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TOXIC CHEMICALS IN WATER A PUBLIC HEALTH PERSPECTIVE

(Summary of remarks by Dr. Russell F. Christman, Professor and Head, Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill, at the Southeast Conference on Toxic Chemicals in Water, Charleston, S. C., April 14, 1981.)

Thousands of different chemical compounds are present in natural surface water systems. How many of these may actually be present in any one water is actually unknown, as is the extent of temporal and spatial variability. It is well known that the trihalomethanes are only a part of the total organic load in drinking water, and it is less well known--though documented--that they are also only a part of the total chlorinated organics present in drinking water. Since the trihalomethanes are ubiquitous, it is reasonable to assume that the other products are, too.

There is a bias in analytical procedures for volatile substances in all of the testing--including the actions/surveys. In fact, an analytical bias exists in all of the data that we have for organic molecules in the environment in favor of the simpler molecules. The scientific methodology used for trace organics are relatively sophisticated and are in an active state of current development. No reputable scientist would place a very high confidence on the precision or accuracy of anything we have measured to date. It is safe to say that the list of contaminants will grow as scientific research continues, and we may well be presently unaware of which compounds ultimately prove to be most worrisome. Thus, far from providing simple solutions to the problem before us, our science is still attempting to adequately describe the problem. Very few national surveys have been conducted on surface waters, drinking waters, and even fewer have been conducted on ground water systems. There is no sense of security in the analytical data before us. The number of compounds in the water environment that pose human health hazards is unknown. Only a small fraction of the compounds identified have been adequately tested for carcinogenicity. Scientific uncertainties are not restricted to laboratory experiments. Epidemiologic studies of human exposure are faced with enormous statistical constraints. Scientific extrapolations of animal test data must be made.

Definitive statements on toxic substances in water have not been forthcoming. That puts us in a tight spot. You deal with people in a regulatory framework every day. How long will the answer "because it's the law" hold up?

The scientific community has unwittingly added to this confusion by failure to recognize significant differences that exist between the terms risk and safety. Risk is a compound measure of probability and magnitude of an adverse effect. Whereas, safety is an independent social and individual value judgment regarding the acceptability of that risk.

In case of the Safe Drinking Water Act, the Congress seriously misstated the role of science by mandating that the National Academy of Sciences, or an equivalent institution, review the health hazards from contaminants in water and state a true limit of safety for each. Quite properly, NAS refused. They prepared a statement which gave the best possible scientific statement of the risks involved. Since then, additional work has been directed at establishing risk estimates for the growing list of organic contaminants identified in water systems. The creation of such lists is precisely what the research establishment should be generating as a part of the risk to public health that results from involuntary human exposure. The refinement of these lists is what we should be about. This would require substantial increases in budgetary allocations to national surveys and to research into improvements of analytical methodologies and methods for assessing cellular impacts of contaminants. This is the only way that our problem will be defined sufficiently to permit generalizations about the relative degrees of risk from different contaminants.

Research on chemical structure-activity relationships is vitally important but will not benefit us without adequate information on the actual structures constituting exposure hazards in time and space.

The U.S. EPA is presently seeking public reaction to new recommended maximum contaminant levels for toxic materials in drinking water. Since the Safe Drinking Water Act mandates the avoidance of known or anticipated effects and requires the Administration to consider the possible impacts of synergism from multiple exposures, the federal regulatory process has no alternative but to set standards for these compounds. In the case of carcinogenic materials, there is apparently no safe concentration, and one is led to the inexorable confusion that the maximum allowable concentration should be set at zero. However, zero cannot be obtained. If the Administration sets limit at zero, everyone will be in violation, and the law will have no meaning. If the limit is set at some other level, we must make a social value judgment of safety. The advance notice of rule making has taken the latter alternative, and public comment is now being sought relative to federal adoption of a risk level of one cancer death per million population for each contaminant as a safe level. The worst of this strategy is that there is no end in sight. As more compounds are identified as a result of investment in more sensitive analytical techniques, we are unavoidably led to a growing list of unattainable goals or federally predigested levels of safety.

