NEWS

WATER RESOURCES RESEARCH INSTITUTE

OF THE UNIVERSITY OF NORTH CAROLINA

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CONTENTS

WATER SAVINGS AND SUPPLY CONFERENCE SCHEDULED

The Institute is co-sponsoring the North Carolina Conference on Water Savings and Water Supply Assistance on November 18 at North Carolina State University.

The one-day conference is designed to explain water supply assistance programs available to publicly owned water systems and to review the benefits of water savings by presenting local examples. It is meant specifically for local officials, water supply managers, utility directors, consulting engineers and water system operators.

Also sponsoring the conference are the Office of Water Resources-DNRCD, the Agricultural Extension Service, the Environmental Health Section of the Division of Health Services-DHR, the League of Municipalities, the County Commissioners Association and the Rural Water Association.

The Conference agenda is printed on the front page of this newsletter. Attendance is limited, and pre-registration is required. Registration fee is $15. To register, send name, title, organization name and address and registration fee to: Water Resources Research Institute of The University of North Carolina, 124 Riddick Building, N. C. State University, Raleigh, NC 27650.

GROUND WATER MANAGEMENT

On January 30-31, 1980, key representatives of the eight Southeastern states met in Birmingham, Alabama, to discuss ground water problems and consider corrective actions. The conference was the fourth of a series directed toward major water resource problems of Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia.

The conference summary report, prepared by Professor Emeritus David H. Howells, has been published by the UNC Water Resources Research Institute as No. 2, Vol. 2, of Southeast Water Resources. An important part of this report is its summarization of state ground water management programs and related conclusions and recommendations. These are presented below:

Conclusions

1. Ground water utilization as a source of municipal water supply varies from marked underutilization in some areas to overutilization in others.

2. There are insufficient data on ground water yields, aquifer boundaries, location of recharge areas, water level trends, salt water-fresh-water interfaces, ground water quality, and water use.

The problem is particularly severe in the Piedmont and Mountain provinces.

3. Well systems are often poorly designed and operated. Persons involved in the design, construction, and regulation of well systems often lack sufficient understanding of ground water hydrology and well hydraulics to make effective use of the resource. This deficiency can be traced to a lack of needed course work in universities and underutilization of trained hydrogeologists in the design and management of ground water systems.

4. The traditional separation of ground and surface water programs in state law and government institutions and emphasis on the surface water have resulted in an imbalance in information concerning the two resources and lack of attention to ground water resource and interrelationships with surface water in water resource planning and management.

5. Some state ground water programs do not appear to enjoy the status and funding needed for the proper management of this important resource.

6. Knowledge of ground water quality and related institutional means for management are rudimentary relative to surface water. The implications of this deficiency are particularly serious with respect to the control of contamination from hazardous substances.

7. State regulation of well construction, reporting by drillers, sealing on abandonment, and waste discharge to ground waters is spotty.

8. Ground water data management by state agencies is still relatively primitive, and Virginia is the only state reporting an operational automated data management system.

9. Major regional centers of overpumping with extensive water level declines are reported by all coastal states in the Southeast.

10. Overpumping of coastal limestone aquifers has been associated with collapse or subsidence of overlying land surfaces at a number of locations in the Southeast, particularly in Florida.

Recommendations

1. A general strengthening of state ground water programs to bring them into balance with surface water programs.

2. The full integration of ground water and surface water planning in state agency programs and encouragement of conjunctive planning and management.

3. Immediate attention to the design and implementation of automated data systems in state government to make full use of existing data.

4. Review university curricula in engineering and geology to assure sufficient instruction in ground water hydrology and well hydraulics.

5. Increase opportunities in continuing education for upgrading of skills in ground water hydrology and well hydraulics.

6. Development and implementation of comprehensive state ground water management plans and programs with particular attention to hazardous substances.

7. Sustained efforts on the part of state government to cope with regional overdraft problems and increased emphasis on preventive planning and management.

8. Adoption and implementation of regulatory and reporting programs needed to assure proper well construction, withdrawals, discharge of wastes to ground water, needed reporting, and sealing on abandonment, where these do not exist and strengthened enforcement where they have been adopted.

9. Research on:

   (a) Hydrogeology of aquifer systems
   (b) Ground water-surface water relationships, including water quality implications
   (c) Aquifer discharge and recharge
   (d) Operational digital models for ground water management
   (e) Principles of well field location, design, and operation
   (f) Improved ground water recovery, well design, and construction
   (g) Automated data management systems to facilitate overall water resource planning and management
   (h) Impact of waste disposal and/or utilization on various aquifer systems, with particular emphasis on leachate transport in the ground water.

A limited number of copies of the summary report, "Ground Water Management in the Southeast," is available from each of the Water Resources Research Institutes in the South Atlantic-Gulf Region.

GROUNDWATER POLLUTION STUDIED Studies conducted recently by the Environmental Protection Agency confirm that groundwater pollution can be caused by surface impoundments. These liquid waste impoundments are designed to store, treat, or dispose of liquid waste. The Environmental Protection Agency has estimated that 118 billion gallons of liquid waste are discharged into the nation's groundwater annually from surface impoundments.

