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## WORKSHOPS ON LAND APPLICATION OF WASTEWATER

The North Carolina Water Resources Research Institute, the Agricultural Extension Service, the Agricultural Experiment Station, and the North Carolina Department of Natural and Economic Resources are sponsoring two workshops on the land application of wastewater. These workshops will be conducted at the Jane S. McKimmon Center for Extension and Continuing Education on the North Carolina State University campus, Raleigh, N. C. They are scheduled for June 1-2 and June 15-16, 1977, and each workshop is designed to meet the needs of a specific audience. The first workshop is designed for state and local government officials and the second is intended for industrial representatives and consulting engineers.

Participation in these workshops will be limited. The fee for this will be \$25 and includes the cost for two luncheons.

Emphasis in this workshop will be problem solving. Actual case studies of operating systems for municipal wastewater and sludge, industrial wastewater and

sludge, and agricultural wastes will be examined. Each of these case studies has been selected to present important principles needed by those engaged in any aspect of land application. Participants will be able to work along with the designers of these existing systems and follow a system from the initial predesign phase through to the actual operational phase. The workshop sessions will be conducted by a panel, each of whom worked with the subject system. The sessions will last approximately one and one-half hours and ample time has been allotted for questions and answers.

For program information contact Dr. James M. Stewart, Water Resources Research Institute, (919) 737-2815. For registration information contact Kelly Crump (919) 737-2261 at the Jane S. McKimmon Extension and Continuing Education Center, North Carolina State University, Raleigh, N. C. 27607.

#### LEE TO SPEAK AT INSTITUTE ADVISORY MEETING

Howard Lee, Secretary of the Department of Natural and Economic Resources, will be the luncheon speaker for the Water Resources Research Institute's annual Advisory Committee meeting on March 31 at the Jane S. McKimmon Extension and Continuing Education Center in Raleigh.

The meeting will include an overview of current and future research activities, and short presentations on the following topics:

- Welcome - Dr. E. Walton Jones, Vice-President for Research and Public Service Programs - The University of N. C.
- Opening Remarks - Dean Ralph E. Fadum, School of Engineering, N. C. State University, Chairman, Board of Directors
- State of the Institute Report - Dr. Neil S. Grigg, Director
- Overview of the Current Institute Program - Dr. James M. Stewart, Associate Director
- Development of Nutrient Models for the Pamlico River Estuary - Dr. Charles R. O'Melia, Dr. Donald T. Lauria, and Mr. Jeff Koenings, Department of Environmental Sciences and Engineering, UNC, Chapel Hill
- Chowan River Studies - Mr. Grover Cook, Division of Environmental Management, NCDNER; Dr. Donald Stanley, Department of Environmental Sciences and Engineering, UNC-CH; Dr. Michael Amein, Department of Civil Engineering, NCSU
- Effects of Stream Channelization on Water Quality - Dr. Edward J. Kuenzler, Department of Environmental Sciences and Engineering, UNC, Chapel Hill
- Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems - Dr. T. E. Maki, Forestry, NCSU
- Effects of Large-Scale Agricultural Land Development on Water Quality (First Colony Farm) - Dr. R. Wayne Skaggs, Dept. of Biological

and Agricultural Engineering, NCSU; Dr. James W. Gilliam,  
Dept. of Soil Science, NCSU

The afternoon session will be devoted to program evaluation and suggestions for new research priorities.

#### DUKE POWER ACCEPTS WATER LIMITS

Duke Power Co. has agreed to abide by the state Environmental Management Commission's recommendations for use of Yadkin River water to cool the utility's proposed Perkins nuclear power plant.

The Environmental Management Commission recommended limits on the use of Yadkin River water to cool the power plant, including the suggestion that Duke remove no water when stream flow is 650 million gallons a day or less. The average stream flow of the Yadkin is 1,910 million gallons a day.

The flow, according to state figures, exceeds 650 million gallons a day about 94 per cent of the time.

Duke hopes to begin construction of the Perkins plant in August. If the current schedule is held to, the plant's first unit will begin generating in 1985. See related story in January *News*.

#### SOLAR HOT WATER PROJECT SUCCEEDS

A new solar hot water heating installation in Pueblo, Colorado, is reported to be functioning perfectly in its first test under winter weather conditions. The system provides hot water for five publicly owned dwellings there. Recent low temperatures have proved the capability of the new system to provide hot water for the ten adults and 27 children resident in the small complex chosen for this experimental installation.