Strategies are not right or wrong in the absolute sense. They are either appropriate or inappropriate. Our present strategy is inappropriate and may lead to the baby being thrown out with the bath water. Perhaps it is time that we reevaluate our investment in this approach to public health. At stake is our credibility with the public without which it will be difficult to obtain support for the necessary risk assessment research.

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TASK FORCE TO ADDRESS N. C.'s COASTAL DRAINAGE-RELATED WATER PROBLEMS

A task force appointed by the Governor to address water

management problems in coastal North Carolina held its first meeting in Raleigh on May 28.

Formation of the task force was prompted by the need to protect the state's coastal resources and at the same time allow maximum production by agriculture and forestry industries active in the area. Concern has been expressed over the impact of drainage from these industries on commercial fishingwaters.

The initial meeting brought together government officials as well as representatives from fishing, agriculture, and forestry interests.

Specific objectives for the group will evolve from future meetings, said Assistant Secretary for Natural Resources Neil Grigg. However, the primary goal will be to formulate a strategy for balanced development by forestry, fishing, and agriculture that is acceptable to all interests, he said. Plans are for the group to meet once a month through 1982.

The task force is comprised of three distinct groups: (1) a resource user group, consisting of representatives from agriculture (corporate and private),

fishing (fin and shell), and forestry (industrial and private woodlots); (2) a technical advisory group, consisting of university personnel, state and federal government officials, and representatives from environmental and wildlife interests; and (3) an advisory group made up of program directors in the Department of Natural Resources and Community Development.

Task force chairman is Dr. Joseph Phillips of N. C. State University. Support services will be provided by the NRCD Division of Soil and Water.

The first meeting featured a presentation by Connell Purvis of the Division of Marine Fisheries, who described drainage-related problems experienced by coastal fisheries. Fresh water draining to fragile estuarine nursery areas lowers the water's salinity, he said, causing fish production to be pushed downstream, where food and protection are lacking. Salinity in the area has steadily decreased over the past 25 years, he said. #

PUBLICATION LOOKS AT COASTAL LAND DRAINAGE

An 11-page publication by the North Carolina Agricultural Extension Service

gives an overview of coastal land drainage practices, why they are necessary, and how they can affect wetlands wildlife and fisheries resources.

Coastal Land Drainage for Agriculture and Forestry is written in general terms, complete with glossary. It is intended "to create an awareness of the major issues related to agricultural and forest land drainage by providing unbiased information," says the introduction. The report notes that drainage is essential for farm and forest production in the coastal zone, where most soils are naturally poorly drained and frequently saturated with water. When drained, however, the soils are "among the most productive in the nation for corn, soybeans, and loblolly pine." The report contains diagrams of drainage practices.

A section on drainage problems and environmental concerns notes some of the issues faced by farmers and foresters (financing, maintenance, and government programs on drainage). It also describes the nature of the wetlands and coastal fisheries and how they can be affected by drainage. Also included is a list of some of the strategies that have been suggested to balance the development of agriculture, forestry, and other resources.

The publication was prepared by William H. Doucette, Jr., N. C. State University Extension Soil Specialist. Single copies may be obtained from the N. C. State University Department of Agricultural Communications, 318 Ricks, Raleigh, N. C. 27607. #

SOIL AND WATER RESEARCH PRIORITIES FOR NATION IDENTIFIED Over 100 scientists and leaders gathered at a February workshop in Madison, Wisconsin, to identify national research priorities on the uses, management, and conservation of soil and water resources.

The workshop, supported by the U. S. Department of the Interior, included nine working panels as well as five cross-review panels (Dr. Wayne Skaggs of N. C. State University was chairman of the one on Energy Constraints and Dr. George Kriz of N. C. State University served on the Water Panel). Panel deliberations culminated in lists of priority research needs, six of which were chosen as most important.