The North Carolina Department of Natural Resources and Community Development was granted $115,200 by the Environmental Protection Agency to inventory liquid waste impoundments in the state and to assess their potential for groundwater pollution. The study, called the Surface Impoundment Assessment Project, was conducted by the Office of Water Resources and was completed in June. The project provides information to be used by the Environmental Protection Agency in evaluating the potential national impact of surface impoundments on groundwater.

Six hundred and eight-three North Carolina waste impoundment sites have been assessed for their groundwater pollution potential. Hydrogeologic data and impoundment waste characteristics were evaluated for each site to determine a rating of the sites' potential for groundwater contamination. The ratings will be used by the state to determine study priorities for other environmental programs mandated by federal legislation.

For more information call: Carl Bailey, North Carolina Department of Natural Resources and Community Development, Office of Water Resources, in Raleigh at (919) 733-7260.

GROUNDWATER LEVELS DECLINE IN EASTERN NORTH CAROLINA COUNTIES

Groundwater levels are declining at a rate of about two feet per year in seven eastern North Carolina counties.

Those are the findings of a recently completed three-year evaluation of groundwater supplies in Lenoir, Jones, Pitt, Greene, Duplin, Craven and Onslow counties.

State groundwater hydrologists with the North Carolina Department of Natural Resources and Community Development Office of Water Resources initiated the $128,000 study in 1977 through a Coastal Plains Regional Commission grant to determine the long-range impacts of increased groundwater use.

Although there is no problem of an immediate shortage, communities will have to plan to avoid long-range problems, according to state hydrologist Jim Narkunas, who headed the study. The study indicates water levels have declined significantly due to large-scale municipal and industrial withdrawals.

The Coastal Plain relies upon groundwater as a major source of water for industrial, municipal and domestic use. Groundwater withdrawal rates at Kinston, the major water user in the central Coastal Plain, have increased by more than 40 percent in the last 10 years. New Bern has increased its withdrawals at Cove City by 50 percent since 1971. Jacksonville water use has increased by 25 percent since 1976 and Greenville by 40 percent since 1970. The entire region can expect water use to increase by almost 60 percent during the period 1980 to 2000.

Several recommendations appear in the study. One is that groundwater use and its effects be more clearly monitored. Another is to locate new wells where there will be minimal effects on existing wells. The study also recommends establishing water conservation and recycling programs as a means of alleviating severe groundwater fluctuations.

Additional information is available from Perry Nelson, Department of Natural Resources and Community Development, Office of Water Resources, P. O. Box 27687, Raleigh, NC 27611 (919) 733-7260.

ACID RAIN DAMAGE, PRESENT AND FUTURE

Yearly losses from acid rain are presently estimated at $5 billion, and that is only part of the picture. Harder to estimate are the costs that must be paid by future generations for damage taking place now.

A variety of such figures and facts were presented by scientists and economists as they testified at a September 23 Senate hearing. The joint hearing of the Senate Environment and Public Works Committee and the Small Business Committee was held to examine the economic effects of acid rain. The question of acid rain will be a major issue in the coming year when the Clean Air Act comes before Congress for reauthorization.

Economist Thomas D. Crocker of the University of Wyoming told the committees that the present annual $5 billion losses include damage to forests, crops, aquatic ecosystems and water supply systems. Economic estimates, however, fail to capture the severity of the issue. Ultimate economic losses could be much larger, he said.

Dr. Orie L. Loucks, Science Director of the Institute of Ecology in Indianapolis, said that of special importance are the irreversible damages caused by acid rain--"economic effects produced by one generation, but which are borne as a cost by the next generation." These include long-term decreases in forest productivity, loss of nutrient stock in shallow or sandy forest soils and chemical alterations in groundwater. Loucks added that an important issue to be addressed concerns the synergistic effects of oxidant and acidic deposition. Both are produced by combustion of fossil fuels. The oxidants act to weaken crops and forests, making them more sensitive to acidity.

Senator Gaylord Nelson (D-Wisconsin) said he plans to introduct legislation amending the Clean Air Act in 1981 to control acid rain.

BILL WOULD EXTEND DRINKING WATER COMPLIANCE DEADLINE

A bill was approved by the U. S. House of Representatives on September 23 that would allow states to give drinking water systems additional time to meet EPA interim drinking water standards. The bill would extend for three years, until January 1, 1984, the states' authority under the Safe Drinking Water Act to grant exemptions to public and private systems that do not meet the standards. EPA estimates show that a number of the smaller systems will not be able to achieve compliance by the current deadlines (January 1, 1981, for individual systems; January 1, 1984, for regional systems). The intent of the bill is to give these systems time to meet the standards, thus ensuring compliance, according to Rep. Henry A. Waxman (D-Calif.) who introduced the legislation.

EPA DROPS COOLING TOWER REQUIREMENT AT BRUNSWICK

According to Carolina Power and Light Co. officials, EPA will accept modifications in the place of cooling towers at its Brunswick nuclear plant.

Under the agreement with the Environmental Protection Agency, CP&L will modify the plant's cooling water-intake system to minimize the flow of water through the plant and the amount of aquatic life entering the system.

