NEWS
WATER RESOURCES RESEARCH INSTITUTE
OF THE UNIVERSITY OF NORTH CAROLINA

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CONTENTS

EDITORIAL

Making Pollution Prevention Pay: Ecology with Economy as Policy

by Don Huisingh

What is the future of hazardous waste and toxic substance management in North Carolina? How we answer that question will greatly influence how we answer yet another question, "What are the prospects for North Carolina's water resources between now and the year 2000?

Several months ago, a cartoonist looked down the road and posed the question even more poignantly, "What well-known liquid, the supply of which is now threatened, comes from beneath the ground and is vital to the survival of the U.S.?

The answer presented was WATER and depicted a dripping faucet with a placard behind it that said, "WARNING CHEMICAL CONTAMINATION, DO NOT DRINK!!!"

The cartoonist's point is especially true for us in North Carolina as we actively foster economic growth and development and as we strive to develop and implement an ecologically sound toxic substances and hazardous waste management plan.

State opinion polls have shown repeatedly that North Carolina citizens are demanding economic growth and quality environment. Yet, many leaders within government and industry believe that, "It is either jobs or the environment!" The implication is that the environmental and economic health of society are in direct conflict with each other. If this is true, we are confronted with a real dilemma!

Is there no way out of this dilemma? Are we trapped in an eternal struggle between economic and environmental forces? Must we sacrifice the environment on the economic altar? Is there another way?

Fortunately, leading industries throughout the world are demonstrating that indeed there is a better way; one that proves conclusively that economic health and environmental health can travel hand in hand. What new secret have they found? They have rediscovered the truth in the old adage, "An ounce of prevention is worth a pound of cure." They have found the truth in what J. T. Ling of 3M so succinctly phrased it, POLLUTION PREVENTION PAYS.

In fact, 3M has, since the inception of its Pollution Prevention Pays program seven years ago, saved more than $100 million while at the same time in the U. S. they are annually preventing the production of 125,000 tons of air pollutants, 4,000 tons of water pollutants, 900 million gallons of waste water, 12,000 tons of solid and hazardous wastes, and have energy savings equivalent to 228,000 barrels of oil a year. They are, therefore, meeting and in many instances doing better than what is required of them by the clean air act, clean water act or the hazardous waste management acts and at the same time coming out with increased profits.

The 3M and dozens of other companies in the U.S., Canada, France, Switzerland, Japan and elsewhere are realizing that any time they produce any pollutant, be it an air pollutant, water pollutant or hazardous waste, that is an indication of inefficiency in their industrial operation. By reformulating their products, making process modifications, recycling their byproducts and other approaches they can decrease the wastefulness, decrease the negative environmental impact and improve their BOTTOM LINE!

On May 26 and 27 we sponsored a symposium in Winston-Salem with the title, "Pollution Prevention Pays." The more than 200 participants heard from leading industrial leaders from the U.S. and Europe about the technologies, economics, and ecological advantages of emphasizing pollution prevention rather than pollution control.*

They learned that ecology and economy are derived from the same Greek root word, oikos. Through pursuance of the pollution prevention course, we can once again reunite economics and ecology in a positive, non-competitive fashion.

North Carolina has the opportunity, with active leadership from the state government, industry, the universities and private citizens to be the first state to implement this concept as policy. If they do, not only will the state's economy be improved, the state's air, water and land quality will also be improved. Our children's children will be thankful!

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*The complete symposium proceedings are available in a 1982 hardback publication from Pergamon Press under the title MAKING POLLUTION PREVENTION PAY: ECOLOGY WITH ECONOMY AS POLICY edited by Don Huisingh and Vickie Bailey. A limited supply of complimentary copies is available. Please contact Dr. Don Huisingh, Professor, Division of University Studies, 140 Harrelson Hall, North Carolina State University, Raleigh, NC 27650.

