

WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA

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BARRIER ISLANDS FACE UNIQUE WASTEWATER PROBLEMS

North Carolina's barrier islands, the Outer Banks, typically have highly variable populations, limited financial resources, and many environmentally sensitive areas which should be protected. Summer vacationers come in such large numbers that the summer population can be ten times that of the winter population, and both the summer and year-round population are expected to increase. Thus, local governments face difficult wastewater problems.

In response to concern that contamination from failing septic tanks was responsible for the closure of polluted shellfishing areas, several communities on the Outer Banks planned to build wastewater management facilities. These communities submitted 201 Facilities Plans to the U. S. Environmental Protection Agency (EPA) as a first step in the Construction Grants program. The EPA required an Environmental Impact Statement (EIS), and a draft of the North Carolina Barrier Island Wastewater Management Environmental Impact Statement, which elaborates on the myriad problems encountered on the state's barrier islands, was recently published.

The EIS lists the environmental features that must be considered in any wastewater management plan for the barrier islands. Some of these features are: geology consisting largely of unconsolidated sediments; topography consisting largely of beaches, dunes, and flats; direct exposure to the Atlantic Ocean and its storms; vulnerability to overwash and inlet formation; sensitive ecosystems, such as salt marshes, freshwater marshes, and maritime forests; and fresh water which is vulnerable to surface pollution and salt-water intrusion since it occurs as a lens floating on the salt water.

The EIS addressed the following issues: water quality, alternative wastewater techniques, financial impact on local governments, nonpoint source pollution, groundwater, and sensitive natural areas. Through the EIS process, a strategy for wastewater management on the barrier islands was developed. After this process, the communities involved had basically three options--the EIS strategy, the 201 strategy, or the no-federal-action strategy. The publication explains that considering costs, implementability, reliability, and environmental impacts, the EIS strategy is superior.

The no-action strategy would not correct existing water quality problems, and reliability would decrease as currently existing on-site systems (septic tanks) and community systems age. The 201 strategy is by far the most costly. It is the implementation of existing 201 plans without revision, and it involves replacing existing on-site systems with centralized collection, transportation, treatment, and disposal systems. These systems would require sophisticated administration and well-trained operators. These systems would be susceptible to storm damage; and if the systems were to fail, the potential for environmental damage would be high. The 201 proposals would extend sewer lines to all areas of the communities, regardless of the existing level of development. This would have additional environmental impacts, as it would promote development.

As for the EIS strategy, the EPA publication explains, "The EIS procedure focuses on refinements to population and land-use analysis, development of wastewater flows, evaluation of alternative wastewater systems, and financial and institutional considerations which are appropriate for barrier islands." With the EIS strategy, use of existing on-site systems would continue, and future development, especially condominiums, would tend to use small community systems. The reliability of on-site and community systems is high, if they are properly constructed, operated, and maintained; but they are somewhat susceptible to storm damage. The EIS strategy is flexible, and the cost is low to moderate.

North Carolina's barrier islands are unique, and this multi-volume Environmental Impact Statement will be useful in developing cost-effective and environmentally sound wastewater management systems to serve these islands.

This EIS provides a step-by-step process for wastewater management planning. For more information on this draft EIS, contact: E. T. Heinen, Chief, Environmental Assessment Branch, EPA, 345 Courtland Street, N.E., Atlanta, GA 30365. Tel: 404/881-3776.

One copy of this EIS is available, on loan, from the Institute library.

DROUGHT OF '83 LEAVES ITS MARK ON NORTH CAROLINA

Damages are still being tallied from this summer's drought, said to be the worst in North

Carolina in 30 years. So far, 55 counties have been designated federal disaster areas, with others likely to be. Total crop damages in the state are estimated at \$430 million, according to the State Emergency Management Board.

Dry-weather patterns and extreme heat combined to produce the drought, which also damaged the state's hardwood trees, particularly in the Piedmont, as well as shrubs and grasses. Mandatory restrictions on water use were imposed in the towns of Chapel Hill and Carrboro, where water supply is a concern, when water levels dropped in University Lake, the towns' main water source.

Damage from the drought, however, is most apparent in crop and livestock losses. The largest of these losses are in corn at \$190 million, soybeans at \$105 million, tobacco at \$80 million, peanuts at \$23 million, hay and pasture at \$15 million, sweet potatoes at \$9 million, and cotton at \$6 million. Death losses of poultry and livestock are estimated at \$2 million, which does not include reduced milk production, smaller eggs, and reduced weight gains for hogs and beef.

HIGH POINT WATERSHED ORDINANCE INCLUDES PERFORMANCE STANDARDS

The City of High Point has taken steps to protect its two water supply

reservoirs from the effects of development. An ordinance passed in August by the City Council created a special zoning designation for the water supply watersheds and established a rating system for proposed development projects.

High Point, located in the headwaters of the Cape Fear River Basin, is dependent on rainfall to supply its lakes since it receives no water from rivers originating outside the area. In such a situation, wise management of runoff from the rainfall becomes crucial.