The modifications will cost about $9 million a year over the next 18 years compared to $40 million annually for cooling towers.

North Carolina officials had issued a draft permit to the facility, which required several of the modifications now agreed to by EPA.

Under terms of the agreement with EPA, CP&L will construct a diversion screen at the mouth of the canal leading from the Cape Fear River to the plant, reduce the flow of water through the plant by as much as 25 percent in the summer and 45 percent in the winter and install mesh screens on one-half of the intake structures.

CP&L will continue its biological monitoring program as part of the agreement with EPA.

HUISINGH HEADS STATE TOXIC SUBSTANCE MANAGEMENT PLAN

Dr. Don Huisingh has taken a leave of absence from NCSU as project leader for an EPA-funded grant filed by the State of North Carolina under Dr. Quentin Lindsey's Office for Scientific Affairs. The project title is "The Identification, Assessment, and Control of Toxic Substances in North Carolina," which will require Huisingh to work with State and local governments and research to develop a comprehensive toxic substance management plan.

FILM ON WETLANDS ROLE IN MANAGEMENT OF WASTEWATER

A new 16 mm film describing the use of wetlands as an alternative to conventional methods for advanced treatment of wastewater is available on loan from Modern Talking Pictures, Inc., 1901 L Street, NW, Washington, DC 20036, Telephone 202/293-1222. The film describes much of the NSF-supported research on the use of wetlands for treating wastewater.

SWCC SEEKS NONPOINT SOURCE MANAGEMENT DESIGNATION

The North Carolina Soil and Water Conservation Commission voted in its last meeting to seek official designation by the Governor as the management agency to implement the agricultural element of the statewide Water Quality Management or 208 Plan. Such designation would give the Commission authority to implement the non-regulatory control program for nonpoint source pollutants, recommended in the plan.

GUILFORD COLLEGE FACILITY USES SOLAR ENERGY HOT WATER NETWORK

A new Guilford College complex is designed to be heated with a solar energy hot water network that recovers waste heat and uses the earth for heat storage.

According to Jim Newlin, Guilford's business manager, the most spectacular feature of the new facility is its heating and cooling system. Panels that collect heat from the sun will be installed on the south side of the existing gym to heat water for showers, lavatories, laundry, and an indoor swimming pool in the field house.

Treated coil units, through which hot water flows, will reclaim waste heat from all over the complex and send it to unheated areas or to underground storage. The water flow in the coils can be reversed for cooling in summer, but the process is most efficient in heating.

Most significant about the system is an "earth heat sink," which alleviates the storage problem common to solar heating installations.

The earth sink works this way: Excess heat, in the form of warm water, passes slowly into the ground through a medium of crushed rock and plastic spread beneath the insulated concrete floor. The earth, normally about 58 to 60 degrees Fahrenheit, absorbs and stores the water's heat, which gradually reaches 100 degrees F., Newlin said. The cool water circulates back through the system to collect more excess heat.

"It's a very slow process," he explained. "We're talking about 30 days to warm the earth up. Heat will penetrate into the earth about 40 feet. We'll lose some, of course, because the earth has no boundaries."

Unlike the conventional concrete heat storage tank that's built underground, the earth sink will not require a furnace or other backup heating system, said Newlin.

If the earth's temperature drops below normal for operating, a large heat pump will heat water and push energy underground. The heat pump will run only during off-hours.

STATE PROGRAM AIDS WATER-SHORT COMMUNITIES

North Carolina communities facing water supply problems can receive technical assistance from a newly consolidated Department of Natural Resources and Community Development Program.

"The Water Supply Assistance Program aids local governments and their consulting agencies with water quantity problems by assisting them in gathering hydrologic data, providing information on regulatory processes, and identifying possible problems and conflicting demands on limited resources," according to Allan Dietemann, director of the program. Dietemann added, "The program provides information and advice to water users on water conservation methods, expanding existing facilities, water supply planning, and state and federal funding assistance."

"Department staff developed the concept of a small program devoted exclusively to assist communities, industries, and their consultants, with certain key aspects in developing and conserving their water supplies," said John Wray, Chief of Water Planning and Development. According to Wray, for many years water supply assistance requests from communities and industries were handled on an ad hoc basis, with special assistance provided by specialists having primary interests in other areas. The Administration supported the General Assembly funding of two positions to spearhead this effort.

The Water Supply Assistance Program staff, along with Department of Human Resources personnel, will work with local officials, administrators, and consulting engineers on a request basis. The staff is presently evaluating water systems in Robersonville, Ossipee, Cameron, Autryville and Wallace.

The new program is non-regulatory. Technical assistance provided by the Water Supply Assistance Program will be used by towns or communities as they desire.

Any town or community interested in receiving assistance on a water supply problem should contact Allan Dietemann, Department of Natural Resources and Community Development, Office of Water Resources, P. O. Box 27687, Raleigh, NC 27611, (919) 733-7856.