(Editor's Note: See page 3 of the November issue of the NEWS for related information describing another important publication titled Profit from Pollution Prevention.)

* * * * * * *

EPA DEVELOPS NEW GROUND WATER POLICY DRAFT

A long-awaited and overdue ground water policy by EPA has gone through another draft. The latest draft was made available October 7 and is still undergoing revisions before being sent to Anne M. Gorsuch, EPA Administrator.

The draft policy statement does vary with the traditional non-degradation approaches used in environmental protection and would seek to protect ground water according to current and projected uses. The assumption is that not all ground water has the same value and needs the same level of protection.

Major issues resolved in the draft policy include grant eligibility, water allocation, state and EPA agreements, revisions of regulations and a determination of the lead agency for ground water policy.

In the policy statement, "EPA recognizes that state and local governments have the principal responsibility for the management and protection of ground water." The statement says they "must locate and control sources of pollution, manage sensitive recharge areas, and at times provide alternate sources of drinking water to the public or treat water that had previously been used without treatment."

The statement indicates that a combination of state and local control measures plus the programs under the Resource Conservation and Recovery Act (RCRA), Superfund (CERCLA), the Clean Water Act (CWA), Federal Insecticide Fungicide and Rodenticide Act (FIFRA), Toxic Substances Control Act (TOSCA), and the underground injection control provisions of the Safe Drinking Water Act (SDWA) are measures which can be used to protect ground water quality.

With regard to water allocation, the draft policy gives this responsibility to the states.

On the issue of state/EPA agreements, EPA plans to encourage state strategy development even though some states have expressed reservations.

EPA indicates it will coordinate ground water quality programs among federal agencies but would not play a lead agency role. The emphasis would be on states taking the lead with national coordination and support from federal government.

EPA SEEKS TO RETURN MANAGEMENT OF WATER PROGRAMS TO STATES

EPA Deputy Director, John W. Hernandez, Jr., said in a recent address to the Ohio Water Management Association that his agency "wants to return to the states the opportunity to manage water resources." Hernandez stated that EPA proposed water quality standard guidelines" will allow states to meet federal tests with greater flexibility." The EPA guidelines would encourage state-oriented standards and the agency would help states develop site-specific criteria for certain pollutants.

Hernandez said EPA "wants to get out of the business" of telling local communities how to design and build their sewage treatment plants. The agency also plans to decrease its funding for these programs over the next ten years from $90 billion to $36 billion.

EPA's emphasis on water quality standards as opposed to technology-based standards in determining wastewater treatment is being widely debated. Water quality standards focus on the quality of the receiving water instead of the effluent. The currently used technology-based standards came about with the passage of the 1972 Water Pollution Control Act and later amendments, which required secondary treatment for all municipal dischargers by 1988 and set up a permit system for enforcement.

Critics of the technology-based standards say that it is treatment's sake and that its uniform approach to regulation is too simplistic, often requiring a level of treatment not justified by the quality of the receiving water. They contend that water quality standards would be more flexible, allowing states to determine what treatment levels are appropriate based on the use of the receiving water.

Critics of the water quality-based standards argue that this approach would require elaborate monitoring and that it assumes knowledge of background levels of chemicals in the receiving waters.

NO MORE CHLORINE

According to a recent article in the Water Pollution Control Federation Journal, Illinois has become the 25th state in the U.S. to revise its standard for chlorine disinfection in wastewater, after studies showed that the requirement was excessive and had a negative effect on aquatic life. According to Illinois Environmental Protection Agency Director Richard J. Carlson, "This change will improve the environment, save the public millions of dollars, and there will be no health risks resulting from the change." Illinois plans to increase monitoring of the treatment plant during the change. About 88 of the state's 1600 treatment plants will still be using chlorine if they are within 20 miles of a drinking water plant or a swimming beach.