Pueblo's domestic solar hot water system was designed to provide at least 40% of winter needs, and 75% of summer needs. These are conservative estimates, and the system has exceeded expectations consistently, since it went into operation last September.

The new system employs a central solar collector unit, which houses a 350-gallon storage tank, having radial hot water feeders to each home. The houses are located at approximately equal distances from the solar collector and hot water storage building.

The Pueblo system was built as a demonstration project for the Department of Housing and Urban Development, and was funded by HUD and the City of Pueblo, at a total cost of less than \$20,000.

The Pueblo system was designed by a local architectural firm to use only components available in the commercial market and it incorporates a thermostatically controlled, pressure-vented method to protect against internal scaling, and for absolute protection against freeze damage due to low ambient temperatures, snow cover, or commercial power failure.

For further information about the Pueblo solar, domestic hot water heating system write: Solar, c/o Public Technology, Inc., 1140 Connecticut Ave., N.W., Washington, D. C. 20036.

....Public Technology Inc. News

#### WATER CLEAN-UP LOANS AVAILABLE FOR FARMERS

A new program to help farmers obtain funds needed to comply with clean water requirements has been announced by the Environmental Protection Agency. The low-interest loan program will be operated in conjunction with the Small Business Administration and will be used primarily to assist owners of small farms in controlling erosion and the runoff of chemicals from fields.

Those eligible to participate in the program include individuals as well as corporate, proprietorship, and partnership farming concerns. Loans will be made by the SBA following certification from EPA's regional offices that the steps taken are both necessary and adequate to meet clean water and public health requirements. The present loan rate is 6 5/8 percent. Loans may extend for a term up to 30 years.

Farmers may also get financial assistance for pollution control from the USDA Agricultural Conservation Program and from the Farmers Home Administration under the Rural Development Business Administration. More information is available from the SBA, the Farmers Home Administration, or the coordinator of EPA's Small Business Loan Program (WH-586), 401 M Street, SW, Washington, D.C. 20460. The telephone is (202) 755-6907.

#### 404 NOTICE ON RANDLEMAN LAKE PROJECT

The Wilmington District, Corps of Engineers, proposes to construct the Randleman Lake project on the Deep River in North Carolina and has issued a public notice which pertains to Section 404a of the Federal Water Pollution Control Act Amendment of 1972 (Public Law 92-500) and only concerns discharge of dredged and fill material in navigable waters. The Corps' notice was issued to advise interested parties of the proposed construction of the Randleman Lake project and of soliciting comments and information necessary to evaluate the probable impact of the discharge of dredged and fill material on the public interest.

A final Environmental Statement (EIS) on the Randleman Lake project is expected to be filed with the Council on Environmental Quality (CEQ) in March 1977. Copies may be obtained from the District Engineer, Wilmington District, Corps of Engineers, P.O. Box 1890, Wilmington, North Carolina 28401.

Construction of the Randleman Lake project was authorized by the Flood Control Act of 1968 (PL 90-483) enacted by the 90th Congress on 13 August 1968. The damsite is located on the Deep River in Randolph County near the Town of Randleman, N. C. The damsite is in the upper part of the Deep River basin, approximately 2 miles north of Randleman, and 15 miles south of Greensboro. The lake will be in Randolph and Guilford Counties.

The Randleman project is a multiple-purpose reservoir designed to serve the flood control, water supply and outdoor water-oriented recreational needs in the Deep River basin or area of project influence.

#### NEW RESEARCH SPECIAL AVAILABLE

Continuing its series of abbreviated summary reports (6 pp. or less) on special research topics, the Institute announces the following report issued this month:

*Evaluation of Soil Systems for Land Disposal of Industrial and Municipal Wastewaters*, by Dr. Bobby L. Carlile and Dr. Joseph A. Phillips, Department of Soil Science, North Carolina State University at Raleigh.

#### YOU WON'T KNOW UNTIL YOU TRY IT!

Do you have a problem and need water research findings and related water information? One source of water resources information is as close as your telephone. Rapid access to more than 90,000 water-related references is available through the Southern Water Resources Scientific Information Center (SWRSIC).

Among the subject areas are water quality, planning, recreation, use, management, protection, conservation, supply, engineering work, and manpower - to list a few. Quickly, you can have a full printout of the abstracts for your area of interest. If you have a problem and need information, an efficient and economical way to get it is through SWRSIC.