The "watershed performance zone" designation was established by the ordinance to manage development in the water supply watersheds. Development within this zone, in addition to meeting regular zoning district requirements, must meet performance standards set forth in the ordinance. These standards are in the form of a rating system and are based on factors that determine the impact of stormwater runoff from development in the zone. Out of a possible 200 points, 100 must be earned before a proposed development is approved.

The factors considered are density, percentage of impervious surface, proximity to lake or stream, soil type, drainage, slope, land cover, runoff control strategies, sewage disposal, and road and driveway design. In the category of impervious surface, for example, a proposed development may earn the maximum 20 points for that category if it has 0-3 percent impervious surface; for 3-7 percent impervious surface, 15 points are earned; for 10-15 percent, 5 points; and for more than 15 percent, 0 points.

A watershed review committee will review proposals for development and award points for compliance with the rating system.

Requirements of the new ordinance are based on recommendations from a study performed by the City. The Oak Hollow Lake Watershed Study proposed a management plan, which included the watershed performance zone and performance standards, to protect the lake from sediment and other pollutants resulting from development. Oak Hollow Lake, a secondary water supply, is in an area experiencing development pressure.

STRATEGY RECOMMENDS PROTECTION MEASURES FOR FALLS, JORDAN LAKES

A Strategy for Protecting Falls, Jordan Lakes--a set of recommenda-

tions on watershed protection issues for the two lakes--was developed by a water resource committee working through the Triangle J Council of Governments and has been adopted as policy by Triangle J. The recommendations are meant to serve as a policy and planning guide for local governments in the region and to coordinate with State watershed protection efforts.

A key part of the strategy deals with urbanizing areas in the watersheds, where new development brings problems of pollution from stormwater runoff and wastewater treatment systems. Strategy recommendations stress the importance of natural infiltration in controlling stormwater pollution. As development occurs, areas of impervious surface, such as paved streets and rooftops, increase. Stormwater runoff, instead of filtering into the ground, becomes a source of pollutants to streams.

Recommended stormwater management practices are:

1. For new development in both watersheds, all jurisdictions should require on-site infiltration of

the first half-inch of runoff from all impervious surfaces. It is estimated that this will reduce runoff pollution from new development by at least 70 percent.

2. Encourage large lot sizes in areas nearest to the lakes.
3. Adopt the following limits for impervious coverage in new developments. (Impervious coverage includes all buildings, parking areas, sidewalks, areas of concrete or asphalt, or any other areas which prevent infiltration of water into the soil.)

<u>Portion of the Watersheds</u>	<u>Maximum Impervious Coverage</u>
Water Quality Critical Areas (unsewered)	6 percent
Non-critical Areas/Unsewered	12 percent
Non-critical Areas/Sewered	30 percent

Water Quality Critical Areas, which have not yet been designated, are parts of the watersheds that are close to the reservoirs or water intake points.

CATCHBASINS EVALUATED IN EPA STUDY

Catchbasins, widely used to remove coarse materials from stormwater runoff, were evaluated for pollutant removal

effectiveness in an EPA-sponsored study in Boston. Data collected from November 1979 through January 1980 at three study sites representing different conditions (land use, traffic, design) showed catchbasins to be very effective at removing suspended solids-related stormwater pollutants from influent waste streams.

Pollutant mass reductions were achieved of 60-97 percent total suspended solids, 48-97 percent volatile suspended solids, 10-56 percent chemical oxygen demand, and 54-88 percent biological oxygen demand, according to an EPA summary of the project. The data showed that catchbasins did little with regard to nutrient removal.

The study also evaluated the pollutant-reduction effectiveness of inlet strainers inserted in the catchbasins. The purpose of these devices, which are used in Europe, is to screen out solids such as cigarette butts, leaves, lawn clippings, and paper. The strainers were shown to provide a marginal increase in catchbasin pollutant removal up to 10 percent.

The study concluded that, if maintained, catchbasins are an efficient pollutant reduction tool and should continue to be used. Further monitoring studies are recommended in other geographic areas to substantiate findings of this study.

The complete report from this project, entitled "Evaluation of Catchbasin Performance for Urban Stormwater Pollution Control," is available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. Telephone 703/487-4650.

The report order number is PB 83-217 745. Cost is \$11.50, subject to change.

NEW NATIONAL WATER POLICY EVALUATED

Recent studies by the Congressional Budget Office (CBO) describe three options for making a transition in shifting from

federal to local responsibility in financing new water projects. According to CBO, there is support for a shift from building new projects to local projects and the management, repair and modernization of existing projects.

The options outlined in the CBO study, "Efficient Investment in Water Resources: Issues and Options," are:

- Establishing a self-sustaining federal loan fund to replace annual appropriations for local water-resource projects.
- Replacing federal grants for projects of local interest with block grants to states where states play a greater role in project selection.
- Direct the remaining federal grants to water projects that are national in character. Under this option states would assume full responsibility for projects not having a national significance with the determination being made by an independent review board.