LOANS FOR SMALL HYDROELECTRIC FEASIBILITY STUDIES

The Department of Energy Small Hydroelectric Loan Program provides loans for up to 90 percent of the costs of feasibility studies and licensing activities for small hydroelectric projects. This program has proven to be very popular as evidenced by the 160 applications received for loans. Loans are being made routinely to qualified applicants. North Carolina now has the second largest member of applications for loans with 15.

The recent Energy Security Act has provided for the changes to the loan program. The range of sizes of qualifying facilities has been increased from

100kW-15,000kW to 100kW-30,000kW. This provision is being implemented and applications for the extended range are presently being accepted. The second provision is to include sites which use "natural water features" for hydroelectric generation in addition to those covered in the past at sites with existing dams. Modifications of the Rules and Regulations are now being made to allow implementation of this provision.

The Energy Security Act extended authorization for appropriations for the existing loan program to 1982 and appropriated funds will remain available until expended. Municipalities, electric cooperatives, public and private utilities, irrigation districts, individuals and others who have access to a site with hydroelectric potential are encouraged to apply for a loan to assist in financing a feasibility study. Those who have been pursuing the development of a site and have had a favorable feasibility study performed are encouraged to apply for a loan to assist in the financing of license and permit activities.

Applications should be made to the appropriate DOE Regional Office. The individuals and phone numbers for Region 4 are: Bill Rankin and Jim Grissom, U. S. Department of Energy, 1655 Peachtree St., NE, 8th Floor, Atlanta, GA 30367 (404) 881-2389.

LAND-OF-SKY 208 PROGRAM GEARED TOWARD IMPLEMENTATION

The Land-of-Sky Regional Council's 208 current planning program has been geared toward implementation of solutions to the highest priority problems identified in the water quality management planning process. The most widespread water pollution problems identified were sedimentation and coliform bacteria.

The sedimentation problem is being addressed through a construction notification system implemented by Buncombe County, an agricultural BMP demonstration watershed program, and a Streambank Stabilization testing program.

The Agricultural Best Management Practice demonstration program has incorporated aid from established agricultural agencies in the region. The program will encourage the producers within the watershed to install Best Management Practices on a voluntary basis. The utilization of BMP's will have a beneficial effect on water quality, while saving the producer valuable topsoil, and act as a demonstration site for other farmers.

The Streambank Stabilization Project has conducted species evaluation trials at three sites and has established vegetative buffer strips at fifteen other sites. The program has also been testing a low-cost method of streamflow control. This method involves the placement of treetops into the channel along the banks to help control streamflow which is severely eroding the streambanks.

There are two types of sources of contamination (as indicated by fecal coliform bacteria) which are thought to be of significance in Region B from the standpoint of human health and the national goal of "fishable and swimmable" streams. These are: (1) raw sewage leaking from or bypassed by central sewerage systems; and (2) contamination of domestic wastewater from failing septic systems or "straight pipes."

Buncombe County is the primary example in the region of stream pollution resulting from treatment system bypasses and leaking sewers. The county is primarily sewered and the system is in very poor condition. Excessive inflow and infiltration into the system causes sewage to leak from broken pipes and damaged manholes eventually finding the way into nearby streams. In the event of a heavy rain, the treatment plant cannot accommodate the excess wastewater and inadequately treated waste is bypassed into the French Broad River. Under the direction of the 208 project, a task force, composed of local system owners, has been meeting to resolve the complex legal and financial arrangement associated with rehabilitating the collector system. This project is also part of EPA's Financial Management Assistance Program (FMAP).

This program was one of only ten FMAP projects in the country because it was seen as a prototype project. As a result, Project Director Bob Purcell and Bill Mull, task force chairman and Engineer Manager of the Metropolitan Sewerage District, were both speakers on the program at the 1980 National Water Quality Management Conference. In addition, the project was one of four featured in the September 29th issue of County News (published by the National Association of Counties), and will also appear in the upcoming EPA publication.

Failing on-site wastewater systems (primarily septic system drainfields and "straight pipes") are being addressed by the 208 program's alternative treatment systems project. Under this project, the 208 staff has been providing the technical assistance to the sanitarians of the four county health departments in Region B. The technical assistance has helped solve some wastewater problems at sites which posed soil drainage problems for the conventional-septic system and subsurface absorption field. It is also establishing demonstration sites for "alternative" systems which can correct some of these problems. The problem is most pronounced in Madison County where there are up to 1000 systems that are failing, inadequately installed, or "straight-piped" into streams. The problem is widespread within the county and affects dozens of streams. An attempt is being made to get a 201 facilities grant for alternative systems to take care of the problem.

The Council's 208 program has continued its program for public information and public input. There have been numerous meetings of the 208 "policy" committee and its subcommittee and task forces. New methods of gaining effective citizen input have been explored. The Council has reached large and diverse groups with exhibits and the annual Mountain Living Show at the Asheville Civic Center and with French Broad River Week. The purpose of the French Broad River Week was to encourage people to protect as well as enjoy one of their valuable resources.

The Land-of-Sky Regional Council's 208 program is addressing the region's most pressing water quality problems and the necessary management arrangements to ensure effective solutions. The cooperation of area agricultural agencies and county health departments has proven invaluable to the progress of the program to date.

