NEWS
WATER RESOURCES RESEARCH INSTITUTE
OF THE UNIVERSITY OF NORTH CAROLINA

Number 199 October 1982

CONTENTS

EDITORIAL

Doing Something About Acid Rain in North Carolina

by James M. Stewart

Acid precipitation or acid deposition, while not new, is becoming increasingly recognized as an important issue in North Carolina.

Acid precipitation is caused by sulfur dioxide and nitrogen oxides being emitted into the air primarily by the burning of fossil fuels by industry, residences, transportation, and power plants. Once in the air, these chemicals react with moisture to form sulfuric and nitric acids. The chemicals can also be deposited on the surfaces where dew and other moisture combine to form the acids.

The outlook for improvements in the acid rain situation in the State is not very optimistic. Seven monitoring stations, all located in rural areas, in the State have recorded over the past four years mean pH levels of 4.4. In Winston-Salem atmospheric deposition studies of urban sites over a recent two-year period recorded mean pH values of 3.82. Scientists become concerned about the acidity of rainwater as it drops below a 5.6 pH.

Low pH rainfalls can have impacts on crops, forests, water, and property. Extreme events like the recent mountain fish kills attributed to acid rain and damage to tobacco are obvious indicators of a problem. Because of lack of resources, the long-term effects of low pH rainfalls and atmospheric fallout on lakes, streams, water supplies, fisheries, crops, buildings, and human health simply have not been adequately documented in North Carolina.

The primary monitoring sites currently operating in North Carolina are partly supported by the U. S. Geological Survey, the Agricultural Research Service, National Atmospheric Deposition Program, and EPA/North Carolina State University Acid Precipitation Program. Some limited assessments of effects of acid rain on crops has been done by North Carolina State University under the USDA Air Quality Program. Nationwide more effects studies have been done primarily with EPA and NSF funding.

Current monitoring efforts need to be maintained and the effects studies need to be expanded. The effects are often slow and difficult to recognize and unless the resources are provided for comprehensive monitoring and improved technology to determine the effects, the damage may go undetected until a crisis or irreversible situation occurs.

The problem cannot be solved by ignoring it or saying the federal government and the air pollution laws will handle the problem.

There is a need for some positive action by citizens in North Carolina. Some of those actions we can take include:

- encouraging support for enforcement of strict emission laws
- informing ourselves of the actual situation and what is being done now
- since the problem is getting worse, we can encourage leaders to provide the resources for monitoring and for additional research to document the effects
- intensifying efforts to develop corrective measures to reduce acid precipitation and explore ways to reduce its impacts.

A strong scientific data base is needed to make rational decisions. We cannot control all of our environment that is destructive and manmade. We must, however, become aware of their effects and possible solutions. Our ignorance can be destructive bliss.

* * * * *

A LOOK AT N. C. SEDIMENT CONTROL PROGRAM

As the N. C. sediment control program, now in its ninth year, looks ahead to a second decade, the challenges loom large. Development will continue, and valuable water supplies must be protected from sediment.

A brief look at the state program shows its basic structure, some current concerns, and how local governments can benefit from involvement.

The Sedimentation Pollution Control Act of 1973 established a statewide program for the control of soil erosion and resulting stream sedimentation. The Act is administered by an 11-member Sedimentation Control Commission, appointed by the governor. Work is carried out by the Land Quality Section of the Division of Land Resources in the Department of Natural Resources and Community Development. Staff in seven regional offices statewide plus the Raleigh headquarters are cross-trained in mining, dam safety, and sediment control.

The Commission has exclusive jurisdiction over land-disturbing activities by state, federal, and local governments; by persons having right of eminent domain; and by entities licensed by the state or United States. Agriculture, forestry, and mining activities are excluded from the Act. An erosion-control plan must be submitted for land-disturbing activities of more than one acre.

Local governments have the option of adopting and enforcing their own ordinances upon approval by the Commission. Standards must equal or exceed those of the Commission's model local ordinance, and two or more units of local government may establish a joint program. There are now 36 such programs in the state; areas without local programs come under the jurisdiction of the state.