According to CBO, responsibility for local projects would be shifted to the states over a 10-year period. Similarly, some Corps of Engineers flood control and dredging projects would also be transferred to the states.

CHESAPEAKE BAY STUDY CALLS FOR FEDERAL-STATE CLEANUP

The Chesapeake Bay is described as "an ecosystem in decline" and in need of a long-range intensive pollution control program, according

to the final report of a recently completed seven-year EPA study. The report, "Chesapeake Bay: A Framework for Action," recommended that the current management committee for the Bay develop a basinwide water quality strategy to reduce pollution in the Bay. According to the report some of the steps needed to save the Bay include reductions in nutrients from publicly owned treatment works and nonpoint sources, primarily agricultural and stormwater runoff, additional monitoring and research, and controls on industrial dischargers to reduce toxic pollutants.

Senator Charles Mathias, Jr. has estimated the Bay's cleanup cost at \$1 billion. EPA budget for the Bay program in FY 84 is \$4.2 million. EPA Administrator William D. Ruckelshaus has estimated it will take at least 10 years to reverse the Bay's decline.

A recently released EPA report, "Chesapeake Bay, A Profile for Environmental Change," highlights significant declines in the system:

- submerged aquatic vegetation, a significant source of wildlife food, has declined throughout the Bay;
- the number of spawning oysters and freshwater fish has declined since 1973;
- nitrogen and phosphorus levels are increasing in many areas;
- many areas of the Bay experienced low dissolved oxygen; and
- high levels of metals and organic chemicals are occurring in the Bay.

Additional information is available from EPA Chesapeake Bay Program, 2083 West Street, Annapolis, MD 21401; telephone 266-6077.

CLEAN WATER ACT AMENDMENTS WOULD FUND STATE NONPOINT PROGRAMS

Amendments to the Clean Water Act approved September 21 by the Senate Environment and Public Works Committee

would provide funds to help states establish nonpoint

pollution management programs. The amendments as approved by the committee specify less stringent non-point control measures than an earlier version. Deleted was a provision that would allow states to direct the federal government to withhold funds for activities that contribute to nonpoint pollution, according to an article in the Environment Reporter.

Under the amendments, \$300 million would be authorized over a three-year period beginning in fiscal 1985 to help states control nonpoint pollution: \$70 million in fiscal 1985, \$100 million in fiscal 1986, and \$130 million in fiscal 1987, the article said. States could submit nonpoint program proposals to EPA to be considered for 75-percent matching grants. Two-thirds of the funds authorized by the amendments would be earmarked for the state programs. One-third of the funds could be awarded, at the discretion of the EPA administrator, "to states that face particularly serious nonpoint source problems, encourage the development of innovative control practices, are attempting to control interstate nonpoint pollution, or need funds to control pollution from mining activities," according to the article.

CP&L CONDUCTS AQUATIC WEED CONTROL STUDIES IN HYCO RESERVOIR

In 1982, Carolina Power and Light Company carried out a study to evaluate methods of controlling Brazilian elodes (Egeria densa) in Hyco

Reservoir, near Roxboro, North Carolina. Chemical, biological, and mechanical control measures were evaluated in the egeria-infested portion of the 4500-acre reservoir.

Three herbicides were evaluated in various plots. Equally effective control was achieved with Diquat (2 gallons/acre) and a mixture of Diquat (1 gallon/acre) and Aquathol K (3 gallons/acre) with one application. Biomass of egeria was reduced significantly in these plots about four weeks after application and remained at approximately 25 percent of that of the control plot four months after treatment. A mixture of Diquat and Cutrine Plus did not provide the same level of control. One month after the first application, biomass in this plot was approximately 50 percent of that of the control plot. It had risen to 75 percent four months later, even after a second application was made two months after the first.

Tilapia zilli, a plant-eating fish, was stocked in small coves that were isolated from the main reservoir by block nets and provided reasonably good control. Egeria biomass was reduced to approximately 66 percent of that of the control plot at a density of 300 fish/acre and to 48 percent of that of control at a density of 1000 fish/acre. No statistically significant difference existed between the standing crop of egeria in the two treatments after 80 days of grazing.

Mechanical control of egeria proved unfeasible. The harvesting rate of an H-650 harvester was 0.35 acres/hour or approximately one-fifth of that of the chemical treatment. Harvesting operations resulted in immediate reduction in biomass values, but regrowth to original levels occurred within two months. In addition, fragmentation and difficulty in maneuvering around docks, boathouses, and shallow areas produced negative results.

The results of this study indicate that Egeria densa in Hyco Reservoir can best be controlled with an integrated program of biological and chemical methods. Stocking Tilapia zilli at a density of 300 fish per acre (of weeds) and the application of aquatic herbicides in selected high-use areas, such as swimming and water

skiing areas, around docks and boathouses, and scattered infestations throughout the reservoir has been recommended to Company management. If approved, further evaluation of Diquat and Aquathol K would be carried out to determine the most effective control available with the smallest rate of herbicide application.