. . . Chris Kelly
Water Quality Management Planner

NEW INSTITUTE REPORTS Three Institute research completion reports were published recently and are now available free of charge to North Carolina residents and at $8 per copy for out-of-state residents.

Effects of Agricultural Land Development on Drainage Waters in the North Carolina Tidewater Region relates the findings of a three-year study by N. C. State University scientists Dr. R. W. Skaggs of the Department of Biological and Agricultural Engineering, Dr. J. W. Gilliam of the Department of Soil Science and Dr. T. J. Sheets of the Department of Entomology.

Numerous questions have been raised about the effects on the environment of massive land changes by corporate farms in eastern North Carolina. Development of this swampy, high-organic soil in the Tidewater Region (called the Blacklands) requires drainage, and specific questions have focused on the effects of this drainage and development on the hydrology and water quality of drainage waters leaving the area. Concern was expressed over possible damage to the nearby Pamlico and Albemarle estuaries from sediments, nutrients and pesticides, and about changes in runoff rates and water table depths.

To determine the effects of the drainage and development, the researchers measured the quality and quantity of drainage waters from six sites (three developed, three undeveloped) on First Colony Farms, which is located in Washington, Tyrrell, Dare and Hyde Counties. Research results showed that peak runoff rates occur earlier and are three to four times higher on developed than on similar undeveloped lands. However, because of limited capacity of current canals, there may be little difference between runoff from developed and undeveloped lands during the largest runoff events. The research also showed a small but significant increase in inorganic nitrogen outflow from the developed organic-rich soils. Phosphorous loss, however, was greater from developed organic soils than from undeveloped organic or developed mineral soils. Agricultural development results in a small increase in sediment load of drainage waters, and turbidity also increases, particularly during the developmental phase, the study showed. Dissolved oxygen, biochemical oxygen demand, temperature, pH and other water quality parameters are measurably affected by development, but the changes are relatively small.

One potential water quality problem, the report states, is the movement of fecal organisms from grazed pastures into drainage waters. A significant increase in the loss of fecal and total coliform bacteria was observed from the pasture site. Pesticide studies showed that movement of the pesticide alachlor in surface runoff does not appear to be a major route of water contamination.

Complete details of the research are included in the report, No. 159.

Characterization and Land Application of Seafood Industry Wastewaters, by Dr. Michael R. Overcash and Dr. Dhiraj Pal of the N. C. State University Department of Biological and Agricultural Engineering, is the third in a series of reports on land treatment of industrial wastewater (previous research was on textile and petroleum wastes). This report illustrates the land treatment alternative for four segments of the seafood processing industry: shrimp, crab, tuna and oysters. In the study, bulk volume and composition of waste from processing facilities were characterized for average-size plants. Substantial levels of nitrogen, phosphorous, calcium and other nutrients were documented.

Evaluation of known parameters for land application systems revealed that soil-plant systems are capable of using the seafood industry wastewater with little or no pretreatment requirements. Soil-plant assimilative capacity for the water effluent parameters were calculated in this study, and the necessary land area requirements for environmentally compatible operations were estimated. Use of clay loam sites, compared to sandy loam, was found to reduce land needs for shrimp and crab processing but had no effect on tuna wastes. Oyster land areas were increased by going to a clay loam site. The order of land needs partially reflects the differences in sizes of typical processing facilities in each segment the study showed. The researchers recommend a detailed design prior to land treatment because of probably variations in site and waste characteristics.

The report is No. 142.

Effects of Stream Channelization on Bottomland and Swamp Forest Ecosystems describes work by researchers in the N. C. State University Forestry Department.

Channelization for purposes of agricultural drainage, flood reduction and water transportation has encountered opposition in recent years based on fears that it would irreparably damage the natural functioning of bottomland and swamp ecosystems, including damage to hardwoods such as those in North Carolina's valuable oak-gum-cypress complex. This study examined several aspects of the changes resulting from channelization: groundwater behavior, overstory and understory vegetation and spoil banks.

The investigators monitored groundwater regimes in floodplains of cutover and non-cut areas of both channelized streams in eastern North Carolina using lines of wells. Water levels in the wells provided a basis for comparing plant communities in these areas. The inventory of overstory vegetation showed that all timber stands in the area had been high-graded (the most valuable trees removed during logging operations, leaving those less valuable to suppress regeneration and usurp growing space). Growth studies indicated that channelization resulting in moderate average summer water levels was not necessarily detrimental to mature tree growth, including that of "water-loving" species such as water tupelo, swamp blackgum and bald cypress. Severe dieback or loss of vigor in trees along channelized streams was noted only where water had been backed up by spoil material into stagnant pools or where soil was piled against the bases of the trees.

Studies of lesser vegetation showed it to be in competition with planted and naturally regenerated tree seedlings along the channelized streams. Also, survival and growth of water tupelo seedlings were notably greater along non-channelized streams.

Studies on spoil banks revealed that most appeared to have the potential for merchantable production of desirable species, though productivity varied. And the orientation of the face of a spoil bank with respect to the sun's movement was found to have a significant effect on the productivity of the bank. The report also contains data on the effects of channelization and timber cutting on wildlife habitat.

