Energy Crisis." About 100 persons attended the two-day seminar held at the Nebraska Center. The objective of the conference was to identify ways in which the water resources community can help solve or alleviate national and regional energy problems. Conference proceedings will be available shortly. To obtain a copy write to Dr. Warren Viessman, Jr., Director, Nebraska Water Resources Research Institute, 212 Ag. Engineering Building, University of Nebraska, Lincoln, Nebraska 68503.

CONFERENCES

Oklahoma City Site for Wastewater Conference

A conference on the "Use of Wastewater in the Production of Food and Fiber" will be held at the Trade Winds Motor Inn, Central Oklahoma City, Oklahoma, on March 6-7, 1974. The emphasis of the conference will be on an interdisciplinary approach of: sanitary engineering; agriculture and aquaculture to advanced biological treatment of waterwastes; and, examining developments and applications of wastewater treatment which provide recovery or use of nutrients and other products. Papers will be read on health restraints to the use of wastewater for production of food and fibers, results of wastewater systems currently in operation producing food and fiber, and research results on any part of the conference subjects.

For further information on the conference write to: R. LeRoy Carpenter, M.D., Commissioner of Health, Oklahoma State Department of Health, M.E. 10th & Stonewall, Oklahoma City, Oklahoma 73105.

FEDERAL HIGHLIGHTS

Battle on the Hill

Congressman Gillis W. Long (Louisiana) led more than 100 members of the House to petition the President to reject major recommendations of the National Water Commission. They have promised "to do all within our lawful power" to stop the Commission's recommended navigation tolls and beneficiary-pay-all flood control proposals.

The Congressmen expressed their concern over the Commission's findings in the following excerpts from their letter to the President:

"The Commission's decision to endorse ability to pay, rather than potential benefit, as the guiding criterion for the planning of future flood control efforts would reverse the time-tested policy of our national government and lead to intolerable inequities. If implemented, it would severly jeopardize the welfare and even the physical safety of many persons who live in communities susceptible to flooding, but who are too poor to adequately finance the construction of levees and other necessary safeguards. The recommended user charges on inland navigation would halt most waterway modernization and drastically reduce the geographic extent of the commerical waterways system and the tonnage of commodities carried over it. This crippling of our waterway system would do incalculable damage to the economies of the major river valleys and to that of the nation as a whole. In addition, there is substantial risk that the progress being made in protecting the environment in many areas would be critically harmed."

USGS - Change of Address

The first units of the headquarters elements of the U.S. Geological Survey, Department of the Interior, will soon begin moving to the Survey's new national center at Reston, Virginia. By July 1974, it is expected that more than 2,200 USGS employees will have completed the move.

The new $45 million facility, located 18 miles from Washington, D.C., permits consolidation of Survey headquarters elements now scattered in more than 30 buildings, some as far as 27 miles apart in the metropolitan Washington area. The new building will include ultramodern geological, geophysical and hydrologic laboratories to house arrays of sensitive testing, measuring and recording systems. The center will also include sonhisticated facilities for the preparation and production of topographic, geologic and hydrologic maps and special reports.

The Geological Survey, the earth science "arm" of the Interior Department, employs nearly 10,000 scientists, engineers, technicians and administrative personnel, with administrative headquarters currently located in the GSA Building, Washington, D.C. Major field centers are in Denver, Colorado and Menlo Park, California.

Mailing address of the new headquarters facility is: U.S. Geological Survey National Center, Reston, Virginia 22092.

National Commission on Water Quality is Founded

The newly founded National Commisison on Water Quality, established by the 1972 Federal Water Pollution Control Act, has the task of reviewing the costs and benefits for meeting the goals set by the Act. The Commission's office is located at 1111 18th Street, N.W., Washington, D.C. 20036. The following personnel have been appointed to the Commission: (1) Senators - Jennings Randolph, Edmund Muskie, James Buckley, Howard Baker, Loyd Bentson; (2) House Representatives - Robert Jones, James Wright, James Grover, John Blatnik, William Harsha; and, (3) At-Large Members - Gov. Nelson Rockefeller, Chairman; Dr. E.A. Gee, Sr., V-P, DuPont; W.R. Gianelle, Dir., Cal. Dept. Water Resources; R. Kudukis, Dir., Cleveland Dept. Utilities; and C.E. Wright, Ch. Arkansas Dept. Pol. Control and Ecology. Ex-Chief of Army Corps of Engineers, Lt. General Frederick J. Clarke, is the Executive Director and former Commissioner of the Federal Water Pollution Control Administration, Joe G. Moore, is the Program Director.