. . . *South Carolina Aquatic Plant Management Society Newsletter*

MICROCOMPUTERS USEFUL IN WATER, WASTE TREATMENT OPERATIONS

Microcomputers may be the tools of the future for water and waste treatment

operations. William Sun, industrial waste chemist with the City of Durham, writes about the usefulness of microcomputers in report generation and data storage in the September 1983 issue of the Water Pollution Control Federation Highlights.

Submitting monthly monitoring reports to the N. C. Division of Environmental Management for each of Durham's 12 wastewater treatment plants required copious amounts of paperwork. An Apple II plus became part of their lab, Sun said, when the department acquired a pulse height analyzer for gamma ray spectroscopy. "When the system is not being used for gamma ray detection, we have available to us a very versatile microcomputer which lends its 48 K bytes readily to helping us in many facets of our waste treatment operation," he said.

The department decided to use available canned software that could be adapted for its user relatively easily. On the VisiCalc spreadsheet, a worksheet was created similar to DEM's monitoring report.

"The VisiCalc spreadsheet goes from A-1 (left uppermost) coordinate to BK-255 (right lowermost) coordinate. What is required for one month's data in North Carolina is only a very small section from A-1 to Z-50," Sun writes.

"The use of the program is very simple and requires only a familiarization with the VisiCalc command structure that could be mastered in a relatively short time. We created blank worksheets, one each for plant influent, effluent, upstream and downstream data. These are loaded at regular intervals into the computer for data entry. After data entry, that completed section of the worksheet could be saved and the process repeated until the whole monitoring report is finished. Hard copy printouts can then be made for submission to the state."

MADISON COUNTY "208" JOINT WASTEWATER MANAGEMENT AND WATER SUPPLY PROJECT COMPLETED

The Land-of-Sky Regional Council's Madison County "208" Joint Wastewater Treatment Management

Task Force has completed its study of the feasibility of the Towns of Mars Hill, Marshall and Hot Springs in Madison County working together to provide wastewater treatment services. The Task Force, with the help of consultants (Claude Terry & Associates) has designed a set of cooperative projects between the towns and the county which can provide needed services such as water conservation education programs, countywide septage pumping, circuit-riding wastewater plant operators, etc. on a shared basis. Eventually, when the County installs its onsite wastewater treatment systems and when the Town of Mars Hill gets its new sewage treatment plant on line, the individual cooperative services can be combined into a formal but simple Joint Management Agency (JMA).

A related project which the Land-of-Sky Regional Council helped coordinate is also completed. This is a county-wide water supply planning study for Madison County by the Tennessee Valley Authority. In this study, TVA addresses three questions: (1) Should Madison County have a countywide water supply? (2) Should the Towns look to surface water for additional water supply needs? and (3) Can Mars Hill supply Marshall with gravity water from its existing reservoirs? Conclusions are that the three towns should essentially continue to operate separate through expanded water supply systems, that ground water is the cheaper and better source of additional water for the towns.

. . . Jim Stokoe
Land-of-Sky Regional Council

**NORTH CAROLINA GROUPS
ADOPT STREAM WATCH
PROGRAM**

The N. C. Department of Natural Resources and Community Development's Stream Watch Program--in which citizen groups adopt a stream or

lake of interest to them--has gained momentum since its beginning in the spring, with 45 groups now participating.

Stream Watch groups are located from one end of the state to the other, with the majority in the mountain area, according to program coordinator Meg Kerr. Some of the groups are just beginning their activities; others are carrying on or expanding work begun in the past. They range from a high school biology club in Edenton, concerned about water quality in Edenton Bay, to the French Broad River Foundation in Asheville, which has been active in past 208 water quality planning.

The August 1983 issue of the N. C. Coastal Federation's Coastal Review newsletter, in highlighting the Stream Watch program in coastal areas, points out that the Neuse River Foundation has adopted the whole Neuse River Basin. Chowan River Stream Watch members plan to continue their water quality monitoring efforts, now with the help of equipment purchased with Stream Watch funds.

Education and stream improvement activities by some of the groups have been funded in amounts up to \$1,000 from a \$30,000 Z. Smith Reynolds grant to the Stream Watch Program. Thirty-two proposals have been submitted and are being considered for portions of the remaining grant funds.

**NORTH CAROLINA RECEIVES GRANT
FOR ASSESSING HAZARDOUS WASTE**

The Department of Human Resources' Solid and Hazardous Waste Management

Branch has received a \$408,000 federal grant that will be used to conduct assessment studies of abandoned hazardous waste sites across North Carolina, branch head O. W. Strickland has announced.

The grant, provided by the Environmental Protection Agency, is designed to help the state to determine if any old hazardous waste sites in the state pose a threat to public health or to the environment. Strickland said, "Once we have this information we can make plans for the eventual clean-up of some of the sites, if necessary."

Four new staff members will be hired with the one-time, two-year grant: an environmental engineer, a geologist, an environmental chemist and a secretary. They will begin their work by looking at the Emergency and Remedial Response Inventory System List (ERRIS) of North Carolina sites, prepared by the EPA.

