

WATER RESOURCES RESEARCH INSTITUTE

OF THE UNIVERSITY OF NORTH CAROLINA

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CONTENTS

| | <u>Page</u> |
|---|-------------|
| New Institute Projects | 1 |
| Water Management in Coastal North Carolina | 1 |
| Water Resources Consequences of Second Home and Recreational Land Development | 2 |
| Effective Stormwater Runoff Control Strategies for the Protection of Dissolved Oxygen in Streams | 2 |
| Kepone Polluters Receive Stiff Fines | 3 |
| Clean Water Act Amendments Held Over for Next Congress | 3 |
| EPA Enforcement Action on Over 3000 Polluters | 4 |
| Toxic Control Bill Sent to President | 4 |
| California Board Considers Plan for Reclamation and Reuse of Wastewater | 5 |
| USDA Announces Conservation Programs | 5 |
| EPA Publications Available | 5 |
| Pipe Corrosion in Water Supply Systems | 7 |
| New Ways to Measure "Muddy" Water | 7 |
| New Research Specials | 8 |
| Urban Stream Modification and Sediment Control Workshop October 27 | 8 |
| Demonstration of Southern Water Resources Scientific Information Center Scheduled | 8 |
| Other Conferences and Workshops | 9 |
| Positions Available | 9 |
| Water Resource Conditions in North Carolina | 10 |
| Water Resources Legislation in the Congress | 10 |
| New Publications | 11 |

NEW INSTITUTE PROJECTS

Water Management in Coastal North Carolina (Project Supported by EPA and NCDNER)

Residents of coastal North Carolina face unique problems in obtaining water supplies and in disposing of their wastewaters. In some areas, particularly the Outer Banks, water resources are limited. In all areas, proper wastewater disposal is costly.

The purpose of this study is to examine and evaluate the options for water management in coastal North Carolina, including among these options, the potential for ocean disposal of wastewaters. In order to put this option into proper perspective, studies are to be made of (1) population trends; (2) water resources available; (3) water requirements to the end that some of these requirements might be met by the reclamation of wastewaters; (4) potential for wastewater disposal underground, to the land, to inland waters, and to the ocean; (5) potential for wastewater reclamation; and (6) the laws that govern the utilization of the most promising options and the institutions that are available or that can be created to permit implementing these options.

The studies will be concentrated in two populous coastal areas, both unique in character: the Outer Banks in Dare County and the Morehead City-Carteret County area.

Principal Investigators: Dr. D. A. Okun, Dr. Charles R. O'Melia, and Dr. J. K. Sherwani, Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill; Dr. Larry King, Department of Soil Science, North Carolina State University; and Professors W. J. Wicker and M. S. Heath, Jr., Institute of Government, University of North Carolina at Chapel Hill.

Starting Date: August 1, 1976

Completion Date: July 31, 1978

Water Resource Consequences of Second
Home and Recreational Land Development
(A-092-NC)

North Carolina has experienced a traumatic increase in large-scale, second-home and recreational development over the past few years that threatens to alter the landscape of some of the most scenically valuable regions. It is expected that the number of households owning recreational property will double between 1975 and 1985. All of this is largely taking place without benefit of state policy covering such development and local capability to deal with the problem.

Major objectives of this project are to determine the number and location of second-home and recreation land development projects initiated in North Carolina's Multi-County Planning Regions A, B, C, D, and E during the past ten years, estimate future demand, geographic areas and probable acreage. Another important objective will be to estimate the distribution and magnitude of water resource problems that are likely to result from recreational land development.

The project will determine local governments' capacity to assure that sound water/land planning, development, and management policies and practices are pursued in the recreational land development process, as well as the extent to which state intervention is needed.

The results will be particularly valuable in the formulation of state area land management legislation, state water resource and related land planning and regulation, regional growth management and planning, and in assisting local agencies to minimize adverse water resource impacts in planning for, serving, and regulating second-home and recreational land development.

Principal Investigator: Dr. Shirley F. Weiss, Department of City and Regional Planning, University of North Carolina at Chapel Hill.