Reconsideration of WRC Standards Urged

Representative Harold T. "Bizz" Johnson, D-Calif., said in a House speech, that the Water Resources Council's newly adopted principles and standards, scheduled to be effective October 25, 1973, should be reconsidered.

Johnson urged a review of the council's decision to drop consideration of regional development and concern for the welfare of the people as objectives of water resources development. He went on to state that while the Americam free enterprise system is one to be admired, there are some worthwhile projects that can be accomplished better by public interest than by private capital. Johnson ended his plea by stating that past progress in water resources development of the arid West might never have occured had the council instituted its position long ago.

House OK's $116 Million For Big Cypress

On a 376-2 vote, the House has passed a bill (H.R. 10088) authorizing $116 million to create the 570,000-acre Big Cypress National Preserve. The purpose of the project is to protect the fresh water supply that feeds the Everglades National Park.

The bill authorizes federal land acquisition in Big Cypress Swamp which accounts for approximately 56 percent of the water entering the Everglades National Park. The State of Florida is donating money and land totaling $40 million to complete the acquisition. According to the House Interior Committee this move will save the park from a drastic change.

EPA Requires Payment For Sewage Users

According to new EPA regulations, everyone disposing of liquid wastes through federally-financed municipal systems must pay user charges. Industries are required to reimburse cities for their share of federal funds used for treatment of industrial wastes.

EPA has banned flat-rate sewer fees. Levies must be made for 30 years or the life of the treatment works. Cities may keep half the money they collect and pay half to the United States. They must use 80 percent of their share for future pollution control projects.

The new regulations also define secondary treatment levels; i.e., 85 percent removal of biochemical oxygen demand and suspended solids. EPA set stiff rules on coliform content and pH levels.

U.S.-Mexico Set Up $115 Million Water Desalting Project

As soon as Congressional action is taken, Interior Secretary Rogers C.B. Morton says the Department of the Interior will be ready to start on the $115 million salinity reduction project on the Colorado River.

"My department has been studying solutions to the problem for many years," Morton says, "and we intensified our search for the answers when President Nixon assigned former Attorney General Herbert Brownell to negotiate an agreement with our friends south of the border." An agreement was reached between the United States and Mexico on Aug. 30, 1973.

An $80 million desalting plant will be working with the return flows of the Wellton-Mohawk Irrigation and Drainage District and will provide the following as part of the agreement: The water delivered by the United States "must not exceed the salinity of water that arrives at Imperial Dam by more than 115 parts per million (ppm)--plus or minus 30 ppm--of dissolved solids."

By using either reverse osmosis or the electrodialysis process the plant will be able to guarantee production of desalted water with 240 ppm of dissolved solids at the rate of 100 million gallons/day, enabling the U.S. to meet the agreement standards.

Besides the $80 million desalting plant, the $115 million includes $14 million for enhancing irrigation efficiency and acquiring land and $21 million for saving approximately 132,000 acre-feet of water/year by lining some 49 miles of the Coachella Canal.

Streams Disrupted By Army-SCS Diggings

The House Government Operations Committee has sharply critized the Army Engineers and the Soil Conservation Service for their waterways channelization projects. The Operations Committee Claims that flood control projects have been environmentally damaging to miles of waterways and adjacent lands.

A committee report entitled "Stream Channelization: What Federally Financed Draglines and Bulldozers Do to Our Nation's Streams," was submitted after 1971 and 1973 hearings plus additional investigation.

Subcommittee Chairman Henry S. Reuss, D-Wis., was critical of the manner in which SCS and the Army Engineers were degrading the quality of wildlife, water and recreational and scenic values. He claimed that the citizens were also disturbed when they saw "wetlands drained and wildlife habitat destroyed by the dredge bit and the dragline bucket."

In the report SCS is accused of not following EPA recommendations which found channelization "a major factor in causing deterioration of water quality by increasing sedimentation, eutrophication and the accumulation of pollutants." The report also contends that SCS does not fully comply with the National Environmental Policy Act of 1969.

Comptroller General Staats Requires EPA Impact Statements

At the request of Rep. John D. Dingell, D-Mich., Comptroller General Elmer B. Staats confirmed that the National Environmental Policy Act of 1969 requires all federal government agencies, including the EPA, to file environmental impact statements on all major actions.