In North Carolina, Chlorine is required only in those streams where there is not adequate dilution of the wastewater to keep fecal coliform levels to an acceptable limit. With some trout streams in western North Carolina, chlorine residual levels may not exceed 2 micrograms per liter µgL. High levels of chlorine have been found to be toxic to trout.

SMALL HYDRO-POWER SITES UNDER EVALUATION

The potential for generating electricity from small hydro-power stations in western North Carolina is being investigated by a number of groups. Funded by a year-long grant from the North Carolina Alternative Energy Corporation, Appalachian State University, Center for Improving Mountain Living at Western Carolina University, Long Branch Environmental Center and Mother Earth News are assessing potential generating sites in twenty-four mountain counties.

Between two to three thousand sites will be recommended for small hydro-power plants. To be recommended these sites must be capable of generating at least five kilowatts of electricity, meet economic feasibility criteria based on a five-year payback, and have potential users within close proximity of the generator.

Next to the Pacific Northwest, western North Carolina is thought to be the best area in the country for small hydro-power development. Workshops have been held to present the results of the project and to inform the public about how to tap this alternative energy source.

Steve Berkowitz, formerly with the Center for Improving Mountain Living at Western Carolina University, believes that it will take determined individuals to overcome the constraints to developing hydro-power. Although no dams are needed, there is a question of how much water can be diverted from a stream and not cause environmental problems. Moreover, there are many institutional problems, such as streams serving as property lines and hooking up to existing power sources, that must be resolved.

According to Dr. Harvard Ayers, project coordinator at Appalachian State University, Blue Ridge Electric Membership Cooperative purchases power from a demonstration hydro project at the same rate as it pays for wholesale power from Duke Power.

For more details on this project and names of resource persons, contact Dr. Harvard Ayers, Department of Anthropology, Appalachian State University, Boone, NC 28608, (704) 262-2295.

BARRIER ISLANDS BILL CLEARS CONGRESS

Legislation to protect undeveloped barrier islands along the Atlantic and Gulf coasts from unwise development has been passed by Congress and is awaiting the President's signature.

The measure discourages future development on the islands by prohibiting federal assistance to be used for roads, bridges, sewers and other structures. The federal government stopped issuing low-cost flood insurance for barrier island development last year.

The Interior Department has proposed 188 areas to be designated as undeveloped barrier islands. The final decision on whether all should become "barriers" will be made in late November. Those that are so designated would not be eligible for federally financed development. Conservationists are hopeful that the new money-saving program will protect valuable wetlands and other wildlife habitat concentrated on the barrier islands. Maintaining undeveloped barrier island habitat is especially important to waterfowl and other migratory birds.

...*Wildlife Management Institute*

STUDY SHOWS LAND USE-WATER QUALITY CONNECTION

A study completed in March 1982, by the Fairfax County, Virginia Office of Comprehensive Planning recognizes the important connection between land use and water quality. As a result of study recommendations, portions of the county have be rezoned to restrict development.

The Occoquan Basin Study was prompted by concern over accelerated eutrophication and other water quality problems in the Occoquan Reservoir, the source of drinking water for over 600,000 people in northern Virginia. Although an $82 million regional advanced wastewater treatment plant had opened in 1978 and a Best Management Practices (BMP) policy was adopted in 1980 to reduce nonpoint source pollution, water quality modeling showed that these steps would not prevent continued deterioration of water quality in the Occoquan Reservoir. Officials realized that additional measures were needed.

The Occoquan Basin Study was initiated to determine the relationship between land-use planning and water quality. The study area was the Fairfax County portion of the Occoquan Basin, an area facing increasing growth pressures from Washington's suburban sprawl.

As part of the study, the water quality problem was defined, modeling techniques developed, and a water quality goal established. Existing and potential BMP combinations or strategies were evaluated for relative effectiveness and cost. Planning objectives previously established for the study area (such as maximum use of suitable sites for economic development and noise-compatible land uses in the Dulles Airport Noise Impact Area) were evaluated in light of water quality goals. Five land-use test alternatives were developed to determine the impact of land uses on the water quality goal.