Starting Date: October 1, 1976

Completion Date: September 30, 1977

Effective Stormwater Runoff Control Strategies
for the Protection of Dissolved Oxygen in Streams
(Project Supported by NCDNR)

Completed research has produced strong evidence that pollutants carried by stormwater runoff from both urban and non-point urban lands are highly significant contributions to the total pollution load on the nation's streams. Recent local 208 studies also indicate that there is a recurrent adverse effect on dissolved oxygen in the Neuse River that is associated with stormwater runoff. The significance and frequency of these effects relative to those from point source has not been determined. For example, little work has been done to identify the impacts of non-point pollution

loads on stream quality, nor has there been much investigation of the effectiveness on non-treatment techniques on load reduction or smoothing over time.

This study will investigate relationships between storm events, pollutant loads and water quality of the Neuse River from non-point sources and secondary treatment facilities. The study will also address the effects of non-treatment control strategies on the flows of phosphorous.

Principal Investigator: Dr. David H. Moreau, Department of City and Regional Planning, University of North Carolina at Chapel Hill.

Starting Date: October 1, 1976

Completion Date: September 30, 1977

KEPONE POLLUTERS RECEIVE STIFF FINES

Two chemical companies, Allied Chemical Corporation and Life Science Products Company, were given total fines of \$16.9 million October 5 in federal court. Allied Chemical Corporation pleaded no contest to 940 separate counts of violating antipollution laws and was given the maximum fine of \$13.2 million.

U. S. District Court Judge Robert R. Merhige, Jr., took a firm stance for environmental protection. "The word must go out--the word must go out that we're not going to pollute the waters," said Merhige. He called pollution "a crime against every citizen."

Governor Mills Godwin has had the James River closed to fin and shellfishing since high levels of kepone were found in its waters last December. Traces of kepone have also been found in some fish in the Chesapeake Bay.

Diagnostic tests show at least 32 former workers of the Life Science Products Company plant as having kepone poisoning.

CLEAN WATER ACT AMENDMENTS HELD OVER FOR NEXT CONGRESS

The Senate and House Committees were unable to resolve differences in what should be included in the amendments to the Water Pollution Control Act. The Senate version of the bill included:

- ° Extending from September 30, 1977, to September 30, 1978, the time period that money may be authorized to a state for sewage treatment facilities construction;
- ° Giving EPA authority to guarantee loans made by the Federal Financing Bank for the non-federal share of sewage treatment construction grants projects;
- ° Authorizing an additional \$5 billion for the construction grants program for FY 1977;
- ° Distributing construction grants funds on the basis of 1975 population rather than 1990 estimates;

- ° Permitting on a case-by-case basis the extension of the July 1, 1977, secondary treatment requirement for publicly owned sewage treatment works to July 1, 1980; and
- ° Reducing Army Corps of Engineers jurisdiction under Section 404 to traditionally navigable waters. Permit authority under Section 404 would be administered by states authorized to administer the National Pollutant Discharge Elimination System (NPDES).

The House and Senate had conflicting views of certain provisions of the Amendments and must address those questions in the next Congress. Only one amendment actually made it through the Congress. That one authorized the Environmental Protection Agency to guarantee bonds issued to the Federal Financing Bank to fund the local share of sewage treatment construction grant projects. Senator Muskie (D-Maine) has indicated the need for a comprehensive overhaul of the law in the 95th Congress.

EPA ENFORCEMENT ACTION ON OVER 3,000 POLLUTERS

In 1975 EPA initiated enforcement action on 3,300 water polluters, according to a recent EPA publication. One of the high priority areas for EPA's enforcement program relates to getting completion of treatment facilities by industries and municipalities to meet requirements of the Federal Water Pollution Control Act. According to the report by December 31, 1975, 82 percent of major non-municipal permittees and 70 percent of major municipal permit holders were in compliance with permit schedules. About 74 percent of municipal permittees were in compliance with effluent limitations.

NPDES enforcement activity was up in 1975 with 829 administrative orders and 101 notices of violation issued and 123 cases referred to the Justice Department for civil or criminal action.

Single copies of *EPA Enforcement--A Progress Report December 1974 to December 1975* can be obtained from EPA Public Information Center, PM-215, Washington, DC 20460.

TOXIC CONTROL BILL SENT TO PRESIDENT

Both houses of Congress have passed by wide margins the toxic substances bill (S 3149) and it has been sent to the President to be signed.

If signed by the President, the bill would go into effect January 1, 1977. There is the possibility, however, of a pocket veto because of Office of Management and Budget opposition to some provisions of the bill.

The bill grants EPA authority to require testing of chemical substances and mixtures and halt or limit production for reasons of insufficient data or because a substance either may present an unreasonable risk of injury, result in substantial environmental exposure, or substantial human exposure. The bill also requires manufacturers to notify EPA 90 days before marketing of a new chemical or an existing chemical to be put to a new use.