On Sept. 25, five million dollars was set aside by the House specifically for EPA's impact statements. These statements are to be submitted on all actions except for those exempted under Section [511(c)(1)] of the Water Pollution Control Act Amendments of 1972 (P.L. 92-500).

Dingell, who is chairman of the Fisheries and Wildlife Conservation and Environment Subcommittee of the House Merchant Marine and Fisheries Committee, claims the President's Council on Environmental Quality has also abandoned a 1971 exemption for EPA's preparation of impact statements from its guidelines.

"The GAO opinion, together with CEQ's abandonment of this exemption in its guidelines, will hopefully convince EPA that its continued disregard for NEPA's requirements is folly," Dingell said.

Dingell is also hoping for Senate approval of the House-approved five million dollars in funds granted for EPA's impact statements, even though

he fears some Senate members will hold up passage because they " do not want EPA to comply with the law."

Deadlines Set For Feedlot Operators

The Environmental Protection Agency has set a July 1, 1977 deadline for all feedlot operators to have the "best practicable" methods available for control of runoff that could pollute waterways. This deadline applies to poultry, sheep, swine, beef and dairy cattle - the only exception is feedlots for ducks.

All feedlot operations must be using the "best available" methods that are "economically feasible" by July 1, 1983.

The proposed standards, which were published in the Sept. 7 Federal Register, state that by 1983 the feedlots must have a storage capacity that can handle wastewater in addition to the runoff from a 24-hour storm "likely to occur only once in a 25-year period."

EPA Rules On Public Participation

The EPA has ruled that public participation is an important part of any overall state program under the Federal Water Pollution Control Act of 1972. The final regulations (38 FR 22756) provide the following: consultation, notification, legal proceedings, enforcement, rule making, informational materials, access to information and assistance to the public. The public will be encouraged to take an active role in reporting violation of the Act.

Composted Sewage Sludge Used As Fertilizer

According to Secretary of Agriculture Earl L. Butz, a method of composting sewage sludge on trial by USDA and Maryland researchers may solve one of the problems of waste disposal. On Sept. 18, in Beltsville, Md., Butz said that the Blue Plains sewage treatment plant serving the metropolitan Washington area was receiving sludge from the USDA facility at Beltsville.

Any dry bulking agent, such as wood chips, is mixed with the sludge. Every day for 2-3 weeks a composting machine mixes the sludge into windrows so that air is drawn into it.

The material becomes pasteurized after a fast microbiological breakdown occurs and releases heat. It is then stockpiled and left for one

month to cure. Composted sludge that can be used as fertilizer is the end result, said Butz.

"It now looks as if composting comes closer to being technically efficient, economically sound, environmentally safe, agriculturally beneficial, and politically feasible than any of the alternative methods for disposing of sewage sludge," Butz declared.

Bicycling Anyone?

Biospherics, Inc., Rockville, Maryland has conducted a study on automobile pollution.

According to the study, automobiles not only pollute the air, but also are a primary polluter of the waterways. Cars deposit asbestos, rubber, zinc. lead, nitrogen and phosphorus compounds on roadways and adjacent areas which is then washed into rivers and streams.

REGIONAL NEWS

NPPD - One Million Kilowatt Plant

NPPD is considering the construction of a 1 million kilowatt plant in northeastern Nebraska. The structure would provide adequate electricity during peak periods, without serious environmental consequences. It requires only 15 employees and would be economical to run on its gas turbine.

The plant would operate using two reservoirs with one at a higher elevation. Electricity from other NPPD units would be used to pump water from the lower reservoir to the upper one during slack periods. Thus, a greater supply of water could be sent through the powerhouse during peak periods.

The plant could cost up to $188 million, according to Larry Kunel and D.W. Hill of NPPD. But, the one-of-a-kind plant for Nebraska has the support of State Sen. J.W. Burbach, Crofton, because of its fuel consumption and environmental aspects. NPPD's board will consider initiation of engineering studies in October.

PUBLICATIONS

Water Handbook For Laymen

A 30-page water handbook designed for laymen has been published by the U.S. Geological Survey. The pamphlet is available free of charge. To obtain copies, write: Director, U.S. Geological Survey, Washington, D.C. 20244.