The water quality goal established by the Study was "to assure no further degradation of the Occoquan Reservoir water quality beyond that level projected for existing and committed use."

Related Study findings include the following:

- Land uses shown in the Fairfax County Comprehensive Plan for the study area can come close but cannot achieve the non-degradation goal with any cost-effective package of BMPs that can be identified at present.
- Current BMP requirements are sufficient to meet the water quality goal only if new development is severely limited, which would mean severely curtailing established economic development and housing goals.
- The most effective land-use BMP is non-urban development. Land-use test alternatives that do not have extensive areas of non-urban land use did poorly in water quality model simulations.
- In order to meet the water quality goal, about two-thirds of the Occoquan Basin study area must be implemented in the urban envelope (commercial, industrial, and office use and residential use at a minimum density of .5 dwellings per acre).

A general conclusion is stated in the Study report: "It is possible to modify the Comprehensive Plan for the Occoquan Basin study area so that an acceptable water quality goal can be met while the county continues to pursue and realize a variety of other planning and development objectives. This can be done if about two-thirds of the land in the Occoquan Basin study area is rezoned to a residential density of .2 dwellings per acre to insure that the area remains in non-urban uses. It is also necessary for the BMP program to be strengthened to substantially reduce projected rates of runoff pollution from urban areas.

LAND USE AS A BMP

A major result of the Fairfax County Occoquan Basin Study, described in the preceding article, is the selection of land for non-urban use.

The Fairfax County Comprehensive Plan was amended in June 1982, based on the Study findings. According to the amendments, land uses more intense than .2 dwelling units per acre (5 acres per unit) have been limited to an urban envelope that comprises only 33 percent of the Fairfax County portion of the Occoquan watershed. The remaining two-thirds of the area were recommended for non-urban use, which includes parkland, open space, and residential use at a maximum density of 5 acres per unit. Within the urban envelope, land uses must employ innovative site development designs and state-of-the-art stormwater management techniques ~~described~~ in the Study.

The study report notes that the selection of land uses for the study area has as great an impact on water quality as the selection of Best Management Practices. An example is given: if the study area were 100 percent commercial land use, there would be four times more phosphorus runoff than if 100 percent of the study area were used as five-acre residential.

REPORT RELATES AGRICULTURAL RUNOFF TO WATER QUALITY

A study by the N. C. Division of Environmental Management showed that currently recommended soil and water conservation practices greatly mitigated the effect of agricultural runoff on stream water quality.

The study used biological monitoring to evaluate the effects of the runoff on stream quality and the effectiveness of the agricultural management practices. This topic is of interest in North Carolina since agriculture is the state's largest industry and since agricultural runoff can contribute sediment, nutrients, and pesticides to streams.

Some benthic fauna, or bottom-dwelling stream organisms, are less tolerant of poor water quality than others. Biological monitoring, by analyzing the composition of these benthic communities, provides a good indicator of water quality. The DEM study was conducted at five sites across the state, representing a variety of geographic areas. Each had one well-managed and one poorly managed agricultural site as well as a control site.

According to the study, comparisons of organisms at the three sites suggested that good erosion control reduces the impact of agricultural runoff at least 50 percent. The most important stress factors in agricultural streams were found to be sedimentation and occasional toxicity.

The report Biological Series #107 was prepared by David R. Lenat with the Division of Environmental Management.

N. C. LAND USE CONGRESS ELECTS OFFICERS

The N. C. Land Use Congress, Inc., a statewide non-profit organization concerned with the wise use and management of land, has elected officers to serve in the coming year. They are:

President: James M. Stewart, UNC Water Resources Research Institute
Vice-President: Maurice Cook, NRCD Division of Soil and Water Conservation
Secretary: Phyllis Danby, NRCD Division of Land Resources
Treasurer: Joe Williams, USDA Soil Conservation Service

Board members are Leon Danielson, NCSU Agricultural Extension Service; Ken Windley, Onslow County Planning Department; Susan M. Smith, Center for Improving Mountain Living, Western Carolina University; and Raymond Burby, UNC Center for Urban and Regional Studies.