The Act provides for suitable enforcement procedures and penalties. Since July 1, 1981, $48,000 in penalties have been assessed.

At present a major thrust of the program is education, ranging from efforts aimed at school-age children to those intended to acquaint developers and equipment operators with proper erosion control measures. Funds collected by the Commission for sediment violations have been used to develop teaching materials for eighth-grade earth science classes, including teacher guides and audio-visual shows tailor-made for different areas of the state. In addition, a 30-second television public service announcement was prepared and is being aired.

A pilot program in Raleigh has state erosion control staff and concerned developers working together to convey information and technical guidance to home-builders, equipment dealers, and others in construction, who can in turn spread the word to those in the field. A primary goal is to reach the small developers, who are often not familiar with sediment control requirements.

More local programs would help in this regard, officials feel. The smaller areas of coverage would mean closer supervision of construction activities. Other benefits to local ordinances include the opportunity to tailor a program to local needs and to have more stringent standards than the state program.

ABANDONED MINE LANDS RECLAIMED IN WESTERN N. C.

Over 100 acres of abandoned mine lands in western North Carolina have been reclaimed in a multi-agency project whose leaders include the Tennessee Valley Authority and the N. C. Department of Natural Resources and Community Development. North Carolina officials are hopeful that funds can be found to continue the work, which addresses one of the state's worst water quality problems, sedimentation caused by erosion.

The project sites, located in mountainous Mitchell, Avery, and Yancey Counties, are "orphan mines," that is, land mined and abandoned before passage of the N. C. Mining Act of 1971, which requires operators to restore damaged land. A 1979 TVA survey of the project area revealed 1,500 acres of orphan land, once mined for mica, feldspar, and kaolin. Fine, sandy soil from these barren, sloping sites is easily eroded, contributing tons of sediment annually to area rivers and streams.

Silt damage to aquatic life, loss of reservoir capacity, and clogged or covered water intake pipes in the TVA system prompted that agency's involvement in the first phase of restoration work, a demonstration project. Along with TVA and NRCD, the Region D Council of Governments, the USDA Soil Conservation Service, the local soil and water districts, local mining industries, and conservationists have been instrumental in the project.

The first phase, or demonstration, involved 41 acres and 4 sites, each demonstrating a different degree of reclamation, from minimal to intensive.

During the second phase, recently completed, approximately 80 acres were reclaimed. Reclamation has involved installation of sediment-control measures, grading and site preparation, and revegetation. TVA contributed $100,000 in Congressionally appropriated funds for the project; North Carolina donated $7,500, taken from the N. C. Sedimentation Control Commission's civil penalty fund; the Division of Forest Resources has donated 50,000 white pine seedlings; and mine operators have contributed time and equipment worth $5,000. Private site owners agreed to give the project team access to the sites, to contribute time and materials, and to leave the restored sites undisturbed for at least five years.

State officials are looking into legislative funds to continue the reclamation work. They would like to see state and local sources pick up where the regional project left off. A survey is planned to identify other sites on the 1,500 acres of *orphan land* that are causing adverse water quality impacts.

For more information on these efforts, contact J. D. Simons of the NRCD Division of Land Resources. Phone: (919) 733-4574.

IMPACTS OF SEDIMENT ON STATE WATER SUPPLIES

The impact of man's activities is taking its toll on the state's water supply sources at a time when new sources will be expensive and funds to obtain them limited. John Wray of the N. C. Office of Water Resources outlined the effects of sediment on reservoirs at the September meeting of the Sedimentation Control Commission.

Sediment reduces lake storage capacity for water supply, water quality, hydropower, and flood control. Recreation also is impaired as mud flats and sand bars are formed. Fish populations are affected as spawning areas are covered and food supplies reduced.