Start by calling Jean Porter at (919) 737-2683 and describing your problem!

#### WASTEWATER DISINFECTION: A STATE-OF-THE-ART SUMMARY

A recently completed report by Dr. C. M. Sawyer of the Department of Civil Engineering at Virginia Military Institute provides a good summary of current information on wastewater disinfection. According to his report chlorination has become the nearly exclusive method for wastewater disinfection. Its principal

advantage is economic - being by far the lowest-cost method of providing adequate disinfection of wastewater. Among other advantages of chlorination are its well-established technology, its ease of operation, and the known availability of needed materials.

Undesirable consequences with chlorination are described in the report. Chronic toxicity effects recently have been observed in fish exposed to low concentrations of residual chlorine compounds in receiving waters. Combined chlorine-reaction products also are slow-acting viricides, requiring extended periods of exposure to achieve significant reductions of undesirable microorganisms, including viruses. Finally, chlorine has become a public-health concern because of harmful effects that may result from the presence of chlorinated organics in wastewater effluents.

The toxicity problems identified with chlorination have prompted evaluation and consideration of such various alternative disinfection methods as chlorination-dechlorination, chlorbromination, ozonation, and irradiation. Alternate disinfectants become more attractive economically if dechlorination is necessary for removal of residual toxicity. For most applications, alternate means of disinfection can offer more efficient microbial inactivation and minimal toxicity problems. However, these alternatives to chlorination require more extensive pre-treatment, effluent monitoring, dosage control, and post-treatment, than that currently practiced.

This report summarizes the advantages and disadvantages of many possible alternatives to chlorination, as reported in recent literature. It is divided into five major sections: Available Disinfection Technology, Practical Disinfection Technology, Disinfection Regulation, Summary, and Recommendations. The literature references have been organized into nine categories: Chlorination, Ozonation, Other Halogens, Irradiation, Miscellaneous Disinfectants, Indicators, Toxicity, Virology, and General Disinfection.

A copy of the report (Bul. #89) may be obtained by writing: WRRRC, VA Polytechnic Institute and State University, Blacksburg, VA 24061.

## OHIO RIVER CHEMICAL SPILL

Two spills of carbon tetrachloride in the Ohio River system last month turned off many Cincinnati area residents to the local water supply. Restaurant owners claim diners were substituting other beverages for water with their meals and grocery stores reported an increase in sales of soft drinks and bottled water.

Because of the chemical spills Cincinnati, Ohio, closed its intake valves for 31 hours to its drinking water supply.

Spills of 6,000 pounds and 70 tons of carbon tetrachloride occurred in the Ohio River. The chemical, used in fire extinguishers and as a cleaning agent, can cause liver damage and is believed to be a cancer-causing substance. The chemical was accidentally spilled into the Kanawha River at the FMC Corp. near Charleston, West Virginia.

#### EPA CONSTRUCTION GRANTS OBLIGATE \$12 BILLION

The EPA construction grant program is currently the nation's largest ongoing public works program, providing municipalities with 75 percent federal grants for construction of sewage treatment facilities. EPA says it is administering over 8000 active sewage treatment projects in various stages of planning and construction. To date, the agency has obligated almost \$12 billion of the \$18.5 billion authorized to date under the 1972 Federal Water Pollution Control Act Amendments and the 1976 Public Works Employment Act.

#### COURT UPHOLDS EPA AUTHORITY FOR ISSUING INDUSTRY-WIDE EFFLUENT LIMITS

The U.S. Supreme Court ruled last month that, under the Federal Water Pollution Control Act, EPA is authorized to promulgate by regulation industry-wide uniform effluent limitations for classes and categories of point sources. The court ruled that the uniform limits applied so long as some allowance is made for variations in individual plants.

The court said, "As we read it, Section 304 of the Water Pollution Control Act requires that the guidelines survey the practicable or available pollution control technology for an industry and assess its effectiveness. The guidelines are then to describe the methodology EPA intends to use in the Section 301 regulations to determine the effluent limitations for particular plants."

#### STATUS OF WATER PROJECTS UNCERTAIN

Several federal water development projects have been cut from the proposed 1978 budget by the Carter Administration. Included are the Garrison Diversion Project in North Dakota, Cache River Project in Arkansas, Oahe Project in South Dakota, and Meramec Park Project in Missouri. Economic and environmental reasons have been given for withholding funding from the projects.