Information from the workshop is contained in two forms: a Proceedings and a shorter Executive Summary. The six priority research needs, listed in the Executive Summary, are:

1. Sustaining soil productivity. Research is needed to quantify the relationship between plant growth and those soil attributes affected by erosion.
2. Developing conservation technology. Emphasis should include conservation tillage for cultivated land, management of crop residues and organic wastes, reclamation, reclamation of erosion-depleted soils and disturbed lands, nutrient management of all lands, and rehabilitation and management of rangeland and forest lands.
3. Managing water in stressed environments. Strategies and practices to increase total water yield and efficient water use must be improved.

4. Protecting water quality. Research must determine the relations involved in transport of sediments and chemicals by surface and subsurface flow to permit prediction and development of land management practices.
5. Improving and Implementing Conservation Policy. Research is needed to quantify the effect of alternative policies on adoption of soil and water conservation practices.
6. Assessing Soil and Water Resources. Technology is needed for data collection through a combination of ground, aircraft, and satellite acquisition systems, along with efficient data analysis.

The Executive Summary, Soil and Water Resources: Research Priorities for the Nation, is published by the Soil Science Society of America, Inc., 677 South Segoe Road, Madison, Wisconsin 53711. #

BASIC ISSUES IN GROUNDWATER POLLUTION Over the next decade, more than 1 million wells will have to be installed in the United States to monitor potential sources of groundwater contamination as a result of federal and state mandates to protect groundwater, participants in a recent seminar on groundwater quality protection in Houston were told.

The seminar was sponsored by Geraghty & Miller, Inc. and American Ecology Services, Inc., consulting firms in the groundwater field, for officials and water resources managers concerned with groundwater pollution.

Environmental attorney Edward Selig told attendees that liability in common law is what you have to fear most from groundwater contamination. It is never a defense in a tort action--a civil damage suit--to say you had a permit, he noted.

Problems in applying tort law to groundwater contamination include: the time between the causative action and the subsequent injury; the uncertainty of what constitutes an injury (e.g. does 1 ppb benzene in the water supply constitute an injury?); the problem of identifying who dumped the materials; and proving cause and effect. "The courts do not like statistical evidence," Selig said.

Pumping out contaminated groundwater is theoretically possible, but it has rarely been totally successful, James J. Geraghty, Geraghty & Miller, Inc., told the seminar audience. Most regulators stipulate on-site containment, but "in the final analysis, all clays or artificial barriers eventually leak," Geraghty said.

Dr. Olin C. Braids, A Geraghty & Miller associate, in a discussion on chemical data, said that some standards for groundwater pollutants are being proposed at concentration levels for which there is currently no available technology for detection.

The ultimate effectiveness of a groundwater monitoring program at an industrial site is dependent on an early, clear definition of the desired objectives of the program, according to David W. Miller of Geraghty & Miller. Costs for monitoring programs range from \$5,000 to satisfy minimal regulatory objectives to more than \$250,000 where contamination has been documented, he said. The system design should be based on demonstrated hydrogeologic principles and site-specific data, he concluded.

. . . Lyle S. Raymond, Jr., Extension Associate, water Resources Information Specialist, Center for Environmental Research/Cooperative Extension, Cornell Univ. #

APPLICATION OF ADVANCED TECHNOLOGY FOR POTABLE WATER SUPPLIES IN NORTH CAROLINA

A recent review of water treatment in Europe showed a concern with bacteriological and virological safety but

even more concern with chemical contamination. The Institute supported study shows that a number of techniques have potential application in North Carolina and the nation.

Five European water treatment techniques which have a definite potential include: ozone, chlorine dioxide, granular activated carbon, biological activated carbon and dissolved air flotation.

Ozone is an attractive alternative to chlorine as a primary disinfectant. It may also be useful for pretreatment purposes, trihalomethane precursor removal and overall organics oxidation. Cost considerations and a very short-lived residual are responsible for the limited use of ozone in the United States.