The amount of sediment deposited in a lake depends on the shape of the lake, storage, time, and operating procedures. An average of 90 percent of the sediment entering all lakes is trapped. Different reservoirs in the state provide for differing amounts of sediment storage. Falls Lake, for instance, has a sediment pool of 38,000 acre feet; Jordan Lake's is 74,700 acre feet. Sediment storage is not provided in many municipal reservoirs in the Piedmont. Others provide small amounts.

Effective sediment control could extend the life of these reservoirs, which in turn would mean more dollars saved by local governments.

A conference on watershed protection is planned for October 21. (See announcement elsewhere in this newsletter.)

PROCESS FOR RESOLVING WATER RESOURCES MANAGEMENT ISSUES IN THE NC-VA TIDEWATER AREA OUTLINED IN DRAFT REPORT

Three major interstate water resource issues in the Tidewater region present real challenges for water officials to resolve. These issues are (1) the need for a long-range source of water supply for southeastern Virginia; (2) the maintenance of water quality in the Chowan River Basin; (3) and the management of ground water withdrawals from the aquifer underlying both states.

A study funded by the U. S. Water Resources Council investigated these interstate water resource management issues and problems in northeastern North Carolina and southeastern Virginia. A recently completed draft report of that study describes the water resource uses and needs of the Tidewater region, and outlines institutional alternatives with the potential for resolving existing and future water resources conflicts. The report also recommends institutional arrangements or structures that will provide for a permanent and continuous process of water resource conservation, development, and management in the region.

The draft report was distributed for review and comment by Joe Grimsley, Secretary of the Department of Natural Resources and Community Development. The study was initiated through the efforts of the North Carolina-Virginia Water Resource Management Committee and is a cooperative effort between the State of North Carolina, Department of Natural Resources and Community Development, the Commonwealth of Virginia, State Water Control Board, and the United States Water Resources Council.

For additional information regarding the report, contact John Morris or Scott Hall, Office of Water Resources, NC Department of Natural Resources and Community Development, P.O. Box 27687, Raleigh, NC 27611.

JORDAN LAKE WATER QUALITY

The Division of Environmental Management reported to the Environmental Management Commission September 9 on its latest sampling of water quality in Jordan Lake. Eleven stations were examined on July 14 and on August 10, 1982. Numerous water quality measurements were made at each station and samples were collected to be analyzed for conventional chemical water quality parameters, trophic state indicating parameters and numerous metals. Bottom sediments were sampled in July as part of the state's long-term study of sediment/water interactions in the Jordan impoundment.

Jordan Lake is new and is still a dynamic system. It will not stabilize for several years. Data collected at this time indicate present water quality but cannot be used to predict future conditions. The data for the two samplings indicated similar trends in Jordan's water quality. The vegetation inundated by the new impoundment is decaying rapidly. In July, the lake was thermally stratified and bottom waters at most stations were anoxic. In August, many sections of the lake were not stratified. The heavy rains and accompanying winds that have occurred throughout most of this summer have probably increased the mixing in the lake making stratification a temporary phenomena. However, in August, dissolved oxygen concentrations were low throughout the water column. The oxygen required for decomposition of the bottom organic material and dead surface algae appears to be limiting the oxygen resources of the lake. The bottom waters smell strongly of decaying vegetation indicating that this process is dominating lake water quality this first summer.

Nutrient concentrations have been high in the bottom layer of Jordan where the vegetation is decaying. Algal activity has kept surface concentrations of nitrogen and phosphorus low and the data indicate that phosphorus is the nutrient limiting algal growth. Chlorophyll a concentrations are consistently high throughout the lake, exceeding the state's 40 μg/l standard in over 75% of the lake during both July and August. However, there have been no nuisance algal blooms reported on the lake.

The metals analyses have only been completed on the July samples. Twenty-one metals were analyzed for and no metal was found in concentrations warranting concern. Zinc, lead, nickel, copper, chromium, cobalt, and cadmium were below detection limits at all stations. Iron, manganese and magnesium were found in concentrations typical of Piedmont waters.