CALIFORNIA WATER RESOURCE BOARD CONSIDERING PLAN FOR RECLAMATION AND REUSE OF WASTEWATER

The California State Water Resource Control Board has prepared a draft plan which considers both policy and action for reclaiming and reusing treated waste material. The plan would amend their current grant program regulations to require increased consideration of reclamation alternatives in water pollution control projects. A major objective of the plan is the creation of additional water supplies.

Included in the plan are provisions for establishing procedures and criteria for selecting wastewater recovery research and demonstration projects. Special studies would be initiated to investigate health aspects of using reclaimed water. The Board's plan calls for a wastewater reclamation staff specialist to assist with implementation and monitoring the action called for in the plan. An interagency water reclamation policy advisory committee would be established to review and report on the state plan for wastewater reclamation.

USDA ANNOUNCES CONSERVATION PROGRAMS

The U. S. Department of Agriculture has announced a \$190 million 1977 Agricultural Conservation Program which was activated October 1 in all agricultural counties.

The objective of ACP is to encourage enduring soil and water conservation practices on farmland and to benefit wildlife. ACP provides up to 75 percent of the cost of carrying out approved practices.

Along with ACP, the Department said that the 1977 Water Bank Program would be funded at the full \$10 million level. It compensates participating landowners for maintaining wetlands and associated upland areas for migratory waterfowl and other wildlife which use that type habitat. The small Water Bank Program has increased wildlife populations significantly on participants' lands. There always are far more requests for participation than funds available. Farmers in the program are protecting important public resources for the money received.

— *Wildlife Management Institute*

EPA PUBLICATIONS AVAILABLE

During the past few months the Corvallis Environmental Research Laboratory has published a number of research reports in EPA's Ecological Research Series. If you have need for any, or all, of these reports (refer to both title and publication number), and contact the Office of Public Affairs, Corvallis Environmental Research Laboratory, 200 S.W. 35th Street, Corvallis, OR 97330.

- Impacts of Construction Activities in Wetlands of the United States*, EPA-600/3-76-045.
- Self-Regulation of Environmental Quality: Impact Analysis in California Local Government*, EPA-600/3-76-040.
- The Influence of Land Use on Stream Nutrient Levels*, EPA-600/3-76-014.
- Trophic Classification of Lakes Using LANDSAT-1 (ERTS-1) Multispectral Scanner Data*, EPA-600/3-76-037.
- Evaluation of the Algal Assay Procedure*, EPA-600/3-76-064.
- Chemical/Biological Relationships Relevant to Ecological Effects of Acid Rainfall*, EPA-660/3-75-032.
- Tidal Flats in Estuarine Water Quality Analysis*, EPA-660/3-75-025.
- Nutritional Ecology of Nuisance Aquatic Plants*, EPA-660/3-75-027.
- Some Effects of Cadmium on Coniferous Soil/Litter Microcosms*, EPA-660/3-75-036.
- Design Guidelines for Agricultural Soil Warming Systems Utilizing Waste Heat*, EPA-600/3-76-026.
- Evaluation of Mathematical Models for Temperature Prediction in Deep Reservoirs*, EPA-660/3-75-038.
- Phosphate Reduction and Response of Plankton Populations in Kootenay Lake*, EPA-600/3-76-063.
- Analysis of Multiple Cell Mechanical Draft Cooling Towers*, EPA-660/3-75-039.
- Environmental Trace Materials: Computer-Coupled Radioactivation Analysis*, EPA-600/3-75-015.
- Bioenvironmental Impact of a Coal-Fired Power Plant--First Interim Report*, EPA-600/3-76-002.
- Bioenvironmental Impact of a Coal-Fired Power Plant--Second Interim Report*, EPA-600/3-76-013.
- Geochemical Interactions of Heavy Metals in Southeastern Salt Marsh Environments*, EPA-600/3-76-023.
- Effects of Ozone on Nitrogen Fixation in Ladino Clover*, EPA-600/3-76-031.
- Effects of Sulfur Dioxide and/or Ozone on Several Oat Varieties*, EPA-600/3-76-032.
- Limnological Studies of Flathead Lake, Montana: A Status Report*, EPA-600/3-76-039.
- Effects of Mechanical Cooling Devices on Ambient Salt Concentrations*, EPA-660/3-76-039.
- Studies on Lake Restoration by Phosphorus Inactivation*, EPA-600/3-76-041.
- Nitrate Removal From Water at the Water-Mud Interface in Wetlands*, EPA-600/3-76-042.
- Plant Uptake of Cadmium from Phosphate Fertilizer*, EPA-600/3-76-053.
- Phosphate Reduction and Response of Plankton*, EPA-600/3-76-063.
- Water Quality Criteria Research of the U. S. Environmental Protection Agency, (Proceedings of an EPA-sponsored Symposium)*, EPA-600/3-76-079.
- Proceedings: Biostimulation-Nutrient Assessment Workshop*, EPA-660/3-75-034.