The Land Use Congress, beginning its thirteenth year, is composed of professionals in a variety of fields and concerned citizens. It has four objectives:

- to create an awareness among the general public of the need for proper land use
- to encourage the development of effective land use policies
- to promote cooperation among groups and individuals interested in land use
- to promote research projects which will contribute to expanded knowledge of proper land use.

SATELLITE HELPS ASSESS WATER QUALITY IN WRRI-SUPPORTED STUDY

The weatherman cooperated with scientists from N. C. State University and the N. C. Department of Natural Resources and Community Development recently to provide clear weather at a critical time when satellite pictures could be taken and coordinated with intensive water quality monitoring on the lower Neuse River.

Dr.Siamak Khorram with the N. C. State University School of Forestry and Department of Electrical Engineering heads a Water Resources Research Institute project to determine whether a National Aeronautics and Space Administration satellite can help to evaluate the environmental quality of North Carolina's waterways.

In this project digital data derived from the Landsat Multispectral Scanner (MSS) is combined with surface truth data for salinity and chlorophyll mapping of the lower Neuse River. Water quality measurements are made from boats simultaneous with Landsat overpass. After the completion of laboratory analyses of water quality samples and preliminary processing of Landsat data, regression models will be developed to establish the relationships between Landsat MSS data and water quality measurements for the sites sampled. These models will then be extended to the entire study area to map the selected water quality parameters.

In the project a sampling network was designed by NCSU investigators and technical personnel from the Division of Environmental Management, N. C. Department of Natural Resources and Community Development (DEM-NRCD) to collect water quality data at 83 sites. In addition to the DEM-NRCD, personnel from the N. C. Division of Marine Fisheries and the N. C. Wildlife Resources Commission participated in data collection efforts. Sample sites were plotted along 10 study segments distributed from Streets Ferry Bridge about 10 miles above New Bern to Oriental, N. C.

Results from the study will help to determine if satellite sensing could provide more and faster information about water quality in coastal rivers and estuaries.

MOREAU NAMED AS INSTITUTE DIRECTOR

Dr. David H. Moreau, Professor of Water Resources and Environmental Planning at the University of North Carolina at Chapel Hill, has been appointed Director of the North Carolina Water Resources Research Institute, effective November 1, 1982. He succeeds Dr. Neil S. Grigg, now at Colorado State University, who held the position from 1977 through January 1982. Associate Director Dr. James M. Stewart has served as Acting Director beginning in 1979 when Dr. Grigg took a leave of absence from the University to serve as Assistant Secretary for Natural Resources, N. C. Department of Natural Resources and Community Development.

A native of Natchez, Mississippi, Moreau earned his PhD in water resources from Harvard University. He holds a B.S. degree in Civil Engineering from Mississippi State University and an M.S. in Civil Engineering from North Carolina State University. Dr. Moreau joined the faculty at Chapel Hill in 1968; he holds the rank of Full Professor in the Departments of City and Regional Planning and Environmental Sciences and Engineering. During this period he has been active in water resources research and public service activities, particularly in urban water management and planning. In 1974, he was a principal advisor to the Triangle J Council of Governments for the development of a regional water quality management plan, a project funded by the U. S. Environmental Protection Agency as a national model for planning under Section 208 of the Federal Water Pollution Control Act. Since 1977, he has served on the Board of Directors of the Orange Water and Sewer Authority, serving one term as its chairman. His recent research activities have been in the areas of quantitative risk assessment, watershed management and the financing of water and sewer services.