Strickland said the ERRIS list represents the compilation of several lists of potential abandoned sites in North Carolina. While there are 628 such sites on the ERRIS list, he noted that many of these are duplications, or sites that do not need to be listed because they already have been investigated or do not contain hazardous waste.

Strickland said an initial investigation of the abandoned sites on the ERRIS list was conducted by the Solid and Hazardous Waste Branch in 1982. He said the EPA grant will enable the branch to take a closer look at about 160 of the sites that needed further evaluation.

**SUMMARY REPORT HIGHLIGHTS
POLLUTION REDUCTION EFFORTS
BY ELECTROPLATERS**

A summary report from a workshop held earlier this year shows how one industrial category is taking steps to reduce pollution from its operations.

Making Pollution Prevention Pay in the Electroplating and Metal Finishing Industries, an Institute summary report of a workshop held April 13, 1983, in Charlotte and April 14 in Raleigh, contains highlights of speakers' presentations. State government is encouraging North Carolina industries to incorporate the PPP concept into their operations. This workshop is the first to bring that concept to a specific industrial group.

Workshop speakers explained how, by making certain changes in operations (chemical substitutions, process changes, etc.) a company can not only reduce the amount of pollutants released into the environment but also reduce costs for chemicals, water and sewer, energy, and sludge disposal.

In addition to the summaries of speakers' talks, the report includes sections on how the workshop originated and participants' recommendations for similar programs in the future, an annotated list of reference materials on the workshop topics, and supplemental material on controlling electroplating wastes.

Sponsors of the workshop were WRI, the N. C. Department of Natural Resources and Community Development, the Blue Ridge and Charlotte-Metrolina branches of the American Electroplaters' Society, the UNC-Charlotte Urban Institute Waste Information and Education Program, and the N. C. State University Industrial Extension Service.

The report is available from the Institute free of charge to North Carolina residents; for out of state, the cost is \$8.

NEW INSTITUTE REPORTS

Abatement of Heavy Metals in Industrial Effluents by a Catalyzed, Electrochemical

Removal Scheme by J. Lewis Ayres and Peter S. Fedkiw, Department of Chemical Engineering at North Carolina State University in Raleigh. WRI report No. 207.

This report represents the work performed in the first year of a two-year project. An evaluation of lead and copper deposited on a reticulated vitreous carbon (RVC) surface as a catalytic agent for the electrodeposition of Cu(II), Ni(II), Pb(II), and Zn (II) from dilute solutions (10 mg/l) was performed using a flow-through porous electrode reactor. Copper showed a very strong catalytic activity for Zn(II) and Ni(II) electrodeposition at loadings from 20 to 50 ug/cm².

The removal efficiency of Cu(II) from a 100 mg/l solution circulated from a reservoir to a porous, flow-by, uncatalyzed electrode and back to the reservoir was examined. A current efficiency of 87 percent was measured as the concentration of Cu(II) was lowered from 95.6 ppm to 0.05 ppm. An electrical operating cost of 11 cents per lb. of copper recovered can be estimated from the results. This should be compared to the cost of chemicals required if precipitation is used of 65.3 cents per lb. of copper removed. In addition, the volume of waste generated is considerably lower in the electrolytic route in comparison to precipitation; the volume of precipitation-generated sludge composed of 4 percent solids is 4.45 gal per lb. of copper as compared to .0279 gal per lb. copper (50 percent of void volume in RVC filled by copper) electrochemically generated.

Present and Potential Impacts of Toxic Substances on Municipal Ground Water Resources in North Carolina by Dr. Donald Huisinigh of the N. C. State University Division of University Studies and Janet Hatley of the Louisburg College Department of Biology. Report No. 198.

An estimated 477,000 North Carolinians in 260 municipalities use 64,000,000 gallons of ground water per day. This report graphically presents the locations of approximately 2,000 toxic substance and hazardous waste problem sites in relation to the locations of these 260 municipalities.

North Carolina's 70 top priority ground water pollution sites, the 10 most important identified by each of the state's 7 NRCO regional field offices for the area, are described and mapped. They represent an array of pollutant types and sources. Other sections of the report address specific problem areas--toxic and hazardous substance spills, pesticide container dump sites, liquid waste impoundments (agricultural, municipal, mining, and industrial), permitted sanitary landfills, and abandoned hazardous waste sites. A set of maps shows the locations of these sites.

The report notes, for instance, that pesticide container dump sites are particularly concentrated in five counties: Scotland, Harnett, Caswell, Columbus, and Edgecombe. The number of sites in each county is given, along with the number of people served by municipal wells.

During the research, information was gathered from the N. C. Departments of Agriculture, Human Resources, and Natural Resources and Community Development.

The authors recommend several steps to protect ground water. One is increased monitoring for the presence of toxic substances in water from municipal and private wells in the vicinity of the toxic and hazardous waste sites identified. They also urge the development of a comprehensive and integrated surface and ground water management strategy.