Chlorine dioxide is well suited for use both in pretreatment and posttreatment to provide a distribution system residual. Lower chlorinated organics formation, reduced pH dependence and a more persistent residual allow it to compete with chlorine. The major drawback with chlorine dioxide is its relatively high cost.

Granular activated carbon is attractive for the treatment of waters contaminated with organic chemicals. Difficulties are presently encountered in assessing the need for such treatment and in evaluating process performance. An additional factor is the significant costs associated with the process, particularly for replacement of exhausted carbon.

Biological activated carbon is a new process which is a variation of granular activated carbon treatment. Its potential advantage is the possibility for a significant increase in activated carbon service life. Biological activated carbon is now the subject of considerable research as basic questions about process capabilities remain unanswered.

Dissolved air flotation provides an alternative to sedimentation. Advantages over sedimentation include: a sludge thickening capability, a larger hydraulic surface loading and better algae removal. However, the process is more complex and limited data suggest that flotation may be cost competitive only when the above listed advantages are specifically useful.

This study was conducted by Gerald E. Speitel, Jr., Graduate Student Assistant, Department of Environmental Sciences and Engineering, University of North Carolina. It was supported in part through a grant from the Water Resources Research Institute with funds from the Office of Water Research and Technology, U. S. Department of the Interior. #

LESS TILLAGE SAVES MONEY AND PETROLEUM

No-till planting, with no conventional cultivation, was employed on some

257,000 acres of corn and soybeans in North Carolina in 1980, resulting in a fuel saving of \$1,187,000 compared to regular plowing. According to Foy D. Hendrix of Raleigh, state agronomist for the USDA-Soil Conservation Service, reduced tillage, with

less cultivation than conventional but short of complete "no till," was employed on another 790,000 acres. The fuel saving here was \$1,525,000 compared to conventional tillage.

The savings were calculated by using an average farmers' cost of \$1.10 a gallon for diesel fuel. Conventional tillage uses about 5.1 gallons per acre, while reduced tillage uses only 2.6 gallons an acre and no-till only nine-tenths of a gallon per acre. #

NORTH CAROLINA AMBIENT WATER MONITORING PROGRAM*

The Division of Environmental Management is charged with numerous responsibilities

relating to the protection of the natural environment of North Carolina. The purpose of this Division is to achieve and maintain, for the citizens of North Carolina, an environment of superior quality that will permit the beneficial uses of these resources.

The Ambient Water Monitoring Program is one of the mechanisms used to achieve the goals of the Division. The purpose of this program is to monitor a statewide network of stations on an established and continuing basis to determine the effectiveness of the total environmental program, to monitor and analyze trends in ambient water quality, and to provide the basis for identifying and initiating additional monitoring efforts when necessary.

Presently, this water quality network consists of over three hundred sites. Each site is sampled on a monthly basis for a variety of water quality parameters. The locations of these sites are statewide and encompass a wide range of environmental conditions. Monitoring is accomplished on flowing streams and rivers, estuaries and lakes throughout the State. Once these data are analyzed, the results are transmitted to STORET, which is a computerized data base for water quality data storage. Following data analysis, verification, and storage, this information is available for public use.

This information is used by various sections within the Division of Environmental Management for numerous purposes such as modeling, discharger compliance, eutrophication evaluations, water quality trends, effluent limits, water quality stream standards, stream segment classifications and to initiate further special investigations when questionable limits are detected. In addition, other agencies, universities, environmental groups and private citizens use this information for a variety of purposes.

The aquatic environment is very dynamic in nature rather than static. Therefore, the scope of a program to monitor such a changing environment must be dynamic also. This program undergoes continuous review to enable adequate data availability for those who strive to protect our aquatic resources.

For additional information contact: The Division of Environmental Management, Environmental Operations Section, Attn: Steve W. Tedder, P. O. Box 27687, Raleigh, NC 27611.