Coliform bacteria concentrations were extremely low in all areas of the lake. The highest concentrations measured in July and August occurred in the Haw River arm and were considerably below the state's 200/100 ml standard for bathing waters. Coliform numbers were less than 10/100 ml for most of the lake during both sampling runs.

ALBEMARLE SOUND STUDY

On August 24, the Weyerhaeuser Company undertook a dye study of the Albemarle Sound near the company's Plymouth Pulp Mill. The action is part of the company's on-going environmental studies of the impact of its discharge on water quality and aquatic life in the sound. The dye (Rhodamine WT) was used to trace the movement of water from the mouth of the Roanoke River out into the sound and is expected to be helpful in understanding some of the factors which cause algal blooms, which have appeared in the sound in recent years.

Paul Wilms, assistant director of the state Division of Environmental Management, said the dye is not expected to have any adverse effect on the fish or plant life in the Albemarle Sound.

MORE LOCAL INITIATIVE IN WASTE TREATMENT WORKS CONSTRUCTION

In a report to the Environmental Management Commission on September 9, the Division of Environmental Management emphasized the need for greater efficiency and local initiative in the provision of municipal waste treatment works as alternatives to sharp cutbacks in federal funds.

The U.S. Environmental Protection Agency's Construction Grants Program has been one of the most generous categorical funding programs to emerge from the national legislative process. But with the change in the federal administration, this program has been subjected to severe cuts in appropriations. From fiscal years 1975 through 1979 North Carolina enjoyed an average funding level of $80 million per annum. In 1980, Congress acted on a new recision formula which effectively reduced fiscal year 1980 and 1981 funds available to North Carolina by $45.1 million. The state's allocation for projects in fiscal year 1982 is $46.8 million. The impact of the Congressional recisions and reductions on the municipalities of North Carolina has been, and will continue to be, enormous. At the current seventy-five percent Federal funding level, the state had expected to commit funds to approximately 78 publicly owned wastewater treatment facility projects from fiscal year 1980 and 1981 appropriations. With the recisions, this number was reduced to approximately 37. The reduction in appropriations slated for fiscal years 1982 through 1985 bodes corresponding figures. Consequently, North Carolina feels obligated to consider alternate means of distributing the funds available for commitment to this state's eligible communities.

The Federal funding level for Construction Grants projects will remain at seventy-five percent for fiscal year 1982. The 1981 amendments to the Federal Clean Water Act mandate a reduction in this rate to fifty-five percent in fiscal year 1985. The amended Act also authorizes the Governor, with concurrence of the EPA Administrator, to adopt a uniform statewide rate lower than seventy-five percent prior to 1985. North Carolina is considering a modified percentage rate of fifty-five percent Federal funds to be utilized in the commitment of grants for fiscal years 1983 and 1984. A lowered Federal rate for these two years would release state grant money to a larger number of construction projects. By permitting a different mix of available grant funding, most communities would be confronted with an increased local share of ten percent.

The North Carolina Clean Water Bond Act of 1977 (HB 1179) created a fund of $230 million derived from the sale of bonds for the purpose of assisting municipalities and other population concentrations whose wastewater systems ". . . are inadequate, antiquated and, in some instances, nonexistent." A portion of the money was specifically designated for use in conjunction with Federal grants. The maximum grant made under this Act must not exceed twenty-five percent of the total construction costs of any project or fifty percent of the non-Federal share, whichever is less. It follows that if the level of Federal funding for wastewater treatment facilities were reduced to fifty-five percent, the Clean Water Bond Program could contribute another twenty-two and one-half percent rather than the twelve and one-half percent which it now supplies.

Approximately $27,000,000 remains in the State Clean Water Bond Account. Based on seventy-five percent Federal grants for fiscal year 1982 and fifty-five percent for fiscal year 1983, State grant money will be expended by the end of fiscal year 1983. Should the Federal rate be lowered to fifty-five percent, the local share will be twenty-two and one-half percent as long as State grant funds remain. When these are exhausted, the local share will revert to forty-five percent.