The authors conclude that channelization can cause a shift from "water-loving" to more mesic plant species, but does not cause dieback, death or drastic reductions in growth of swamp hardwoods or large decreases in productive potential of swamp sites. They note that good forest management practices could result in substantial improvements in the bottomland and swamp forests.

Principal investigator for the research was the late Dr. T. Ewald Maki. Complete research findings are contained in WRRI Report No. 147.

CONFERENCES AND WORKSHOPS

USGS Ground-Water Workshop for Engineers. The U. S. Geological Survey will conduct a two-day workshop on ground water as a source of supply and ground-water pollution in Raleigh on November 11-12. The workshop is being sponsored jointly by the U. S. Geological Survey and the North Carolina Society of Engineers and will be held at the McKimmon Center of N. C. State University.

The workshop is designed to meet the needs of consulting engineers and others involved in the development of ground-water supplies and in the siting of sanitary landfills and other waste disposal sites. Topics to be covered include the hydraulic characteristics of ground-water systems, occurrence of ground water in N. C., analysis of aquifer-test data, design of wells and well fields, and sources and movement of ground-water pollutants.

Attendance at the Raleigh workshop will be limited to 30 participants. If the demand exceeds the number that can be accommodated in the Raleigh workshop, additional workshops will be held either in Raleigh or in other cities.

Class instructors will be Ralph C. Heath, District Chief, and Hugh B. Wilder, Assistant District Chief, of the North Carolina District Office of the USGS in Raleigh. For further information contact: N. C. Society of Engineers, P. O. Box 1551, Raleigh, N.C. 27602. 833-1624.

A short course on Water Quality Modeling will be held in Las Vegas, Nevada, January 12-16, 1981. 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, D. J. O'Connor, G. F. Lee, G. T. Orlob, K. L. Dickson, and P. A. Krenkel. For further information contact P. A. Krenkel, Executive Director, Water Resources Center, Desert Research Institute, P. O. Box 60220, Reno, NV 89506, phone (702) 673-7362. (Continuing education credits will be awarded, if desired.)

POSITIONS AVAILABLE

Faculty Position: UNC Department of Environmental Sciences and Engineering. A senior faculty position will be available in summer or fall 1981 for an environmental chemist with demonstrated excellence and current research interests in cycling and fate of elements in the aquatic environment, emphasizing major systems or the biosphere. Teaching and research will contribute to the Environmental Chemistry and Biology Program Area which aims to integrate basic principles of chemistry and biology with problems of aquatic pollution and environmental deterioration. Rank and salary commensurate with experience. Send resume and names of at least three references to Dr. Edward J. Kuenzler, Department of Environmental Sciences and Engineering, University of North Carolina, Chapel Hill, NC 27514, before December 15, 1980. An equal opportunity/affirmative action employer.

The Congressional Research Service of The Library of Congress is currently seeking candidates for the position of Technical Information Specialist in water resources and public works. Applications should be submitted to The Library of Congress Employment Office, Room LCBG-106B, Washington, DC 20540.

WATER RESOURCES CONDITIONS IN NORTH CAROLINA

Streamflows remained considerably below normal throughout most of the State. As compared to long-term records, flows during September ranged from about 1/5 normal flow in most of the Coastal Plain to normal conditions in the northern Mountain and northwestern Piedmont streams. Flows throughout much of the eastern Piedmont and Coastal Plain regions were deficient (in lower 25 percent of long-term records) for the third consecutive month. During the last several days of September, widespread rains gave needed relief from the drought but caused only small rises on most streams.

Ground-water levels also declined for the third consecutive month. Although levels were generally below long-term averages in the Coastal Plain aquifers, levels remained slightly above average in the Mountains and Piedmont.

. . . *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 publications. The addresses are provided by the News for this purpose.)

Water Resources Planning

"Identifying and Meeting Training Needs for Public Participation in Water Resources Planning," (#107), 12/79, by M. O. Ertel, avail. from WRRC, U. of MA, Amherst, MA 01003. (06A Public Participation)

"Report of the Task Force on Non-Indian Federal Water Rights," 6/80, by Task Force 5A, President's Water Policy Implementation, avail. from USGPO, Washington, DC 20402. (06E)

Water Quality Management

"Aquifers as Processing Plants for the Modification of Injected Water," (Bul. #11), 8/80, by J. S. Hanor, WRRI, LA St. U., Baton Rouge, LA 70803. (02F)

"Effects of Water-Borne Mirex on the Survival and Production of Macrobrachium Rosenbergii (De Man)," (#88), 6/80, WRRI, Clemson U., Clemson, SC 29631. (05B Agr. Wastes)

"Grants and Loans for Municipal Water Supply and Wastewater Treatment Systems: Water Conservation Provisions," 7/79, Final Report of Task Force II, USDA, USEPA, USDC, USDHUD, avail. from US EPA, Office of Water and Waste Management, Washington, DC 20460. (03D Conservation)