Bureau of Reclamation projects deleted from the budget are: Central Arizona; Auburn Dam in California; Dolores and Fruitland Mesa in Colorado; Savery-Pot in Colorado and Wyoming; Garrison Diversion in North Dakota; Oahe in South Dakota; and Central Utah.

Army Corps of Engineers projects deleted include: Cache River; Freeport in Illinois; Grove Lake in Kansas; Dayton, Paintsville Lake and Yatesville Lake in Kentucky; Atchafalaya River and Bayous Chene, Bleuf and Black in Louisiana; Dickey-Lincoln in Maine; Meramec Park; Lufata Lake in Oklahoma; and Richard B. Russell in Georgia.

The projects were being reviewed for environmental safety and economic necessity. It is expected that funding under the fiscal year 1978 budget would be withheld until the review is completed.

On March 10 the Senate endorsed by a 65 to 24 vote an amendment that would require the spending of the \$10 billion appropriated for water development projects. The Amendment was tied to a bill designed to stimulate the economy.

#### HATTERAS BEACH CHOSEN AS DREDGE SPOIL DUMP

Sand from a U.S. Army Corps of Engineers dredging project in Rollins Channel near Hatteras will be dumped on the Outer Banks beach because of the National Park Service's opposition to an inland dumping site, according to a Corps spokesman.

Officials of Dare County, the park service and the Corps agreed on the beach site. County officials, who must provide the dumping area for the Corps project, wanted to use a 24-acre site near Hatteras in the Cape Hatteras National Seashore and to remove more than 80,000 cubic yards of sand from that site during the year.

Park Service Officials expressed concern that the sandpile and hauling would hurt the aesthetics of the seashore.

David W. Huett, public information officer for the Corps in Wilmington, said the approved site lies between the dune line and surf zone, several hundred feet from the area to be dredged. He said the site would be used only once and other areas will have to be found for future maintenance of the channel.

Dr. Paul Buckley of the Park Service's northeast regional office in Boston, Mass., toured the area before approving the alternate site.

#### OTHER CONFERENCES AND WORKSHOPS

##### Public Policy for Ground Water Protection

The Engineering Foundation will hold a conference on "Public Policy for Ground Water Protection" at Virginia Polytechnic Institute and State University on April 13-16, 1977. Serving as chairman of the conference is William R. Walker, Director of the Virginia Water Resources Research Center at Virginia Polytechnic Institute.



Discussions at the conference will focus on public policy and controls with respect to the various sources of ground water protection. Initially, the program will evaluate on a regional basis the significance of potential sources and assess the extent of the problem, in terms of waters presently and potentially affected.

Participants will discuss the ramifications associated with proposed policies, such as non-degradation, limited degradation, or laissez-faire. Discussions of existing policies will follow, on a variety of activities involving water use and disposal practices. The implementation of controls at various levels will be evaluated, with specific case studies and contrasting experiences presented.

#### Lake Restoration Conference Slated for April 25-28

The University of Wisconsin-Extension is offering a conference on the "Mechanics of Lake Restoration" in Madison, April 25-28.

The conference is intended for people from state and federal lake rehabilitation agencies, environmental and engineering consultants, contractors, and others interested in lake restoration.

The program includes 39 speakers. It will begin with a review of federal and state lake protection and rehabilitation programs. Speakers will also discuss methods for data collection, analysis, and interpretation; development of alternative management plans; and a range of renovation techniques. Contact: Environmental Resources Unit, University of Wisconsin-Extension, 1815 University Avenue, Madison, WI 53706.

#### Storm Water Detention Basin Design

This program is designed to aid those engaged in the design and management of urban storm water systems. The concept of detention basins to impede peak run-off flow in storm drainage systems is recognized as a method to reduce the cost of providing urban areas with adequate drainage protection. In addition, many jurisdictions require on-site detention facilities to control run-off associated with new development. It is the purpose of the two-day session to present specific design procedures for the development of detention systems.

The session is presented by the Department of Engineering, University of Wisconsin - Extension on April 14-15, 1977. Program director is William R. Baker, Department of Engineering, University of Wisconsin - Extension, 432 North Lake Street, Madison, WI 53706. For program information phone (608) 262-2061. For enrollment (608) 262-1299.