At a Federal rate of seventy-five percent for fiscal years 1983 and 1984, twenty-seven projects could be funded. Should this rate be lowered to fifty-five percent, that number would increase to forty. Thus, thirty-three percent of eligible projects would remain unfunded unless there is a reduction of the Federal rate. Carrying these figures forward to fiscal year 1985, a reduction of this rate would increase the number of funded projects from forty-one to sixty-seven over the three-year period, a difference of twenty-six projects. Should the rate not be lowered, thirty-nine percent of eligible projects would remain unfunded.

A reduction in the Federal rate would effect benefits concomitant to increasing the number of projects funded. The number of capital intensive projects would probably drop. Experience has shown that it is quite possible to design more efficient wastewater treatment systems and reduce costs. The state goal is to attain water quality standards. This goal can be achieved with more cost-effective designs than in the past. Increased local responsibility could provide incentives to this end. Alternatives to grants and bond issues are largely unexplored in an atmosphere of Federal assistance. Local communities need to be encouraged to assume greater responsibility for their water quality needs.

NEW STUDY TO EVALUATE STATE PROGRAMS FOR FLOOD HAZARD MITIGATION

A new research effort undertaken by University of North Carolina scientists is designed to contribute to improved state flood hazard mitigation programs by (1) providing a systematic assessment of the effectiveness of hazard mitigation measures and procedures currently being used by state governments; and (2) developing guidelines which can be used to help formulate effective mitigation strategies and programs in the future.

Specific products emerging from the study will include: (1) a comprehensive description and assessment of state flood hazard mitigation programs, including a taxonomy of state practices, matrices describing organizational arrangements, programs, and their interrelationships, and output and impact measurements; (2) guidelines for use in choosing among state flood hazard mitigation alternatives; and (3) a set of specific policy recommendations for implementation by the states and federal government.

Research methods employed in this study include formulation of an evaluation model for assessing and explaining flood hazard mitigation program effectiveness, original data collection from fifty state governments using a combination of telephone and mail survey techniques, examination of government documents, and the conduct of four in-depth case studies of particularly effective state programs.

Researchers involved in the study are Raymond J. Burby, David R. Godschalk, and Edward J. Kaiser, Center for Urban and Regional Studies, UNC-CH; and Beverly A. Cigler, Department of Political Science and Public Administration, NCSU.

FLEXIBLE WASTELOAD ALLOCATIONS IN WISCONSIN

The State of Wisconsin is one of the first states to design and implement greater flexibility in wasteload allocations, both in law and in practice. This innovative permitting technique is taking place along the lower Fox River, which flows northward some forty miles from Lake Winnebago toward the City of Green Bay, where it empties into Lake Michigan. The Fox River is a water quality limited receiving stream into which eighteen paper mills currently discharge more than 49,000 pounds per day of biochemical oxygen demand (BOD_5) and eight municipalities discharge another 12,000 pounds per day of BOD_5. Second round NPDES permits for the paper mills and for the larger municipalities are being written as variable permits, in which the allowable wasteload can vary on a daily basis between May 1 and October 31, based on daily flow and temperature conditions in the river.

Each permit has variable limits established for that particular facility. The idea for allowing continual load transfers between plants (a multiplant bubble) was considered but rejected because of enforceability problems. However, permits can be modified to transfer wasteload allocations where there is a new or increased production. For example, one interplant transfer of wasteload allocation has been approved between a paper mill and a Publicly Owned Treatment Works (POTW) in which the mill plans to eliminate its discharge and send its waste to the POTW. In return, the POTW will get credit for the mill's wasteload allocation. Another interplant transfer is currently being negotiated between two large paper mills.