For the past four years Moreau has had administrative responsibilities as Associate Dean for Planning and Budgeting in the College of Arts and Sciences at UNC-Chapel Hill. While the Dean of the College is on leave during the spring of 1983, Dr. Moreau will act for him, thus limiting his active role as Director of the Institute before July 1, 1983. Dr. Stewart will continue to serve as Associate Director.

1983 TRIANGLE CONFERENCE ON ENVIRONMENTAL TECHNOLOGY

The 1983 Triangle Conference on Environmental Technology to be held April 5-7 is the 21st in a series hosted jointly by three universities and initiated over 30 years ago. It is designed as a forum for exchanging new ideas on environmental technology. With a new title, and modified somewhat in format, it continues as a regional annual conference, hosted on a rotating basis among the three institutions. An area featured in this year's conference will be ground water pollution.

Sponsors and Planning Committee

Duke University, Department of Civil and Environmental Engineering, Durham, NC: P. Aarne Vesilind

North Carolina State University, Department of Civil Engineering, Raleigh, NC: Charles Smallwood

Host Institution for 1983:
University of North Carolina at Chapel Hill, Department of Environmental Sciences and Engineering, Chapel Hill, NC: James C. Lamb, III.

Brochures will be mailed in January 1983. For further information, contact: Judith K. Carter, Program Assistant, Office of Continuing Education, UNC-CH School of Public Health, Chapel Hill, NC 27514 (919-966-4032).

Financial support has been provided by the Z. Smith Reynolds Foundation, Winston-Salem, NC.

CAROLINA ENVIRONMENTAL AFFAIRS CONFERENCE SET FOR MAY 11-12

The first Carolina Environmental Affairs Conference of The University of North Carolina--"A Healthy Economy in a Healthy Environment"--will be held on May 11-12, 1983, at the North Carolina State University McKimmon Center at Raleigh. The conference, sponsored by the Environmental Studies Council of The University of North Carolina, is intended to provide a forum for the examination of environmental conditions and concerns, with special emphasis on the contributions that the University community might make to problems associated with environmental management in the state.

An important part of the conference will be panels on which researchers and professionals present papers in areas concerning environmental conditions, trends, and management strategies. All papers should be relevant to North Carolina although research may have been conducted elsewhere. While the Council expects to select a number of papers concerned with the conference's major theme, any proposed paper related to environmental affairs will receive full consideration. Papers will be selected for presentation based on their contribution to the continuity of the conference program. The Council would like to have all institutions represented on the conference program. Major speakers will also address the conference theme. Selected papers and/or abstracts will be published in the conference proceedings.

The theme of the conference is: A Healthy Economy in a Healthy Environment.

Papers are welcomed on topics related to the following subthemes:

- economic incentives and environmental management
- toxic substances and hazardous wastes
- environmental health protection
- solar and renewable energy potentials
- public and private management of natural resources
- identification and protection of natural areas
- resource planning for outdoor recreation and tourism
- agricultural environmental management
- environmental indicators and monitoring

Those interested in presenting a paper at this conference, should send a one-page paper proposal by December 15, 1982, to:

Dr. E. Walton Jones
Vice President for Research
& Public Service Programs
UNC General Administration
P.O. Box 2688
Chapel Hill, NC 27514

The Environmental Studies Council will assess the proposals and organize them into appropriate panels. Invitations to present papers will be announced by January 1, 1983.

CONFERENCES AND WORKSHOPS

Leachate Management: Generation, Control, and Treatment. This seminar will be held on December 2, 1982, at the Holiday Inn, I-64 West-End, Richmond, Virginia. Many municipalities are facing new, strict criteria designed to minimize effects of solid waste leachate. The questions are many. What is Leachate? Why be concerned about it? How is it collected? How can it be treated? What will it do to POTW's?

To provide answers to the above questions and more, the Virginia Water Pollution Control Association, Inc. will sponsor this one-day seminar which will feature many of the country's leading experts in the field of leachate management. Speakers will discuss technical design considerations and share practical operating experiences for the challenging and growing nationwide problem of leachate management. All individuals dealing with solid waste disposal and wastewater treatment will find this seminar timely and informative.