"Development and Implementation of a Sediment Control Ordinance or Other Regulatory Mechanism: Institutional Arrangements necessary for Implementation of Control Methodology on Urban and Rural Lands--The Washington County Project," (EPA 905/9-80-003), 11/79, by F. W. Madison, et al., avail. from NTIS, Springfield, VA 22161. (EPA)

"Determination of Sediment Filtration Efficiency of Grass Media--Sediment Filtration Efficiency of Continuous Grass Media," (Vol. 1, #124), 3/80, by D. T. Kao, WRRI, U. of KY, Lexington, KY 40506. (02J)

"Production, Fate and Removal of Trihalomethanes in Municipal Drinking Water Systems," (Rpt. #78), 4/80, by R. A. Minear, WRRC, U. of TN, Knoxville, TN 37916. (05F)

"Technical and Economic Evaluation of BATEA Textile Guidelines," (EPA-600/2-80-041), 1/80, by R. E. Mayfield, et al., avail. from NTIS, Springfield, VA 22161. (EPA)

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SPECIAL

Scientific Review Committee Reports on Chowan River Algae Problem

An EPA-assembled committee of seven scientists from federal environmental research facilities here completed a two-week assessment of the Chowan pollution control program to determine the adequacy of the technical approaches being used to solve the algal bloom problem. The committee also reviewed the existing Virginia and North Carolina institutional arrangements and made recommendations for additional scientific studies necessary to support regulatory controls. The following are the committee's major conclusions, recommended actions and recommended study needs.

Conclusions

· Nonpoint sources contribute significantly to the problem because of their extensiveness and the resulting magnitude of their input load. Point sources contribute significantly to the problem because of high nutrient concentrations in their waste stream and the resulting elevated nutrient concentrations in the receiving water.

· Based upon total annual load, nutrient from nonpoint sources far outweigh the contribution from all other sources. However, nutrients from point sources are delivered both in forms more available for algal growth and in higher concentrations that are more readily assimilated by algae.

· North Carolina's decision to concentrate on removing both nitrogen and phosphorus by controlling point sources, accompanied by a voluntary plan for controlling nonpoint sources is reasonable given the state of knowledge about the causes of the problem. Incentives or mandatory measures may need to be considered to achieve useful levels of nonpoint source control.

· No limiting nutrient for algal production in the Chowan has been identified, although it has been stated that sometimes N and sometimes P is limiting in the river.

· Causal relationships between declining fisheries and algal blooms in the Chowan have not been established although the circumstantial relationship of contemporaneity exists. Red sore disease outbreaks, occurring in epizootic proportions in the lower Chowan and western Albemarle, although known to occur more readily in stressed organisms, has not been positively linked to algal blooms.

· Current operation practices at CF Industries appear to be causing no additional nutrient load into the river, unless it is found that air emissions are significant.

· Existing high concentrations of nutrients in ground water at CF Industries are a source of nutrients to the river that are injected primarily by rainfall events.

· No evidence exists to implicate the Union Camp effluent as influencing the algal blooms. Questions remain, however. (Please see summary of study needs.)

Summary of Recommended Actions

· The Bi-State Water Resources Committee should be fully supported and should hold meetings every six months. They should be held in open forum so that discussion includes citizens and members of the press.

· Technical subgroups should be established and given specific mandates and timetables to develop strategies for various problems such as recommending water quality standards and developing management action plans.

· A mechanism is needed to integrate data from diverse sources, test management alternatives, facilitate communication, and point up where additional evaluation is required. A technical subgroup of the Bi-State Water Resources Committee could largely satisfy this need.

· A joint 208 Water Quality Management Plan should be developed for the basin.

· Land disposal systems should be installed for municipal sewage treatment wherever feasible in the basin, and additional EPA participation should be sought to carry out the installations wherever needed. Storage of secondary treated wastewater could be considered as an alternative, considering, insofar as possible, the potential retention of nutrients in the river, and especially the potential effect on the Albemarle Sound.

· Improved storm water drainage systems should be installed at CF Industries as a minimum. Activities should begin toward finding a long-term solution. A bluff seepage collection trench and a well point system in Dead Tree Swamp offer advantages if they prove to be feasible and operably effective. Investigations should proceed toward determining the most effective solutions.

· Support should be continued for the voluntary program for controlling agricultural runoff, and consideration should be given to providing incentives to improve participation in the program if such a need becomes apparent.

· Silvicultural practices in the basin should be reviewed and clear-cutting of forested areas in close proximity to the river and major tributaries should be discouraged.

· Better control of animal feedlot runoff should be achieved.

· Further channelization of streams and ditching of farm areas in close proximity to the river and major tributaries should be discouraged.

· Union Camp should initiate studies of various treatment and management options for reducing concentrations of N and P in their effluents.

Summary of Additional Study Needs

· Studies should be undertaken to determine the retention of nutrients in the river system from the Union Camp releases and their effect upon the growing eutrophication of the Albemarle Sound.

· Soil boring and analysis to determine conditions for design of a bluff seepage collection system at CF Industries should be undertaken.

· Intensive study of disposition of large quantities of nitrogen containing groundwater from CF Industries should be undertaken in view of the buildup of this water inside the slurry well.