Because of the limited wasteload assimilative capacity in Fox River, the proposed categorical BPT effluent limits for the paper mills are as much as three times greater than the assimilative capacity of the river during the critical 7-day, 10-year low flow condition (G_{7-10}). However, under the variable permit format, paper mills are allowed to discharge up to the BPT categorical limit during the months of November through April when the assimilative capacity of the river is greater. From May 1 to October 31, each industrial discharger will be able to enter his own flow versus water temperature table that has been prepared as a result of the water quality modeling effort in order to determine his daily discharge limitation in pounds per day, of BOD_5. An industry group called the Fox River Dischargers Association has been certified by the state for self-monitoring. The Association will take daily readings and notify each member where to enter his individual table. In turn, each discharger must record the appropriate data and corresponding discharge limitation on his monthly report form.

The Wisconsin wasteload allocation program is a step toward developing rational, cost-effective effluent limitations which meet the multiple objectives of (1) providing improvement in water quality to acceptable levels for beneficial use, (2) resource conservation, and (3) preservation of the state's industrial base. Mr. Paul P. Didier, Chief of the Industrial Wastewater Section in the Department of Natural Resources acknowledges that their system may not be perfect, but it is a step in the right direction. He expects that the results will be reviewed closely for five years or so to determine the impact of the program and to make changes, if needed. The significance of Wisconsin's water quality management program is that new techniques are being implemented, based on sound engineering and scientific evidence, in an effort to provide economic and institutional incentives for water quality improvement along a relatively short section of the Fox River having a large number of dischargers.

Inquiries concerning the water quality management program in Wisconsin should be addressed to:

Mr. Michael D. Witt, Assistant Chief
Industrial Wastewater Section
Department of Natural Resources
101 S. Webster Street, GEF II
Box 7921
Madison, WI 53707
(608) 266-1494

...*Guide to Guidelines, EPA, 8/82*

EPA COMPUTER SYSTEM PREDICTS POLLUTANT BEHAVIOR IN LAKES AND STREAMS

A computerized system for predicting the behavior of synthetic organic chemicals in the aquatic environment is presented in a user's manual published recently by the U. S. Environmental Protection Agency's Environmental Research Laboratory in Athens, GA. The manual is entitled "Exposure Analysis Modeling System (EXAMS): User Manual and System Documentation."

EXAMS was developed by Dr. Lawrence A. Burns, Mr. David M. Cline, and Dr. Ray R. Lassiter of the Laboratory staff to provide EPA and other users with a tool for rapidly screening organic chemicals and evaluating their behavior after entry into natural waters as a result of the manufacture, use, and disposal of commercial products.

EXAMS was conceived as an aid to those who must execute hazard evaluations solely from laboratory descriptions of the chemistry of a newly synthesized toxic compound, according to Dr. Burns. The model estimates exposure, fate, and persistence following a chemical's release into an aquatic ecosystem.

Because EXAMS requires no chemical monitoring data, it can be used for new chemicals not yet introduced into commerce as well as for those whose record of use is known. Model predictions are based on measured properties of chemicals and on the relevant physical-chemical characteristics of the affected environment.

EXAMS is an interactive program in which simple commands by the user direct the system to select descriptions of appropriate chemical properties and characteristics of a water body. The model then computes the ultimate expected environmental concentrations resulting from a specified pattern of pollutant loadings, the distribution of the chemical in the system and the fraction of the loading consumed by each transport and transformation process, as well as the time required for effective purification of the system should the pollution loading cease.

The user manual (EPA-600/3-82-023) is available from the Center for Environmental Research Information, USEPA, Cincinnati, OH 45268.

The Athens Environmental Research Laboratory is one of 14 laboratories of EPA's Office of Research and Development. The Laboratory conducts research on the behavior of chemical contaminants in freshwater systems.

CONFERENCE ON SAFE DRINKING WATER THROUGH WATERSHED MANAGEMENT, OCTOBER 21

Estimates are that over 90 percent of the nation's watersheds are at least moderately polluted. Chances are that the water you drink contains at least traces of suspect chemicals which may eventually be hazardous to your health. To make matters worse, recent national surveys of water systems and local governments reveal that the vast majority of water supplies are not adequately protected from pollution.