#### Symposium on Quality of Precipitation

Washington, D.C. will be the site for a Symposium on Quality of Precipitation to be held at the 58th Annual Meeting of American Geophysical Union, during the period May 30 - June 3, 1977. The symposium is sponsored jointly by the Committee on Precipitation and the Committee on Water Quality, both of AGU's Section of Hydrology.

Recent discoveries of the dramatic effects of acid precipitation and other types of precipitation on forests, fish and wildlife, and the quality of surface and ground waters have emphasized the need to know more about this phase of the hydrologic cycle and the effects, both good and bad, created by certain qualities. This symposium will attempt to bring together some of the outstanding specialists in the field to explore all phases of the subject. For symposium details contact: Dr. Eugene L. Peck, Hydrologic Research Laboratory, NCAA - National Weather Service, Silver Spring, Maryland 20910.

## WATER RESOURCES CONDITIONS IN NORTH CAROLINA

February was an unusually dry winter month with precipitation being only about 1/2 of the long-term normal in most areas of the State. Light rains which occurred during the month caused only minor rises on most streams. Much of the runoff in western streams was from melting snow which had fallen during January.

Monthly-mean flows were deficient (in lower 25 percent of record) in most streams. Flows at USGS index gaging stations ranged from less than 1/4 of normal for the Neuse River near Clayton to slightly over 1/2 normal for the South Yadkin River near Mocksville.

Ground-water levels declined in the Piedmont and Coastal Plain regions and rose slightly in the Mountains. Levels, as compared to the long-term averages for the month, were near normal in the Mountains and below normal elsewhere.

. . . . U.S. Geological Survey

## POSITIONS AVAILABLE

Chief Technical Adviser to work in a regional project in Burundi, Egypt, Kenya, Rwanda, Sudan, Tanzania and Uganda; expert in hydrological forecasting to work in member countries of the River Niger Commission. Applications should be addressed to: The Secretary-General, World Meteorological Organization, Case postale No. 5, CH-1211 GENEVA 20, Switzerland.

Extension Water Resource Specialist with the Extension Service - University of Vermont. Area of specialization will include water resources with emphasis on water quality-land use relationships and small community systems. Inquiries should be directed to: R. P. Davison, Associate Dean and Director, Extension Service, Morrill Hall, UVM, Burlington, VT 05401.

Wildlife Management specialist. Assistant Professor to teach undergraduates in wildlife management and introductory environmental science and to conduct research and supervise undergraduate research projects. Contact: Dr. James C. Dawson, Acting Director, Institute for Man and Environment, State University of NY, Plattsburgh, NY 12901.

## WATER RESOURCES LEGISLATION IN THE CONGRESS

### Bills Introduced

#### Senate

- S. 657 To develop and establish an Earth Resource and Environmental Information System.
- S. 687 To establish a uniform and comprehensive legal regime governing liability and compensation for damages and clean-up costs caused by oil pollution.
- H.R. 3549
- S. 846 To provide for a continuing program of water resources research and development.
- H.R. 4157

#### House

- H.R. 3344 To authorize the Secretary to engage in feasibility investigations of a potential water resource development.
- H.R. 3909
- H.R. 4141 To extend until Oct. 1, 1980, appropriation authorizations for Seal Beach, Great Dismal Swamp, and San Francisco Bay NWR.

NEW PUBLICATIONS RECEIVED BY THE INSTITUTE

(Residents of North Carolina may borrow these from the Institute for a two-week period. Where individual copies are desired, readers are encouraged to request copies from the organization issuing the publication. The addresses are provided by the *News* for this purpose.)

Abbreviations used throughout as follows:

ARS	- Agricultural Res. Service	OWP	- Office of Water Program
ASCE	- American Society of Civil Engineers	OWRT	- Office of Water Research & Technology
CEQ	- Council on Environmental Quality	RTI	- Research Triangle Institute
DEM	- Division of Environmental Management	SCS	- Soil Conservation Service
EDS	- Environmental Data Service	TVA	- Tennessee Valley Authority
EMC	- Environmental Management Comm.	UCOWR	- Universities Council on Water Resources
EPA	- Environmental Protection Agency	UNC-SG	- University of N. C. Sea Grant
ERC	- Engineering Research Center	USDA	- U. S. Department of Agriculture
ERS	- Economic Research Service	USDC	- U. S. Department of Commerce
GAO	- General Accounting Office	USDI	- U. S. Department of the Interior
IHD	- International Hydrological Decade	USGPO	- U. S. Government Printing Office
IWR	- Institute for Water Resources	USGS	- U. S. Geological Survey
NAS	- National Academy of Sciences	WPC	- Water Pollution Control
NCDNER	- N. C. Dept. of Natural & Economic Resources	WQS	- Water Quality Standards
NERC	- National Environmental Research Center	WRC	- Water Resources Council
NOAA	- National Oceanic & Atmospheric Adm.	WRI	- Water Resources Institute
NPS	- National Park Service	WRRC	- Water Resources Research Center
NSF	- National Science Foundation	WRRRI	- Water Resources Research Institute
NTIS	- National Technical Information Service	WRSIC	- Water Resources Scientific Information Center
NWC	- National Water Commission		