PIPE CORROSION, WATER QUALITY AND FLOW EFFICIENCY IN WATER SUPPLY SYSTEMS

A persistent and annoying problem for water supply utilities is the deterioration of clear, palatable and safe water produced at the water treatment plant that occurs on the way to the consumer's tap.

Corrosion can be responsible for such deterioration in water quality, especially with metal water pipes.

The chemical or electrochemical reactions which take place between the water passing through the pipes and the materials in the pipe linings are affected by the chemical constituents in the water supply source and the corrosion process in turn can significantly lower the quality of water delivered to the user.

Although cement-lined water mains have an excellent record of performance for corrosion resistance, thousands of miles of metal pipes are still in service by water supply systems which are subject to the effects of corrosion.

Recent renewal of concern for the safety of drinking water supplies, characterized by passage of the Federal Safe Drinking Water Act in 1974, under which water quality tests are to be performed at the consumer's tap or point of delivery, is a significant turn of events for water supply systems experiencing corrosion effects.

Corrosion of water system pipes and its effects is another aspect of water pollution control efforts, for if the quality of the water source is one of the determinants of the corrosion rate, the consumer should be concerned, not only from the standpoint of the quality of the water delivered but on economic grounds as well, for it is well known that corroded water pipes decrease the flow efficiency and that the increased water pressures needed to overcome this efficiency loss can double the cost of pumping.

Water pipe corrosion and its effects is discussed in a recent publication of the Illinois State Water Survey, *Corrosion by Domestic Waters*, by T. E. Larson, which summarizes many years of experience, testing, and research in Illinois on a "problem that has plagued water utilities for as many years as metallic pipes, appurtenances, and water-using facilities have been employed."

To obtain the complete publication, you are referred to Bulletin 59 (ISWS-75-Bul. 59), Illinois State Water Survey, Department of Registration and Education, Urbana, Illinois 61801.

——— *Synopsis* - Lyle S. Raymond, Jr.

NEW WAYS TO MEASURE "MUDDY" WATER

New approaches will be adopted by the U. S. Geological Survey to greatly simplify the complex and difficult job of measuring the turbidity or "muddiness" of water.

As the Nation's largest water resources data agency, the USGS will begin using new methods for measuring turbidity late this year and expects to convert its national network of more than 5000 water-quality monitoring stations to the new methods by October 1, 1977. The turbidity measuring program will be carried out in cooperation with other Federal and State agencies and standards groups.

A review of both the problem of turbidity measurement and the proposed USGS approach to the problem is contained in USGS open-file report 76-153, *Measurement of*

'Turbidity' and Related Characteristics of Natural Water, copies of which can be obtained from the Chief Hydrologist, U.S. Geological Survey, 412 National Center, Reston, VA 22092.

NEW RESEARCH SPECIALS AVAILABLE

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

Agricultural Water Demands in North Carolina

by Dr. Robert S. Sowell and Dr. Ronald E. Sneed
Department of Biological and Agricultural Engineering
North Carolina State University at Raleigh

Strategies for Water Quality Monitoring

by Dr. Jabbar K. Sherwani
Department of Environmental Sciences and Engineering
University of North Carolina at Chapel Hill
and
Dr. David H. Moreau
Department of Environmental Sciences and Engineering and
Department of City and Regional Planning
University of North Carolina at Chapel Hill

WORKSHOP ON URBAN STREAM MODIFICATION AND SEDIMENT CONTROL OCTOBER 27

Readers are reminded that a one-day Workshop on Urban Stream Modification and Sediment Control is scheduled for October 27 in Charlotte. This workshop is designed to familiarize city engineers, soil and water conservation officials, sediment control personnel, planners, and others with land and water-related research and actual work underway on stream modification and urban stormwater runoff. The workshop will also update participants with the current sediment control program in North Carolina.