A companion study to this research addresses the topic of unprotected surface water supplies. It is being conducted by Drs. Francis DiGiano and Alvis Turner of the UNC-Chapel Hill Department of Environmental Sciences and Engineering.

WORKSHOPS, CONFERENCES AND SEMINARS

Seminars on Groundwater Hydrology and Contaminant Transport. The Department of Civil and Environmental

Engineering at Duke University is sponsoring the following seminars:

- Oct. 28, 1983 "Control of Salt/Water Intrusion in Coastal Aquifers," A. L. Kashef, Consultant, Raleigh, NC.
- Nov. 11, 1983 "Hazardous Waste Site Investigations," Dr. Zubair Saleem, EBASCO, Greensboro, NC.
- Nov. 18, 1983 "A Numerical Model Study of Groundwater Contamination from Price's Landfill, New Jersey," Dr. William Gray, Dept. of Civil Engineering, Princeton University, Princeton, NJ.
- Dec. 2, 1983 "Modeling Chemical Transport in Unsaturated Soil," Dr. Warren Piver, National Institute of Environmental Health Sciences, Research Triangle Park, NC.

These seminars will be held in Room 209, Civil Engineering Building (No. 47) Duke University from 3:30 to 4:30 p.m. For further information contact Dr. M. A. Medina at 919/684-2434.

Aquatic Weed Control Seminar - This seminar is scheduled for the McKimmon Center, Raleigh, NC, on November 22, 1983. This program will be of interest to persons engaged in the control of Aquatic Weeds and in particular to those persons licensed as Aquatic Pest Control Pesticide Applicators. Licensed applicators on approval of the Pesticide Board will receive five (5) hours of recertification credits. A registration fee of \$4 is payable to NCSU and should be mailed to: John Wilson, 51 Kilgore Hall, N. C. State University, Raleigh, NC 27650.

Annual Meeting of N. C. AWWA and WPCA - The annual meeting of the North Carolina American Water Works Association and Water Pollution Control Association is scheduled for November 6-9 in Wilmington, NC. Details on the program are available from John Campbell, 408 Latimer Road, Raleigh, NC 27609; Telephone 919/733-5083.

The following Fall 1983 Workshops are offered by Continuing Education, North Carolina State University:

Hazardous Waste Management under RCRA

- September 14-15, 1983, McKimmon Center, NCSU, Raleigh, NC.
October 25-26, 1983, Holiday Inn-North Tryon, Charlotte, NC
December 7-8, 1983, McKimmon Center, NCSU, Raleigh

Applied Spill Prevention, Control and Countermeasures

- September 16, 1983, McKimmon Center, NCSU, Raleigh
October 27, 1983, Holiday Inn-North, Charlotte, NC
December 9, 1983, McKimmon Center, NCSU, Raleigh

Preparing RCRA Part B Permit Applications for Storage in Tanks and Containers

- November 17, 1983, McKimmon Center, NCSU, Raleigh

These workshops and their associated manuals have been developed by the NCSU Industrial Extension Service with help from the N. C. Solid and Hazardous Waste Management Branch to assist hazardous waste generators, treaters, storers and disposers and other concerned individuals meet RCRA requirements. Representatives from the Solid and Hazardous Waste Management Branch of the State of North Carolina will participate in the Management and Permitting Workshops.

The RCRA Management Workshop is designed to help participants understand RCRA and meet its personnel training and emergency and contingency planning requirements.

The Spill Control Workshop is designed to provide the participant with a review of types of spills and releases. Demonstrations and some hands-on use of spill prevention and control equipment will be included in the workshop.

The Permitting Workshop is designed to assist storers of hazardous waste in the preparation of their RCRA Part B Permit Applications.

These workshops are recommended for safety officers, industrial hygienists, environmental engineers and planners, and hazardous waste chemists. For more information and a registration form, contact: North Carolina State University, Division of Continuing Education, P. O. Box 5125, Raleigh, NC 27650, ATTN: Woody Fairbrother/Michelle Howell, Phone: 919/737-2261.

Management of Waste Solvents and Oils in North Carolina - November 15, 1983, Holiday Inn, North Tryon, Charlotte; November 22, 1983, McKimmon Center, Raleigh; November 29, 1983, Hilton Inn, Wilmington, NC.

Each program will include presentations on:

- (1) N. C. Regulations Governing Waste Solvents and Oils (by a Senior Representative of the N. C. Solid and Hazardous Waste Management Branch)
- (2) Minimizing Open Ended Liability on Wastes Sent Out of Plant
- (3) Alternative Handling Procedures for Waste Solvents and Oils
 - (a) Recycling: In and Out of Plant
 - (b) Combustion for Heat Recovery: In and Out of Plant
 - (c) Incineration (No Heat Recovery); In and Out of Plant
 - (d) Solidification and Land Disposal.

The programs are sponsored by the North Carolina Solid and Hazardous Waste Management Branch, the Industrial Extension Service of North Carolina State University, and UNCC Urban Institute Piedmont Waste Exchange. A handout will cover principal features of the presentation.