**This is Part III of a Three-Part Series describing the water quality monitoring of the Division of Environmental Management, prepared by Steve Tedder, Biologist, Environmental Operations Section. Parts I and II were in the April and May issues of the NEWS. #*

NEW INSTITUTE REPORTS

Nitrogen Cycling and Assimilative Capacity of Nitrogen and Phosphorus by Riverine Wetland Forests

by Mark M. Brinson, H. David Bradshaw and Emilie S. Kane.

Studies conducted in eastern North Carolina flood-plain swamps provided insights into the nutrient exchange between surface water and the sediments of the swamp forest floor. Diffusion of labeled nitrate to the forest floor resulted in rapid transformations to N_2O and N_2 by denitrification. Labeled ammonium was found to diffuse to sediments and accumulated in a sediment-exchangeable form. Also, ammonium was readily immobilized from the water by decomposing leaf litter and filamentous algae.

During the drydown phase, which is an annual summer-fall event in tupelo-cypress swamps, surface sediment became aerated. Available nitrogen reserves in the sediments were depleted during these periods.

An experiment was then conducted to determine the capacity of sediments for sustained nutrient assimilation by adding nitrate, ammonium, phosphate, and secondarily treated sewage effluent to surface water in separate chambers at weekly intervals for 46 weeks. Nitrate disappeared rapidly from the surface water between weekly additions and did not accumulate in subsurface water; denitrification was estimated to proceed at a minimal rate of $24.5 \text{ g NO}_3\text{-N}\cdot\text{m}^{-2}$ over the 10-month loading period. Substantial quantities of ammonium accumulated in surface water, and after a lag period, in the exchangeable ammonium fraction of sediment. However, summer drydown depleted these accumulations.

Copies of this report No. 167 are available from the Water Resources Research Institute. For out-of-state requests, there is an \$8 charge. #

**N. C. LAND USE CONGRESS
CONFERENCE: ENERGY AND LAND
USE: WHAT'S THE CONNECTION?**

The eleventh annual conference of the North Carolina Land Use Congress on

"Energy and Land Use: What's the Connection?" will be held at the Jane S. McKimmon Center, North Carolina State University in Raleigh on October 23-24, 1981. The conference, sponsored by the Land Use Congress, is designed to provide an annual forum for the examination of critical land use issues and concerns in North Carolina. The Land Use Congress would like to give all persons who are working on projects related to energy and land use an opportunity to participate in the conference program.

An important part of the conference will be panels where persons working on energy projects--solar, biomass, low head hydro, peat, wind power, wood energy, among others--have an opportunity to share their findings and results with others interested in the energy-land use connection. All papers should be relevant to North Carolina although research may have been conducted elsewhere. Papers will be selected for presentation based on their contribution to the continuity of the conference program. Major speakers will also address the conference theme. Selected papers and/or abstracts will be published in the conference proceedings.

Persons interested in presenting a paper at this conference should send a one-page "paper proposal" by August 1, 1981 to Dr. Raymond J. Burby, Conference Coordinator, Center for Urban and Regional Studies, 108 Battle Lane, Chapel Hill, N. C. 27514. Telephone: (919) 933-3074. #

CONFERENCES AND WORKSHOPS

Water Reuse in the Future, August 23-28, 1981, Twin Bridges Marriott Hotel, Washington, DC.

One of the sponsors is the Office of Water Research and Technology (OWRT)-U.S. Department of the Interior. Increased water reuse is inevitable, not only from the standpoint of pollution control but from conservation demands and economics. Water is simply too valuable to use just once and then discard. De facto reuse exists and planned reuse is a reality.

This is the second week-long symposium devoted entirely to the renovation and reuse of wastewaters from municipal, industrial, and agricultural sources. It is being held at a time when water policy, wastewater discharges, regulations, standards, health effects, resource planning and institutional problems are of increasing interest and concern to all.

The theme "Water Reuse in the Future" implies new water recycling approaches, planning strategies, innovative technologies, in-plant experiences, pertinent case histories and practical community applications of reclaimed sewage effluents. The technical program has been designed specifically to carry out the theme with emphasis on industrial recycling, pollution control and water conservation strategies in the 1980s.