The workshop will start at 9:00 a.m. October 27 at the Bonnie E. Cone University Center on the University of North Carolina at Charlotte campus. Lunch will be served in the Student Center and will be followed by a tour to the field sites in the afternoon, ending around 4:00 p.m.

Those persons planning to attend should contact the Water Resources Research Institute, 124 Riddick Building, North Carolina State University, Raleigh, NC 27607, to preregister and pay the \$7 registration fee. Telephone (919) 737-2815.

DEMONSTRATION OF THE WATER RESOURCES LITERATURE RETRIEVAL SYSTEM SCHEDULED

Through the Southern Water Resources Scientific Information Center, individuals in North Carolina have access to a data base consisting of more than 90,000 entries of published reports and articles on water resources. A computer search of this data base will identify literature on a specific topic and provide citations and abstracts for each entry selected. To demonstrate the system, special workshops have been scheduled for November 9 and 10.

Demonstrations will be held on November 9 in the N. C. Department of Natural and Economic Resources Hearing Room (Room 102, 217 West Jones Street) and on November 10 in Room 10 of the Extension Education Center on Western Boulevard in Raleigh. For details on the demonstrations, call the Institute office at (919) 737-2815.

OTHER CONFERENCES AND WORKSHOPS

Individual Onsite Wastewater Systems

The Third National Conference on Individual Onsite Wastewater Systems will provide a forum for regulatory, manufacturing, and consumer interests to exchange up-to-date information about individual onsite wastewater systems.

Program participants will discuss governmental regulation and leadership, maintenance of treatment units, feasibility of alternative effluent disposal techniques, and diagnosis and cure of malfunctioning systems.

Onsite systems will be examined as a practical, cost-effective alternative in complying with PL 92-500 requirements for areawide waste treatment management planning (Section 208).

Sponsors of the conference include the National Sanitation Foundation and the U. S. Environmental Protection Agency Technology Transfer.

The conference will be held at the Marriott Inn, 3600 Plymouth Road, Ann Arbor, Michigan (313-769-9800). It will begin at 1:00 p.m. November 16 and adjourn at 12:30 p.m. November 18.

Water Problems in the Rural Environment

The objective of this conference is to describe the current rural water situation, including both water supply and wastewater disposal and aspects of quality and quantity; discuss both the socio-economic and technological aspects of alternative solutions to rural water problems and the various impacts involved in changing or improving the current situation; and discern future research and related needs to solve various rural water problems. The conference will focus on domestic and farmstead use of water and discussion will range from small community systems to individual systems. The Conference is scheduled for Nov. 4-5 in Lincoln, Nebraska.

For additional information, please contact: Millard W. Hall, Director, Nebraska Water Resources Research Institute, 310 Ag. Hall - East Campus, University of Nebraska, Lincoln, Nebraska 68583 (402) 472-3305.

POSITIONS AVAILABLE

Water Resources Specialist. Department of Environmental Sciences, University of Virginia: Applications are invited for a research/teaching position which emphasizes water resource economics, water quality management and hydrology at the Assistant Professor level in an interdisciplinary academic department with 28 faculty members (ecologists, hydrologists, geologists, geochemists, meteorologists, resource economists). A formal background in science or engineering is required. Send resume to: Recruiting Committee, Department of Environmental Sciences, Clark Hall, University of Virginia, Charlottesville, Virginia 22903, Telephone (804) 924-7761.

Drexel University Environmental Studies Institute is seeking applications from qualified faculty in the following areas:

1. Air Pollution Control Engineering
2. Water Quality Engineering (water & wastewater treatment)
3. Environmental Toxicologists

Applicants must have a Ph.D. The Engineering applicants must have an engineering degree and be eligible for license. Rank and pay are determined by experience qualifications.

For further information, contact Mr. P. W. Purdom, Director, Environmental Studies Institute, Drexel University, Philadelphia, Pennsylvania 19104.

Faculty position in water resources with the Water Resources Research Institute, University of Nebraska-Lincoln. The person selected for this position will participate in all aspects of the Institute's programs. Primary responsibility will include assisting the Director in planning, coordinating, and administering research in water resources. Additional responsibilities will include assisting with the dissemination of water resources research results and the training of water resources specialists. Classroom teaching and supervision of graduate students also may be involved.