Possible approaches for protecting drinking water supplies through watershed management will be the topic of the Twelfth Annual Meeting of the North Carolina Land Use Congress. The conference will begin at 9:00 a.m. on October 21, 1982, at the Jane S. McKimmon Center at North Carolina State University in Raleigh.

The keynote speech will be given by Dr. Daniel Okun, Kenan Professor, Environmental Sciences and Engineering, the University of North Carolina at Chapel Hill. He will discuss source protection issues in the United States. Okun has worked throughout the U.S. on source protection and is considered a leading expert in the field.

John Clark, Senior Associate of the Washington, D.C. based Conservation Foundation, Inc. will present a luncheon address on, "Safe Drinking Water? A National Perspective." Clark is currently writing a book on water supply problems and state initiatives to provide safe drinking water.

Robert Grady of the Portland Water District, Portland, Maine and William Norris of Albemarle County, Virginia will explain how their communities have successfully adopted watershed management plans to protect their drinking water.

The primary goals of the conference are to: (1) explore the need to manage water supply watersheds; (2) provide a synthesis and assessment of current thought and practice regarding water supply watershed protection approaches, measures, and strategies in the United States; and (3) examine specific land use management approaches that have proven effective in protecting drinking water supplies.

Speakers at the conference will address three main topics. First, actual problems with contaminated water supplies that have occurred both in North Carolina and throughout the United States will be discussed. Second, there will be an assessment of the state-of-the-art of water supply watershed planning and land use management. Third, methods for protecting drinking water supplies that are also effective in overcoming economic, legal, technical, and political constraints to watershed management will be evaluated.

Two recent publications that provide extensive background on watershed management have been prepared for the conference. They are <u>Protecting Drinking Water Supplies Through Watershed Management: A Guidebook for Devising Local Programs</u> (285 pages) and <u>Protecting Drinking Water Supplies Through Watershed Management: A Casebook for Devising Local Programs</u> (376 pages). A charge of $25 is being made for these materials and they may be ordered when registering.

Co-sponsors of the conference include: North Carolina League of Municipalities; American Water Works Association, NC Section; American Planning Association, NC Chapter; Office of Water Resources, DNRCD; Marine Chemurgics, Research and Development; Center for Urban and Regional Studies, UNC-CH; and the Water Resources Research Institute, UNC.

For a brochure and program details on the conference, write to Dr. Raymond J. Burby, Center for Urban and Regional Studies, 108 Battle Lane, Chapel Hill, NC 27514.

...*Land Use Update*

WATER QUALITY MODELING SHORT COURSE

A short course on Water Quality Modeling will be held in Las Vegas, Nevada, January 10-14, 1983. The objectives of this course are to define the need and justification for water quality criteria, to establish the constraints imposed by current regulations, to present the fundamentals of modeling techniques and to demonstrate their applicability to the rational solution of water quality management. The course is designed to aid managers, technicians, regulatory personnel and others who are intimately involved in the decision-making process regarding water quality control. Upon completion of the course, participants will understand the principles of modeling techniques, their limitations and their application to chemical, biological and physical processes. Principal lecturers will include, W. W. Eckenfelder, P.J. St. John, D. Porcella, G. T. Orlob, K. L. Dickson, and P.A. Krenkel. For further information contact Water Resources Center, Desert Research Institute, P.O. Box 60220, Reno, NV 89506; phone (702)673-7361.

WATER RESOURCES CONDITIONS IN NORTH CAROLINA

Streamflow was excessive (in the upper 25 percent of record) in the central Coastal Plain and near normal over the remainder of the state. Very heavy, locally intense rains on the 11th and 12th of August, with unofficial totals of 7 inches reported, caused urban flooding in Goldsboro. Flooding was generally confined to the smaller streams with bankfull stages on the major rivers. However, a new maximum daily flow for the month occurred at the Contentnea Creek near Hookerton index station on the 15th.

Shallow ground-water levels rose slightly in the Mountains and fell over the remainder of the State. Water levels remain 1 to 2½ feet above long-term averages for the month and 2 to 4 feet higher than levels of a year ago.

...U. S. Geological Survey

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.)