For advance registration and hotel reservations, write to the AWWA Research Foundation, 6666 West Quincy Avenue, Denver, Colorado, USA 30235 before August 1981.

Industrial Waste Conference, June 29-30, 1981 at the University of Delaware, Newark, Delaware. The conference is being sponsored by the combined efforts of nine universities and in cooperation with agencies in several states.

This Thirteenth Conference places heavy emphasis on methodology for meeting effluent requirements of the Federal government and the states within the region. There will be presentations related to various aspects of industrial waste problems, their management, control and treatment.

For more information regarding this conference write to the Conferences and Centers, John M. Clayton Hall, University of Delaware, Newark, Delaware, 19711. Registrations received after June 15, 1981, subject to a \$10 late fee.

Water Conservation Workshop. A Water Conservation Workshop will be held at the Sandhills Community College, Southern Pines, 9:30 a.m., July 21, 1981. Topics for the workshop include: (1) Water Conservation in Municipal Water Systems, (2) Residential Water Savings Techniques, (3) Municipal Conservation Programs, (4) Leak Detection, (5) Water Management and Regional Systems, and (6) Revisions in Rate Structure's to Promote Conservation. Presentations will be made by A. R. Rubin, N. C. Agricultural Extension Service and Allan Dietemann, NRCD, Office of Water Resources. No fee will be charged and the workshop is open to public. For additional details contact: Randy Cotton 733-7260.

POSITIONS AVAILABLE

Assistant/associate Professorship in Environmental Engineering. The School of Civil Engineering at Purdue University seeks applications for a tenure-track assistant/associate professorship in Environmental Engineering. Candidates should have a Ph.D. degree and a speciality interest in the area of Biochemical Unit Operations. Duties will include academic year teaching of undergraduate courses in Environmental Engineering,

graduate courses in Biochemical Unit Operations, developing a funded research program in the candidates specialty area, and directing graduate student research. Rank and salary will be commensurate with experience.

Send resume and the names of three references to Professor H. L. Michael, Head, School of Civil Engineering, Purdue University, West Lafayette, Indiana 47907.

Research Assistant Professor, Water Resources. Appointment will be in the Vermont Water Resources Research Center, School of Natural Resources, University of Vermont, Burlington, Vermont 05405. Candidates must possess a Ph.D. degree in a field related to job responsibilities and be well trained in water quality, mathematical and computer modeling and surface water hydrology. Knowledge of soil systems is desirable. The candidate must have an interest and experience in carrying out field research activities.

Interested candidates should send resume, along with names and addresses of three references to: Dr. E. Alan Cassell, Director, Vermont Water Resources Research Center, University of Vermont, 601 Main Street, Burlington, Vermont 05405, telephone: (802) 656-4057.#

WATER RESOURCES CONDITIONS For the sixth consecutive month, streamflows in NORTH CAROLINA in most areas were deficient although rainfall was generally normal or

above for the month. Rains of 1/2 to 2 inches on the 20th caused a slight increase in flow on most streams. Widely scattered, locally heavy rains on the 28th, ranging from about 1/2 inch to over 9 inches, caused minor flooding along headwater streams in the southern Mountain and central Coastal Plain regions. Because of the scattered nature of the rains, however, streams across most of the State had only slight increases in flow.

Monthly mean flows at USGS index gaging stations reflect the severity of the current drought. Flow in the French Broad River at Asheville was the lowest for May since 1941. In eastern North Carolina, monthly mean flows in Contentnea Creek at Hookerton (Greene County) and Deep River at Moncure (Lee County) were the lowest in over 50 years. While the rains during May were a welcome relief, levels in numerous reservoirs and lakes also remained below normal.

Except for minor increases in the Mountains, groundwater levels continued to decline across the State. Compared to long-term records, levels in unpumped, water-table wells generally ranged from about one foot below normal in the Mountain region to 2-4 feet below normal in the Piedmont and Coastal Plain regions.