Send resume to: Dr. Millard W. Hall, Director, Water Resources Research Institute, 310 Agricultural Hall, University of Nebraska, Lincoln, Nebraska 68583.

Chief, Water Resources Projects Branch with the Hydrology and Water Resources Department of the World Meteorological Organization. Applications shall be made on WMO Personal History Forms which may be obtained from the Secretariat on request and shall be addressed to: The Secretary-General, World Meteorological Organization, Case postale No. 5, CH-1211 GENEVA 20.

WATER RESOURCE CONDITIONS IN NORTH CAROLINA

Streamflow conditions during the early part of September were generally unchanged from August. Drought conditions continued in the Eastern Piedmont and Coastal Plain Regions, and most flows were at or below the 70% (7-day, 2-year) minimum flow level. Widespread rains fell on the 14-16 and small rises occurred on most streams. By the end of the month, however, flows had again receded to near drought levels in eastern North Carolina.

During the month streamflow conditions in the extreme western Piedmont and mountain regions were near the long term normal for September.

Groundwater levels continued to decline seasonally. Levels were generally above the long term averages in the mountains and below in the Piedmont and Coastal Plain regions.

WATER RESOURCES LEGISLATION IN THE CONGRESS

New Public Laws

Senate

S 327 Increasing annual authorizations for the Land and Water Conservation fund, and establishing a National Historic Preservation fund.

House

H.R. 13372 Designating as a wild and scenic river a 26 1/2 mile segment of the New River, N. C. Signed 9/11/76 (PL 94-407)

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:

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|--------|---|--------|--|
| ARS | - Agric. Res. Service | NWC | - Nat'l. Water Commission |
| ASCE | - American Society of Civil Engineers | OWP | - Office of Water Programs |
| CEQ | - Council on Environmental Quality | OWRT | - Office of Water Research & Technology |
| DEM | - Division of Env. Management | RTI | - Research Triangle Institute |
| EDS | - Environmental Data Service | SCS | - Soil Conservation Service |
| EMC | - Environmental Management Comm. | TVA | - Tennessee Valley Authority |
| 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 |
| IWR | - Institute for Water Resources | USGPO | - U. S. Government Printing Office |
| NAS | - National Academy of Sciences | USGS | - U. S. Geological Survey |
| NCDNER | - N. C. Dept. of Natural & Economic Resources | WPC | - Water Pollution Control |
| NERC | - National Environmental Research Center | WQS | - Water Quality Standards |
| NOAA | - National Oceanic & Atmospheric Adm. | WRC | - Water Resources Council |
| NPS | - National Park Service | WRRR | - Water Resources Research Center |
| NSF | - National Science Foundation | WRSIC | - Water Resources Research Institute |
| NTIS | - National Technical Information Service | | - Water Res. Scientific Information Center |

Water Resources Planning

- "A Unified National Program for Flood Plain Management," 7/76, USWRC, 2120 L St., NW, Wash, DC 20037.
- "An Appraisal of Conflicting Institutional Attitudes on the Westwide Study Report ('Critical Water Problems Facing the Eleven Western States')," Proceedings Paper No. 308, 6/76, ed. by J. S. Gladwell, WRSIC, U. of ID, Moscow, ID 83843.
- "Lake Management Conference May 12-14, 1975," 5/75, by WRRR, Prudue U., West Lafayette, IN 47907.
- "'Taking' by Regulation and the North Carolina Coastal Area Management Act," (UNC-SG-75-26), 7/76, by D. A. Rice, avail. from UNC-SG, 1235 Burlington Laboratories, NCSU, Raleigh, NC 27607.
- "Public Participation in Water Resource Development--A Bibliography," (OWRT/WRSIC 76-205), 8/76, by WRSIC, OWRT, USDI, Wash., DC 20240.
- "Systematic Development of Methodologies in Planning Urban Water Resources for Medium Size Communities," (TR#63), 5/76, by H. R. Potter, *et al*, WRRR, Purdue U., West Lafayette, IN 47907.
- "Wabash River Systems Model--Terminal Report Phase I," (TR#76), 7/76, by G. H. Toebes, *et al*, WRRR, Purdue U., West Lafayette, IN 47907.
- "Development of Regional Water Management Systems Operational Procedures," 7/76, by D. J. Etzold, *et al*, WRSIC, MS St. U., MS State, MS 39762.