Water Resources Planning

"Further Studies of a Cache Valley Residence Having a Groundwater Heat Pump," (UWRL/H-82/01), 4/82, by M. L. Henrie, Utah Water Research Lab., Utah State U., Logan, UT 84322. (W&E)

"The Feasibility and Benefits of Reclaiming a Man-Made Lake: A Case Study of Lake Paradise, Mattoon, Illinois," (#170), 7/82, by G. E. Stout, et al, IL WRC, U. of IL at Urbana-Champaign, 2535 Hydrosystems Lab., Urbana, IL 61801. (02H)

"A Financial Assessment of Virginia's Outdoor Recreation Planning," (#136), 8/82, by L. Shabman, et al, WRRC, VPI&SU, 617 N. Main St., Blacksburg, VA 24060. (06B)

"Some Variations in Distribution of Fishes in Large Mainstream Reservoirs Associated with Artificial Cover," (#135), 7/82, by D. W. Johnson, WRRI, U. of KY, Lexington, KY 40506. (08I)

Water Quality Management

"Administrative Coordination in the Implementation of Agricultural Nonpoint Pollution Controls," (#171), 8/82, by J. B. Braden, et al, IL WRC, U. of IL at Urbana-Champaign, 2535 Hydrosystems Lab., Urbana, IL 61801. (05B Agr. Nonpoint Source Controls)

"^{228}Ra, ^{226}Ra and ^{222}Rn in South Carolina Ground Water: Measurement Techniques and Isotope Relationships," (#95), 1/82, by J. Michel, et al, WRRI, Clemson U., Clemson, SC 29631. (02F Groundwater Quality)

"Stabilization Characteristics of Deposits of Biologic Solids Generated in Aerated Lagoons," (#92), 3/81, by L. G. Rich, WRRI, Clemson U., Clemson, SC 20631. (05D)

"Influence of Chlorination and the Distribution System on Mutagens in a Potable Water Supply," (#168), 3/82, by R. R. Clark, et al, IL WRC, U. of IL at Urbana-Champaign, 2535 Hydrosystems Lab., Urbana, IL 61801. (05F)

"The Occurrence of Trihalomethane Compounds in Salt Lake City and Ogden, Utah, Drinking Water Supplies," 12/81, by T. Peters, et al, Utah Water Research Lab., Utah State U., Logan, UT 84322. (05F)

Water Quantity Management

"Ground Water Quality and Quantity in Fracture Zones in the Piedmont of Northwestern South Carolina," (#93), 8/81, by D. S. Snipes, WRRI, Clemson U., Clemson, SC 29631. (02F Groundwater)

"Agricultural Irrigation Technology Transfer Assessment," 2/82, by C. A. Marro, et al, Inst. for Research on Land and Water Resources, PA State U., U. Park, PA 16802. (03F Irrigation)

Miscellaneous

"Aquatic and Wetland Plants of Florida," 1979, by D. P. Tarver, et al, Bu. of Aquatic Plant Research & Control, FL Dept. of Natural Resources, Tallahassee, FL 32301 (02I)

"An Economic Evaluation of Citizen Suits," (#94), 8/81, by H. H. Macaulay, et al, WRRI, Clemson U., Clemson, SC 29631. (06)

"The Tennessee Valley Authority's Cooperative Noncoal Minerals Abandoned Mine Land Reclamation Demonstration Project Avery, Mitchell, and Yancey Counties, North Carolina," 8/81, by J. A. Muncy, Land Reclamation/SCOAP Program, Div. of Land & Forest Resources, TVA, Norris, TN 37828. (05B)

"Proceedings of the Governor's Conference on Retention of Prime and Important Farm and Forest Land," 12/81, limited supply avail. from: Kim Stevens, Soil Science Dept., 4234 Williams Hall, NCSU, Raleigh, NC 27650; phone: 919-737-3922. (06 Land Use)

ITEMS OF INTEREST:

WATER RESOURCES RESEARCH INSTITUTE
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