For more information or to register, contact: North Carolina State University, Division of Continuing Education, P. O. Box 5125, Raleigh, NC 27650 ATTN: Woody Fairbrother/Michelle Howell Telephone: 919/737-2261.

CALL FOR PAPERS Fourth National Symposium and Exposition on Aquifer Restoration and Ground-Water Monitoring - The

National Water Well Association is now soliciting papers for this symposium to be held May 23-25, 1984, at the Fawcett Center for Tomorrow in Columbus, Ohio. The deadline for receipt of abstract and biographical sketches is December 9, 1983; and the deadline for receipt of completed written manuscript is March 9, 1984.

For more information on the conference, contact David M. Nielsen, Symposium Coordinator, National Water Well Association, 500 W. Wilson Bridge Road, Worthington, OH 43085, (614) 846-9355.

1984 Triangle Conference on Environmental Technology - This 22nd Annual Conference will be held March 6-8, 1984, at the Bryan Center, Duke University in Durham, NC. One-page abstracts should be sent to Dr. J. Jeffrey Peirce, Dept. of Civil and Environmental Engineering, Duke University, Durham, NC 27706. Anyone wishing to submit an abstract should do so by October 17, 1983.

Papers are sought in all areas of environmental technology and especially in hazardous waste management, groundwater modeling and protection, sludge treatment, wastewater treatment processes, and case histories.

Thirty-eighth Annual Virginia Water Pollution Control Association Conference to be held April 30, May 1-2, 1984, in Williamsburg, VA.

Anyone interested in presenting a paper is asked to submit a brief (300-word) abstract describing the subject and contents of the paper. For more information contact Glenn W. Rehberger, Virginia WPCA, c/o CH₂M/Hill, 1941 Roland Clarke Place, Reston, VA 22091.

POSITIONS AVAILABLE Hydrologist (rank open) at the Wyoming Water Research Center.

The successful applicant for the hydrology position will be expected to: (1) participate appropriately in all of the Center's activities; (2) develop and implement a research program appropriate to the water resource needs of the State of Wyoming; (3) participate in multidisciplinary research programs; (4) contribute to the University's academic programs dealing with water and participate actively in the Center's Graduate Program in Water Resources; (5) direct graduate student research; and (6) obtain outside research funding.

To apply, send letter of application stating research and teaching interests, resume, representative reprints and 3 letters of reference to: Dr. Harold Bergman, Search Chairman, Wyoming Water Research Center, Box 3067, University Station, Laramie, WY 82071

Hydrologist, University of Arizona Water Resources Research Center. This is a nontenure track, 12-month position.

This position will involve responsibilities in both technology transfer and research. Technology transfer duties will include implementing a total information dissemination program for the Center.

Applications will be received until January 1, 1984. The beginning date for employment can be negotiated. Send letters of application, resume, transcripts, and a list of three (3) references to:

Dr. L. G. Wilson, Acting Director
Search Committee
Water Resources Research Center
Douglass Building
Room 102
University of Arizona
Tucson, Arizona 85721

WATER RESOURCES CONDITIONS IN NORTH CAROLINA Streamflow was near normal in the mountains and below normal in the remainder of the state. Streamflows declined to 5-year minimum levels in parts of the Coastal Plain and southern Piedmont. Recent,

cooler temperatures and light scattered rains have caused streamflow to stabilize. Record high temperatures and deficient rain caused considerable agricultural damage this summer; however, exceptionally heavy rain last winter and spring recharged ground water to record high levels and streamflow, with some exceptions, has not been severely affected.

Ground-water levels continued to decline seasonally and are below normal in the Coastal Plain and near normal or above in the Piedmont and mountains.

. . . U. S. Geological Survey

NEW PUBLICATIONS RECEIVED BY THE INSTITUTE

Water Resources Planning

"Drought Management Concepts: Lessons of the 1976-1977 U. S. Drought," (UWRL/P-83/02), 6/83, by R. Narayanan, et al., UT Water Research Lab, UT State U., Logan, UT 84322. (03D)

The following Draft Env. Impact Statements on Barrier Island Wastewater Management are available from Env. Assessment Br., USEPA, 345 Courtland Street, NE, Atlanta, GA 30365, (05D Barrier Islands):

"North Carolina Barrier Island Wastewater Management," (EPA 904/9-83-108a), 6/83

"Technical Reference Document Environmental Inventory Report," (EPA 904/9-83-108b), 6/83

"Technical Reference Document Alternatives Development Report," (EPA 904/9-83-108c), 6/83

"Technical Reference Document Financial Planning Handbook for Wastewater Management," (EPA 904/9-83-108d), 6/83.