Water Quality Management

- "Physiological Effects of Sublethal Levels of Acid Water on Fish," (Bul. 6), 76, by W. J. Pegg, *et al*, WRI, WV U., Morgantown, WV 26506.
- "Effects of Wastewater and Cooling Water Chlorination on Aquatic Life," (EPA-600/3-76-098), 8/76, by W. A. Brungs, for EPA, avail. from NTIS, Springfield, VA 22151.
- "The Use of Continuous Simulation in the Evaluation of Water Quality Management Plans," 8/76, by A. S. Donigian, Jr., *et al*, Hydrocomp, Inc., 1502 Page Mill Rd., Palo Alto, CA 94304.
- "A Simple Diagnostic Model to Determine the Feasibility of Salinity Control of Eurasian Watermilfoil," (UNC-SG-76-07), 8/76, by E. Knowles, avail. from UNC-SG, 1235 Burlington Labs, NCSU, Raleigh, NC 27607.
- "Petrographic and Geohydrologic Model of Aquifer Limestones in Florida," (35), 7/76, by A. F. Randazzo, WRRR, U. of FL, Gainesville, FL 32601.
- "National Water Quality Inventory 1975 Report to Congress," (EPA-440/9-75-014), 1975, by Office of Water Planning and Standards, USEPA, Washington, DC 20460.
- "The Effects of Various Tertiary Treatment Nutrient Removal Schemes on Periphyton Communities in Model Laboratory Streams," (Bul. #86), 7/76, by J. C. Smrcek, *et al*, WRRR, VPI & SU, Blacksburg, VA 24061.
- "Mathematical Modeling of Phytoplankton in Lake Ontario, Part 2 Simulations Using Lake 1 Model," (EPA-600/3-76-065), 8/76, by R. V. Thomann, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.
- "The Effects of Variations in Turbidity on Cycles of Planktonic and Benthic Organisms in Flood Control Reservoirs," 7/76, by Y. J. McGaha, *et al*, WRSIC, MS ST U., MS State, MS 39762.
- "Biological Control of Water Weeds in Plant Pathogens," (#36), 6/76, by T. E. Freeman, *et al*, WRRR, U. of FL, Gainesville, FL 32601.
- "Temporal Changes in the Offshore Islands of Mississippi," 7/76, by T. H. Waller, *et al*, WRSIC, MS ST U., MS State, MS 39762.

"Analysis and GC-MS Characterization of Toxaphene in Fish and Water," (EPA-600/3-76-076), 8/76, by D. L. Stalling, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.

"Waste Injection into the Hawaiian Gyhben-Herzberg Aquifer: A Laboratory Study Using a Sand-Packed Hydraulic Model," (TR#96), 2/76, by S. W. Wheatcraft, *et al*, WRRRC, U. of HI, Honolulu, HI 96822.

Water Quality Management

"Impact of Hurricane Tidal Surges on Subsequent Land Use Changes and Water Resources Reallocation," 7/76, by R. E. Cross, WRRRI, MS ST. U., MS State, MS 39762.

"Education in Hydrology and Water Resources in the United States--1965-1974--an Overview with Recommendations," 1976, by National Academy of Sciences, 2101 Constitution Ave., NW, Wash., DC 20418.

"Development and Application of a Simplified Stormwater Management Model," (EPA 600/2-76-218), 8/76, by J. A. Lager, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.

Miscellaneous

"Public Use of Coastal Beaches," (UNC-SG-76-08), 9/76, by D. W. Owens, *et al*, avail. from UNC-SG, 1235 Burlington Labs., NCSU, Raleigh, NC 27607.

"Standard Test Fish Development Part I," (EPA-600/3-76-061a), 7/76, by I. R. Adelman, *et al*, for EPA, avail. from NTIS, Springfield, VA 22151.

"Directory of Marine Scientists in the State of North Carolina," 7/76, by Office of Marine Affairs, NC Dept. of Administration, 116 W. Jones St., Raleigh, NC 27602.

"Summary of Marine Activities of the Coastal Plains Region," 9/76, by Coastal Plains Center for Marine Development Services, 1518 Harbour Drive, Wilmington, NC 28401.

"Soil Survey of Durham County, North Carolina," 6/76, by USDA, SCS, P. O. Box 27307, Raleigh, NC 27611.

"Soil Survey of Forsyth County, North Carolina," 5/76, by USDA, SCS, PO Box 27307, Raleigh, NC 27611.

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