Water Resources Planning

- "Coastal Planning: The Designation and Management of Areas of Critical Environmental Concern," (UNC-SG-76-09), 11/76, by T. J. Schoenbaum, *et al*, UNC Sea Grant College Program, 1235 Burlington Lab., NCSU, Raleigh, NC 27607, Price - \$2 (free NC residents).
- "Flood Damage Prevention: An Indexed Bibliography," 10/76, by J. W. Weathers, TVA, Knoxville, TN 37902.
- "Flood Plain Management Through Allocation of Land Uses - A Dynamic Programming Model," (#117), 12/76, by L.D. Hopkins, *et al*, U. of IL, Water Res. Center, 2535 Hydrosystems Lab., Urbana, IL 61801.
- "Mathematical Models for Use in Planning Regional Water Resources and Energy Systems," (#116), 11/76, by E. D. Brill, *et al*, U. of IL, Water Res. Center, 2535 Hydrosystems Lab., Urbana, IL 61801.
- "Environmental Pollution Control Alternatives: Municipal Wastewater," (EPA-625/5-76-012), by G. Culp, Technology Transfer, USEPA, Wash., DC 20460.
- "An Analysis of Price/Cost Sensitivity of Water Use in Selected Manufacturing Industries," 6/76, by Bu. of Domestic Commerce Staff, USDC, Domestic and International Bus. Admin., Wash., DC 20230.
- "An Evaluation of the Water Resources Regional Research Process with Particular Reference to Projects Funded by the Office of Water Research and Technology," 1976, by E. A. Engelbert, UCOWR, 310 Ag. Hall, U. NE - E. Campus, Lincoln, NE 68583.
- "Rogue River Study--Report 1: Field Investigations of River Use Within the Wild River Area of the Rogue River, Oregon," (#51), 12/76, by R. E. Pfister, *et al*, WRRRI, OR St. U., Corvallis, OR 97331.
- "Water Resources Technology Transfer: A Guide," 1/77, by W. E. Sharpe, *et al*, for UCOWR Technology Transfer Committee, avail. from Inst. for Research on Land & Water Resources, PA St. U., U. Park, PA 16802.
- "Developing Criteria to Classify Wild and Scenic Rivers," (B-029-IDA), 11/76, by J. E. Carlson, ID WRRRI, U. ID, Moscow, ID 83843.

Water Quality Management

- "Algal Conditions and the Potential for Future Algal Problems in the Willamette River, Oregon," (GSC 715-G), 1977, by D. A. Rickert, *et al*, Br. of Distribution, USGS, 1200 S. Eads Street, Arlington, VA 22202.
- "Asbestos in Potable Water," (#118), 1/77, by W. H. Hallenbeck, *et al*, U. of IL, Water Res. Center, 2535 Hydrosystems Lab., Urbana, IL 61801.
- "Embryopathic Effects of Waterborne and Sediment-Accumulated Cadmium, Mercury and Zinc on Reproduction and Survival of Fish and Amphibian Populations in Kentucky," (#100), 1/77, by W. J. Birge, *et al*, WRRRI, U. of KY, Lexington, KY 40506.
- "Control of Water Pollution from Cropland: Vol. II - An Overview," (ARS-H-5-2), 6/76, by L. A. Mulkey, *et al*, for EPA, avail. from USGPO, Wash., DC 20402.
- "Production and Transport of Gaseous NH<sub>3</sub> and H<sub>2</sub>S Associated with Livestock Production," (EPA-600/2-76-239), 9/76, by J. R. Miner, for EPA, avail. from NTIS, Springfield, VA 22151.
- "Hydrology and Water Quality in the Central Kentucky Karst: Phase I," (#101), 1/77, by J. F. Quinlan, *et al*, WRRRI, U. of KY, Lexington, KY 40506.
- "Effect of Agricultural Practices and Land Disposal Solid Waste on Quality of Water from Small Watersheds," (A-031-TN), 1/77, by F. C. Larson, *et al*, WRRRC, White Ave. Bldg., Rm. 210, 1000 White Ave., U. of TN, Knoxville, TN 37916, Price - \$4.