"Design of Small Dams" - Second Edition

The second edition of the book Design of Small Dams has been published by the Bureau of Reclamation. The first edition was released in 1960.

The manual was prepared under the direction of specialists in the Bureau's Engineering and Research Center, Denver, Colorado. It explains how to collect data necessary for construction of dams up to 50 feet high linked with small streams and limited drainage areas.

Copies of the manual may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, or the Reclamation Bureau, Denver Federal Center, Denver, Colorado 80225. The cost is $12.65 by mail or $12 over the counter.

"Water Facts & Figures for Planners & Managers"

A handbook describing the nature, occurence and changing demands for water was recently published by the U.S. Geological Survey. The report also defines many technical terms used by water scientists and provides the basic information necessary to appreciate the role of water in our daily lives. It includes a glossary of selected standard water terms and units, as well as several tables to aid in the conversion of English units of measurement to the less familiar but standard metric units.

The report, "Water Facts and Figures for Planners and Managers," contains 17 tables and illustrations. It has been published as Geological Survey Circular 601-1 and is the latest report in the Survey's "Water in the Urban Environment" series. Free copies are available from the Director, U.S. Geological Survey, Washington, D.C. 20244.

Slide Set On Lake Problems Available

A new slide-tape set entitled, "Understanding Lakes and Lake Problems," is on file with the Water Resources Research Institute of the University of North Carolina. The 15-minute, 75 color slide set, complete with a tape narration (prepared by the University of Wisconsin Extension for an Inland Lake Demonstration Project), covers the basics of lake ecosystems with lake-related resource management issues as the main topic. A copy of the

narration comes with each set so that local information may be inserted at appropriate places.

The slide set can be purchased for $20 from the Bureau of Audio Visual Instruction, P.O. Box 2093, Madison, Wisconsin 53706. For $1 and postage a 40-page accompanying booklet with the same title as the slide set may be obtained from the Agricultural Bulletin Building, 1535 Observatory Dirve, University of Wisconsin, Madison, Wisconsin 53706.

PEOPLE IN THE NEWS

National Academy of Sciences Appoints Ted Schad

Theodore M. (Ted) Schad. formerly Executive Director of the National Water Commission, has been appointed to the National Academy of Sciences. Mr. Schad is currently Executive Secretary of the Environmental Studies Board. He will be serving under Richard A. Carpenter, who is head of the Commission on Natural Resources.

RESEARCH REVIEW

Project Title: Pollution of Irrigation Waters by Plant Pathogenic Organisms

Principal Investigator: James R. Steadman, Assistant Professor, Department of Plant Pathology, UN-L

The critical need for irrigation water is placing considerable pressure on expansion of irrigated acreage and on water reuse. The inevitable consequence of reuse is that water which has passed through fields having diseased plants could contain and thus spread the disease-producing organisms. Since knowledge of the microbial contaminants of irrigation water are extremely limited, studies along this line were initiated. The objectives of the research supported by OWRR matching grant B-021-NEB are two-fold: (1) Examine the extent of pollution of irrigation water by plant pathogens; and, (2) Develop methods which will minimize the risk of pollution.

Initially, research has focused on furrow irrigated areas in the North Platte Valley of western Nebraska and on the pathogens Sclerotinia sclerotiorum (white mold fungus) and Xanthomonas phaseoli (bacterial blight) on dry beans; and various plant parasitic nematodes on sugar beets. Major emphasis in the first season (1972) of the project was placed on two facets: (1) developing suitable and reliable methods for obtaining

samples from gravity irrigation systems; and, (2) developing techniques for assaying water and debris samples taken from irrigation water sources and drains for the pathogenic organisms.

Sampling numerous waterways in the North Platte Valley between July 1 and August 24 during 1972 and 1973 revealed that many diverse types of nematodes including plant pathogenic species were found in all waterways but were not numerous in runoff from sugar beet fields later in the cropping season contrary to earlier beliefs. The most prevalent cyst-forming nematode species which cause disease problems in the valley were not in high numbers. In contrast, viable structures of the white mold fungus and the bean blight bacteria were present in runoff water from bean fields and in ditches which received runoff water. The water entering the valley from Wyoming and the large canals, with a few exceptions, did not have a high level of this type of organismal pollution. Preliminary evidence from 1973 indicates that the bean blight organism in runoff or tailwater can cause disease in bean fields irrigated with this polluted water. Our findings at this time indicate that the irrigation system in the North Platte Valley serves to disseminate at least two known plant pathogenic organisms and, thus, may be increasing the prevalence and severity of white mold and common blight diseases in western Nebraska.