For further information contact: Virginia Water Pollution Control Association, Inc., Beth Turner, Chairman, Education Committee, P.O. Box 614, Waynesboro, VA 22980.

Water Quality Modeling. This is a short course sponsored by the Water Resources Center, Desert Research Institute, University of Nevada System, January 10-14, 1983, to be held at the Hacienda Resort Hotel and Casino in Las Vegas.

The objectives of this short course are to define the need and justification for water quality criteria, to examine 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 problems.

For further information contact: Water Quality Modeling Short Course, Water Resources Center, Desert Research Institute, P.O. Box 60220, Reno, NV 89506 (702)673-7361.

POSITIONS AVAILABLE

The Department of Civil Engineering and Engineering Research Institute at Iowa State University announces vacancies in two tenure-track faculty positions, one in water resources engineering and one in environmental or sanitary engineering.

Position Open: August, 1983

Application Deadline: February 1, 1983, or until position is filled.

Submit resume to: Dr. Carl E. Ekberg, Jr., Head
Dept. of Civil Engineering
390 Town Engineering Bldg.
Iowa State University
Ames, Iowa 50011

WATER RESOURCES CONDITIONS IN NORTH CAROLINA

Streamflow was considerably below normal statewide with 7-day low flows near the 2-year drought level until the 25th. Heavy rains in the Coastal Plain and eastern Piedmont caused moderate rises on most streams, and at month end flows were above normal in these areas. Flows remain 10 to 40 percent below median in the Mountains and western Piedmont.

Water levels in water-table wells declined except in the western Piedmont where a slight rise occurred. Water levels are 1½ to 3 feet above average and are 2½ to 4½ feet higher than a year ago.

. . . *U. S. Geological Survey*

NEW PUBLICATIONS RECEIVED BY THE INSTITUTE

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

Water Resources Planning

"Competition for California Water - Alternative Resolutions," ed. by E. A. Engelbert, et al., avail. from Univ. of California Press, Berkeley, CA 94720, Price - $8.95.

"Summary of the Coastal Community Water Conservation Workshop," 6/3/82, for info. contact OWR, NRCD, PO Box 27687, Raleigh, NC 27611. (03D)

"The Escatawpa River - An Interstate Approach to Water Resource Management, 7/82, by A. L. Sage, III, et al., WRRI, MS St. U., MS State, MS 39762. (06A)

Water Quality Management

"Agriculture and Stream Water Quality--A Biological Evaluation of Erosion Control Practices," Bio. Series #107, 5/82, by DEM, NRCD, PO Box 27687, Raleigh, NC 27611. (05B)

"Treatment Technology to Meet the Drinking Water Standards for Trihalomethanes for Jackson, Mississippi," 2/82, by A. Shindal, et al., WRRI, MS St. U., PO Drawer AD, MS St., MS 39762. (05F)

"Treatment Technology to Meet the Drinking Water Standards for Trihalomethanes for Jackson, Mississippi, Part II Chloramines as Alternate Disinfectants: State-of-the-Art Review," 9/82, by A. Shindala, WRRI, MS St. U., PO Drawer AD, MS St., MS 39762. (05F)

"The Identification and Treatment of Bromides and Trihalomethanes in Potable Water from the Pearl River at Jackson, MS: Evaluation of Toxicity on Species Diversity," 12/81, by G. D. Barnes, et al., WRRI, MS St. U., MS St., MS 39762. (05F)

Water Quantity Management

"Technology Assessment of Irrigation Scheduling and Crop Response," 2/82, by W. A. Hall, CE Dept., CSU, Ft. Collins, CO 80523. (03F)

"Trickle Irrigation in the Eastern United States," (NRAES-4), 8/81, by Northeast Regional Agricultural Engineering Service, Riley Robb, Cornell U., Ithaca, NY 14853. (03F)

"Proceedings - Eighteenth Annual North Carolina Irrigation Conference," 12/2-3/81, ed. by R. E. Sneed, BAE, 211 Weaver, NCSU, Raleigh, NC 27650, price - $5. (03F)

Miscellaneous

"Evaporation Atlas for the Contiguous 48 United States," (NWS 33), 6/82, by R. K. Farnsworth, et al., Office of Hydrology, National Weather Service, Washington, DC 20240.