- "Conversion of Cattle Manure into Useful Projects," (EPA-600/2-76-238), 9/76, by B. S. Dunn, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.
- "A Mathematical Model for Water Quality Evaluation in the South Carolina Grand Strand," (#45), 9/76, by S. W. McChesney, *et al*, WRRRI, Clemson U., Clemson, SC 29631.
- "North Carolina Water Quality Inventory 305 (b) Report Calendar Year 1975," 4/76, by NCDNER, DEM, Raleigh, NC 27611.
- "Phosphorus Cycling in *Nuphar Luteum* Communities in the Lower Chowan River, North Carolina (Thesis)," (B-079-NC), 7/76, by R. R. Twilley, Dept. of Biology, ECU, Greenville, NC 27834.
- "Guidelines Establishing Test Procedures for the Analysis of Pollutants, Amendments," Federal Register, Part II, (Vol. 41, No. 232), 12/76, by EPA Public Info. Ref. Unit, Rm. 2922, Waterside Mall, 401 M Street, SW, Wash., DC 20460.
- "Proceedings of the Conference on Salt and Salinity Management," (#38), 12/76, by Water Res. Center, U. CA, Davis, CA 95616, Price - \$4.
- "Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," (Bk 5-Ch. A5), 1975, by L.L. Thatcher, *et al*, for USGS, avail. from USGPO, Wash., DC 20402.
- "The Reuse of Water in Commercial Raising of Catfish - Phase II," (#52), 12/76, by B. A. Simco, WRRRC, U. of TN, Knoxville, TN 37916.
- "Systems Design of a Tubular Reverse Osmosis Plant," (#64), 1/77, by V. Goel, *et al*, Water Res. Center, UCLA, School of Eng. & Applied Science, Los Angeles, CA 90024.
- "Design Criteria for Swine Waste Treatment Systems," (EPA-600/2-76-233), 10/76, by F. J. Humenik, *et al*, for EPA, avail. from NTIS, Springfield, VA 22161.
- "Improved Waste-Treatment Systems Design Based on the Natural Thermal Environment," (#64), 7/76 by, L. G. Rich, WRRRI, Clemson U., Clemson, SC 29631.
- "Effects of Thermal Pollution on Certain Aquatic Invertebrates," (#65), 8/76, by A. S. Tombes, *et al*, WRRRI, Clemson U., Clemson, SC 29631.
- "A Synoptic Survey of Trace Metals in Bottom Sediments of the Willamette River, Oregon," (GSC 715-F), 1977, by D. A. Rickert, *et al*, Br. of Distribution, USGS, 1200 S. Eads St. Arlington, VA 22202.
- "Optimal Size of Regional Wastewater Treatment Plants," (#161), 1/77, by W. H. Hovey, *et al*, Water Res. Center, U. of CA, Davis, CA 95616.
- "Treatment of Wood Preserving Wastewater," (TR-79), 10/76, by T. D. Reynolds, *et al*, WRI, TX A&M U., College Sta., TX 77853.

#### Water Quantity Management

- "Irrigation Efficiency: A Bibliography - Volume 2," (OWRT/WRSIC 76-206), 12/76, by WRSIC, OWRT, Wash., DC 20240.
- "Assessment of Irrigation Return Flow Models," (EPA-600/2-76-219), 10/76, by W. R. Walker, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.
- "An Experimental Investigation of the Rainfall on the Turbulence Properties of Overland Flow," (#38), 12/76, by H. Shahabian, *et al*, WRRRC, Purdue U., West Lafayette, IN 47907.
- "Studies on Rainfall-Runoff Modeling 6. A Statistical Analysis of Rainfall-Runoff Relationship," (#81), 12/76, by V. P. Singh, *et al*, WRRRI, NM ST. U., Box 3167, Las Cruces, NM 88003.
- "Terrestrial Contribution of N to Stream Water in Managed and Undisturbed Forested Watersheds," (#82), 12/76, by J. R. Gosz, WRRRI, NM St. U., Box 3167, Las Cruces, NM 88003.

#### Miscellaneous

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