Further studies planned are: (1) substantiation of the initial finding that runoff or tailwater is the major source of plant pathogenic organisms; (2) determination of organismal pollution of irrigation reuse systems; and, (3) development of control measures.

PUBLICATIONS RECEIVED BY INSTITUTE

1. The Impact of Water Pollution Abatement on Competition and Pricing in the Alabama Textile Industry, Hal B. Pickle, Andrew C. Rucks, Water Resources Research Institute, Auburn University, Auburn, Alabama, July 1973.

2. Effect of Waste Discharges Into a Silt-Laden Esturary, A Case Study of Cook Inlet, Alaska, R. Sage Murphy, Robert F. Carlson, David Nyquist, Robert Britch, Institute of Water Resources, University of Alaska, Fairbanks, Alaska, November 1972.

3. The Limnology of Two Dissimilar Subarctic Streams and Implications of Resource Development, Jacqueline D. LaPerriere, David Nyquist, Institute of Water Resources, University of Alaska, Fairbanks, Alaska, March 1973.

4. Laboratory Rearing Experiments on Artificially Propagated Inconnu (Stenodus leucichthys), Jacqueline D. LaPerriere, Institute of Water Resources, University of Alaska, Fairbanks, Alaska, June 1973.

5. Electrical Power Consumption For Municipal Wastewater Treatment, Robert Smith, National Environmental Research Center, Office of Research and Monitoring U.S. Environmental Protection Agency, Cincinnati, Ohio, July, 1973.

6. The Effect of Thermal Inputs on the Populations of Fish and Macro-invertebrates in the Wabash River, J.R. Gammon, Purdue University Water Resources Research Center, West Lafayette, Indiana, June 1973.

7. Georgia's Water Problems and Related Research Needs, Gene E. Willeke, Arthur Benke, Alan M. Lumb, Billy H. Kornegay, Walter P. Neely, Environmental Resources Center, Atlanta, Georgia, August 1973.

8. The Relationship of Land Use of Domestic Surface Water Supply in Georgia, D.W. Shaw, W.L. Nutter, School of Forest Resources University of Georgia, Athens, Georgia, Environmental Resources Center, Georgia Institute of Technology, Atlanta, Georgia, June 1973.

9. Director of Water Resources Research Faculty at University of Minnesota and State and Private Colleges in Minnesota, William C. Walton, Water Resources Research Center, University of Minnesota Graduate School, Minneapolis, Minnesota, August 1973.

10. Rainfall and Snowmelt Runoff from Intermediate Elevation Watersheds, Myron Molnau, Darryl J. Davis, LeRoy Druffel, Robin S.C. Lee, Water Resources Research Institute, University of Idaho, Moscow, Idaho, October 1973.

11. Wild River Perception and Management: A Study of Users and Managers of the Middle Fork of the Salmon River, Robert Larry Peckfelder, Water Resources Research Institute, University of Idaho, Moscow, Idaho, August 1973.

12. Permeability Restoration in Underground Disposal Reservoirs, David M. Grubbs, Charles D. Haynes, George P. Whittle, Natural Resources Center, The University of Alabama, University, Alabama, September 1973.

13. Quality of Surface Waters of the United States, 1968, Part 2. South Atlantic Slope and Eastern Gulf of Mexico Basins, Information collected by W.L. Broadhurst, A.N. Cameron, L.E. Carroon, S.C. Conover, J.W. Ganbrell, R.C. Heath, R.R. Meyer, J.S. Stallings, United States Department of the Interior, Washington, D.C. 1973.

14. Salt Creek Basin--Lincoln Metropolitan Area Water Quality Management Plan, prepared by: City of Lincoln, Nebraska Natural Resources Commission Lower Platte South Natural Resources District, June 1973.

15. Appendices to Salt Creek Basin - Lincoln Metropolitan Area Water Quality Management Plan, Prepared by: City of Lincoln, Nebraska Natural Resources Commission, Lower Platte South Natural Resources District, June 1973.

16. The Water Budget and Waste Treatment at a Modern Dairy, James B. Allen, James F. Beatty, S.P. Crockett, B.L. Arnold for Water Resources Research Institute, Mississippi State University, Mississippi State, Mississippi, July 1973.