· Analysis of available data should be carried out to determine whether additional studies should be done on the nutrient concentrations in channelized streams to compare to those not channelized.

· An assessment of point source air emissions and associated contributions to the Chowan River should be made.

· Silvicultural and animal waste area runoff studies should be instituted to complement the other nonpoint source monitoring programs underway.

· A multivariate analysis of available data should be undertaken to determine correlations that may exist between localized algal bloom, river conditions, and nutrient inputs from point and nonpoint sources on seasonal and annual bases.

· Studies already planned in this river basin should be continued and enhanced by additional mathematical modeling work.

· Existing and soon-to-be-taken data should be used to calibrate a set of existing nonpoint source, instream transport, and estuarine water quality simulation models to provide capability to analyze for probable results of various management decisions.

· A complete synoptic set of hydrodynamic/water quality data should be obtained for two separate periods, each about one month in duration (1 in winter, 1 in summer). Current meter as well as stage data should be collected.

· A flow measuring station should be installed a distance upstream (or downstream) of one of the existing USGS gages in the fluvial portion of the watershed to provide data on mass flux.

· Studies should be undertaken to determine the rate of release to overlying waters of nutrients stored in bottom sediments.

· Studies should be undertaken of the nutrient flux characteristics to and from the swamps as a function of tidal and hydrometeorologic conditions.

· Monitoring stations should be established to gather samples for determining the nutrient fluvial transport mechanisms.

· Nonpoint source (NPS) monitoring program should be initiated in the Virginia portion of the basin at a level of detail similar to that in North Carolina.

· The NPS monitoring program of both states should be expanded to characterize animal wastes and silvicultural sources.

· Studies should be carried out to evaluate:

- factors affecting A. hydrophila abundance and relative virulence of strains
- stress factors predisposing fish to infection
- the existence of relationships between the occurrence of red sore disease and conditions of the waters where the disease occurred
- the effects of bloom algae and specific water quality characteristics on zooplankton populations needed as critical initial food sources for larval fish
- the role of red sore disease on larval survival.

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ITEMS OF INTEREST:

NORTH CAROLINA CONFERENCE ON WATER SAVINGS and WATER SUPPLY ASSISTANCE

November 18, 1980

PROGRAM

8:00 Registration

8:30 **Welcome,** Jim Stewart, Water Resources Research Institute

8:35 **Introductory Remarks,** Neil Grigg, Department of Natural Resources and Community Development

MORNING SESSION

WATER SUPPLY ASSISTANCE

John Wray, Office of Water Resources
Moderator

8:45 **Municipal Needs,** Dave Reynolds, N. C. League of Municipalities

9:00 **Assistance Needs of Rural Areas,** Paul Gosnell, N. C. Rural Water Association

9:15 **State Programs Panel**

NRCD	Allan Dieteman (Water Supply Assistance)
DHR	Joe Riley (Clean Water Bond)
NRCD	Bob Chandler (Community Assistance)
DHR	Charles Rundgren (Water Supply Services)
AG EXT	Bob Rubin (Extension Services)
NRCD	Coy Batten (Recycling)

9:50 **Questions** (30 minutes)

10:20 **Break** – Coffee, Cokes, Donuts

10:45 **Federal Programs Panel**

FmHA	Paul Parks
HUD	Tom Ramsey
ARC CPRC	John Booth
EDA	Dale Jones

11:35 **Questions** (25 minutes)

12:00 **Lunch**

Luncheon Speaker:

Trends in Water Supply Management, John Morris, Office of Water Resources

AFTERNOON SESSION

WATER SAVINGS

David Howells, N. C. Water Resources Research Institute
Moderator

1:30 **Rate Structures and Demand Reduction,** Robert McGarry, General Manager, Washington Suburban Sanitary Commission

2:00 **Economic Benefits,** Bob Rubin, N. C. Agricultural Extension Service

2:30 **Water Conservation Program of the City of Greensboro,** Ray Shaw, City of Greensboro

2:50 **Water Savings in the Orange Water and Sewer Authority,** Everett Billingsley

3:10 **Efficient Groundwater Utilization,** Ralph Heath, U. S. Geological Survey

3:30 **Leak Detection,** G. Brewster Cole, V. P., Pitometer Associates of N. Y.

3:50 **Local Government and Industry Perspectives,** Frank Smith, N. C. State University

4:10 **Closing Remarks,** Jim Stewart, Water Resources Research Institute

4:30 **Adjourn**

**Advance Registration Form*

NORTH CAROLINA CONFERENCE ON WATER SAVINGS and WATER SUPPLY ASSISTANCE

McKimmon Center, North Carolina State University
NOVEMBER 18, 1980

Name ______________________ Title ______________________
Organization ______________________
Business Address ______________________ Telephone ______________
City ______________________ State ______________ Zip Code ______________

Registration Fee: $15.00 per person.

Make checks payable to:
NORTH CAROLINA STATE UNIVERSITY

**Please duplicate this form for multiple registrations.*

Mail check and registration form by Nov. 12 to:

Water Resources Research Institute
of The University of North Carolina
124 Riddick Building
N. C. State University
Raleigh, N.C. 27650