"Defining Stream Fish Microhabitat Requirements for Water Project Planning," 11/82, by W. T. Helm, Utah Center for Water Resources Research & Ecology Center, UT State U., Logan, UT 84332. (06G)

"An Economic Evaluation of Benefits and Costs of Maintaining Instream Flows," (UWRL/P-83/04), 6/83, by R. Narayanan, et al., UT Water Research Lab, UT State U., Logan, UT 84322. (02E)

"Predicting Infiltration and Surface Runoff from Reconstructed Spoils and Soils," (#143), 7/83, by L. G. Wells, et al., WRRRI, U. of KY, 165 Anderson Hall, Lexington, KY 40506. (02J)

"Water Law in Mississippi--An Overview," (D-022-MS), 7/83, by J. I. Palmer, Jr., WRRRI, P. O. Drawer AD, Mississippi State, MS 39762, Price: \$3. (06E)

"Adapting Appropriation Water Law to Accommodate Equitable Consideration of Instream Flow Uses," (UWRL/P-83/06) 6/83- by J. M. Bagley, et al., UT Water Research Lab, UT State U., Logan, UT 84332. (02E)

"Future Waves--Proceedings of a Regional Conference--Water Policy in the South," 8/83, by Southern Rural Development Center, Box 5406, Mississippi State, MS 39762. (06E)

Water Quality Management

"Acid Deposition, Atmospheric Processes in Eastern North America - A Review of Current Scientific Understanding," 1983, by Comm. on Atmospheric Transport & Chemical Transformation in Acid Precipitation, et al., avail. from National Academy Press, 2101 Constitution Ave., NW, Washington, DC 20418, Price: \$16.50.

"Investigation of the Effects and Uses of Biocides and Related Compounds in North Carolina," 9/83, by Water Quality Section, DEM, NRCO, PO Box 27687, Raleigh, NC 27611. (05C)

"Chlorine--Bane or Benefit?, Proceedings of a Conference on the Uses of Chlorine in Estuaries," 4/82, sponsored by Chesapeake Bay Foundation, 162 Prince George St., Annapolis, MD 21404. (05D)

"Proceedings of the Eutrophication Workshop," (Conf. Series #7), 1983, by Dept. of Resources & Energy, Australian Water Resources Council, avail. from Australian Government Publishing Service, Canberra, Australia. (04H)

"Movement of Bacteria Through Macropores to Ground Water," (#139), 1983, by M. S. Smith, et al., WRRRI, U. of KY, 165 Anderson Hall, Lexington, KY 40506. (05B)

"The Induction of Tolerance to Heavy Metals in Natural and Laboratory Populations of Fish," (#141), 1983, by W. J. Birge, et al., WRRRI, U. of KY, 165 Anderson Hall, Lexington, KY 40506. (05E)

"Effects of Surface Application of Dairy Manure on the Infiltration Rate and Quality of Surface Runoff," (#138), 6/83, by J. L. Taraba, et al., WRRRI, U. of KY, 165 Anderson Hall, Lexington, KY 40506. (05B)

Water Quantity Management

"Use of Digitized Radar and Microcomputers to Forecast Local Floods and Irrigation Needs," (#113), 6/83, by S. Nnaji, et al., WRRRI, Clemson U., Clemson, SC 29631. (04A Flood Forecasting)

"Ground Water - A Non-Technical Guide," 1982, by Academy of Natural Sciences, avail. from Good Water America, Suite 600, 21 DuPont Circle, NW, Washington, DC 20036, Price: \$8. (02F)

"Survey of Agricultural Irrigation in the Lower Cape Fear River Basin--1982," NCNRCD and US Water Resources Council, contact Office of Water Resources, NRCD, PO Box 27687, Raleigh, NC 27611. (03F)

"Modeling Surface and Subsurface Stormflow on Steeply Sloping Forested Watersheds," (#142), 1983, by P. G. Sloan, et al., WRRRI, U. of KY, 165 Anderson Hall, Lexington, KY 40506. (02E)

"Fracture Trace Mapping and Water Well Yield in the Piedmont Region of South Carolina," (#112), 8/83, by D. B. Stafford, et al., WRRRI, Clemson U., Clemson, SC 29631. (02F Ground Water)

Miscellaneous

"A Healthy Economy in a Healthy Environment--1983 Proceedings: The First Annual Carolina Environmental Affairs Conference of the University of North Carolina," ed. by J. Hernandez, pub. by Inst. for Env. Studies, UNC, 311 Pittsboro St., Chapel Hill, NC 27514. (04)

Two thousand one hundred and twenty-five copies of this newsletter were printed at a cost of \$621.72, or \$0.29 per copy.

ANNOUNCEMENT

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ITEMS OF INTEREST:

- Barrier Islands Face Unique Wastewater Problems, page 1
- High Point Watershed Ordinance Includes Performance Standards, page 2
- Strategy Recommends Protection Measures for Falls, Jordan Lakes, page 2
- New National Water Policy Evaluated, page 3
- CP&L Conducts Aquatic Weed Studies in Hyco Reservoir, page 4
- Summary Report Highlights Electroplaters' Pollution Prevention Efforts, page 5
- New Institute Reports:
 - "Abatement of heavy Metals in Industrial Effluents by a Catalyzed, Electrochemical Removal Scheme, page 5
 - "Present and Potential Impacts of Toxic Substances on Municipal Ground Water Resources in North Carolina, page 6

AND MORE . . .

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