17, Annual Report of the Iowa State Water Resources Research Institute for FY 1973, Iowa State Water Resources Research Institute, Don Kirkham, Director Norris L. Powell, Administrative Assistant to the Director, July 1973.

18. Economic and Related Impacts of Rural Water Systems in Mississippi, Brenda M. Landry, Charels P. Cartee, D.C. Williams, Jr., Water Resources Research Institute, 1973.

19. A Study of Managerial Practices in Rural Water Systems, Charles P. Cartee, D.C. Williams, Jr., Water Resources Research Institute, Mississippi State University, Mississippi State, Mississippi, July 1973.

20. Synthesis and Evaluation of Urban-Regional Hydrologic Rainfall-Runoff Criteria. John A. Dracup, Thomas J. Fogarty, Sharon G. Grant, for the Office of Water Resources Research, U.S. Department of Interior, Washington, D.C., February 1973.

21. Federal Register, Water Resources Council, Water and Related Land Resources, Establishment of Principles and Standards for Planning, Washington, D.C., September 10, 1973.

22. A State/Local Lake Rehabilitation Program: A Proposed Bill and Commentary, Stephen Born, Jon Kusler, Douglas Yanggen, James Jurtz, for Upper Great Lakes Regional Commission, June 1973.

23. Reports of the Inland Lake Demonstration Project, by the University of Wisconsin and The Department of Natural Resources, for the Upper Great Lakes Regional Commission, July 1973.

24. Dilutional Pumping at Snake Lake, Wisconsin, A Potential Renewal Technique for Small Eutrophic Lakes, Stephen M. Born, Thomas L. Wirth, James O. Peterson, J. Peter Wall, David A. Stephenson, Department of Natural Resources, Madison, Wisconsin, 1973.

25. Nitrogen Sources and Cycling in Natural Waters, Patrick L. Brizonik, University of Florida, Department of Environmental Engineering Sciences, Gainesville, Florida, for the Office of Research and Monitoring, U.S. Environmental Protectional Agency, Washington, D.C., July 1973.

26. Model and Prototype Analysis of the Old River Diversion on the Mississippi River, Patrick C. Harris and William R. Posey, Potamology Section, River Stabilization Branch, U.S. Army Corps of Engineers, Vicksburg District,

Vicksburg, Mississippi, Water Resources Research Institute, Mississippi State University, Mississippi, April 1973.

27. Metamorphosis of a River, A comparison of the Mississippi River Before and After Cutoffs, Brien R. Winkley, Potamology Section, River Stabilization Branch, U.S. Army Corps of Engineers, Vicksburg District, Vicksburg, Mississippi, Water Resources Research Institute, Mississippi State Univeristy, Mississippi, April 1973.

28. The National Water Commission Report: A Review, Helen Ingram, U. of Arizona, Theodore G. Roefs, U. of Arizona, David J. Allee, Cornell University, May 1973.

29. Determination of Optimal Multiple Uses of a Small Water Resource, Carl A. Carlozzi, with William Bellows, Paul J. Godfrey, Joseph C. Mawson, James R. Vilkitis, Water Resources Research Center, University of Massachusetts, Amherst, Massachusetts, May 1973.

30. Annual Report For Fiscal Year 1973, Dan Wiersma, Director, Water Resources Research Center, Purdue University, West Lafayette, Indiana, September 1973.

31. Man's Influence on the Hydrological Cycle, by the Food and Agriculture Organization of the United Nations, Rome, 1973.

32. Rates of Photosynthesis and Photoplankton Growth in Shagawa Lake, Michigan, by Robert O. Megard, Department of Ecology and Behavioral Biology, University of Minnesota, St. Paul, Minnesota, for the Office of Research and Monitoring, U.S. Environmental Protection Agency, Washington, D.C., July 1973.

33. Weed Harvest and Lake Nutrient Dynamics, Joe K. Neel, Spencer A. Peterson, Wintfred L. Smith, Department of Biology, University of North Dakota, Grand Forks, North Dakota, for the Office of Research and Monitoring, U.S. Environmental Protection Agency, Washington, D.C., July 1973.

QUESTIONS AND ANSWERS

Newsletter items and inquiries should be sent to Dr. Warren Viessman, Jr., Director, Nebraska Water Resources Research Institute, 212 Ag. Engineering Bldg., University of Nebraska, Lincoln, Nebraska 68503 or phone (402) 472-3307.

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