"Peat Deposits of Pamlimarle Peninsula--Dare, Hyde, Tyrrell, and Washington Counties North Carolina," 7/82, by R. L. Ingram, et al., Dept. of Geology, UNC-Chapel Hill, NC 27514. (W&E)

"The Water Resources Research Program of the U. S. Geological Survey," 6/82, by Office of Asst. Chief Hydrologist for Research & Technical Coordination, avail. from USGS, 413 National Center, Reston, VA 22092. (USGS)

ITEMS OF INTEREST:

WATER RESOURCES RESEARCH INSTITUTE
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N. C. STATE UNIVERSITY
RALEIGH, NORTH CAROLINA 27650

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December 1982

#201

GROUND WATER AVAILABILITY

IN THE PIEDMONT

December 8, 1982
Raleigh, North Carolina
Mission Valley Inn

9:00	Welcome
9:05	"Disspelling Old Myths" · Ground Water Occurrence · Occurrence of Fractures · Ground Water Budget · The Water Table Speaker: Ralph Heath
9:50	Questions
10:10	Coffee Break
10:30	"Exploration and Development" · Selection of Well Sites · Construction · Sustained Yield Determination · Cary and Charlotte Cases Speaker: Charles Daniel
11:30	Questions
12:00	Lunch and Luncheon Address "Ground Water Development in Cary" Speaker: William Hardin
1:15	"Readying a Well-Driller's Contract · Cost of Test Wells Speaker: Robert Heater
1:45	Questions
2:00	Coffee Break
2:15	"The Role of a Consultant and a Public Agency" · Costs and Funding · Approval of Well Sites · Hiring a Consultant Speakers: Allan Dietemann, Wally Venrick, Harry LeGrand, Perry Nelson
3:00	"Ground Water Pollution" Speaker: Harry LeGrand
3:30	"Planning and Political Considerations" · Subdivisions and Ground Water · Protecting Recharge Areas · Conjunctive Use · What Don't We Know Moderator: Betty Ann Knudson Speakers: John Scott, Harry LeGrand, Charles Welby, Boots Elam
4:00	Questions
4:15	Concluding Remarks Speaker: David Howells

Morning Moderator: Ed Holland
Afternoon Moderator: Jay Langfelder

Participants

City and county planners, managers, and public works directors are invited to attend. Consultants, well-drillers, and private water-suppliers may also benefit from the workshop. As an introduction to ground water and its occurrence in the Piedmont, participants will gain firsthand knowledge from those who have been working in North Carolina in the field of ground water development.

Purpose

The potential for developing ground water has not yet been sufficiently studied for the Piedmont. Too many unknowns remain to make a decision on the feasibility of ground water for many communities in the area. Triangle J Council of Governments and the Water Resources Research Institute hope, with this workshop, to begin a series of discussions and work sessions to look at ground water as a supplement to surface water supplies.

ADVANCE REGISTRATION FORM

MAIL THIS FORM WITH $10*, PAYABLE TO TRIANGLE J COUNCIL OF GOVERNMENTS:

GROUND WATER WORKSHOP
TRIANGLE J COG
P.O. BOX 12276
RESEARCH TRIANGLE PARK, NC 27709

NAME ____________________

ADDRESS ____________________

CITY ____________ STATE ______ ZIP ______

FIRM/ORG. ____________________

PHONE ____________________

*FEE INCLUDES LUNCH.

PLEASE RETURN BY DECEMBER 1