. . . . U. S. Geological Survey
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WATER RESOURCES LEGISLATION IN NORTH CAROLINA

Bills Introduced

Senate

S 587 Environmental Policy Act extended

"To continue the North Carolina Environmental Policy Act of 1971." Extends cited act, Art. 1, GS Ch. 113A, to September 1, 1991 (now, ends September 1, 1981).

House

H 1085 Duplin watershed funds

"To appropriate funds for the Limestone Creek and Muddy Creek Watershed Projects in Duplin County." Appropriates \$197,761 from General Fund to Dep't of Natural Resources and Community Development for fiscal 1981-82 and \$168,500 for fiscal 1982-83 for cited projects. Funds appropriated subject to funding provisions of GS Ch. 139, Art. 4. Effective July 1, 1981.

Amendments and Committee Substitutes

H 747 Chowan River, Albemarle Sound basins study (digested in WRRRI NEWS No. 182, p. 8), Committee substitute adopted in House 5/28/81: (1) increases from six to eight the number of comm'n members; (2) increases the number of nonlegislative members appointed by the Lt. Governor and House Speaker respectively from one to two; (3) requires all nonlegislative members to be residents of the Chowan River or Albemarle Sound Basin areas; (4) requires comm'n's report to evaluate the Chowan River restoration efforts undertaken by Dep't of Natural Resources and Community Development; (5) makes the dep't responsible for conducting the Chowan River restoration efforts and initiating studies leading to an Albemarle Basin Restoration Project, submitting annual reports to the Governor and General Assembly, investigating appropriate restoration strategies, implementing them through appropriate laws; developing appropriate financial, technical, and institutional cooperation with local gov'ts and State of Virginia; developing an index or indicator for success of restoration efforts; operating a local office in the area, augmenting state funds with federal and local funds, and assigning a full-time project manager; (6) increases comm'n appropriations from \$2,500 to \$5,000 for each year of the 1981-83 fiscal biennium; and (7) appropriates \$400,000 for 1981-82 fiscal year and \$360,000 for 1982-83 fiscal year from General Fund to dep't for purposes of act.

- H 797 Water Capacity Use Act procedures (digested in WRRRI NEWS No. 183, p. 9), Committee substitute adopted in House 5/15/81 changes some procedures required of Environmental Management Comm'n under Part 2 (regulation of use of water resources), Art. 21, GS Ch. 143 including: (1) allows administrative hearing before comm'n for anyone adversely affected by a rule issued under GS 143-215.13(d) (declaration of capacity use areas) and specifies that hearings and judicial review must be conducted under GS Ch. 150A (Administrative Procedure Act); allows comm'n in its sole discretion to stay effectiveness of a rule pending hearing and judicial review; (2) requires comm'n to give notice of receipt of an application for a permit under Part 2, Art. 21, to all other permittees and applicants for permits within same capacity use area; requires notice be given within ten days of comm'n receipt of application and requires comm'n to give notice of its proposed action to all permittees or applicants within same capacity use area at least 18 days before action's effective date; (3) requires that appeals be conducted de novo and on any new or additional evidence introduced in superior court (appeals under the Administrative Procedure Act are on the record). #

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

- "Applied Fluvial Geomorphology," (#31), 3/81, by J. G. MacBroom, IWR, U. of CT, Storrs, CT 06268. (02J)
- "Water Resources Protection Technology: A Handbook of Measures to Protect Water Resources in Land Development," 1981 by J. T. Tourbier et al., avail. from Urban Land Institute, 1090 Vermont Avenue, NW, Washington, DC 20005, price: \$22. (06A)
- "Water Planning in Britain," 1980, by D. J. Parker, et al., avail. from George Allen and Unwin Ltd., 40 Museum St., London WC1A 1LU, Price - \$19.95. (06B)
- "The Yawn Model: Yet Another Watershed Numerical Model," (Model Description and User's Model), 4/81, by C. H. Porter, avail. from Civil Engr. Dept., School of Engineering, Mann Hall, NCSU, Raleigh, NC 27650. (04A-Urban Runoff)

Water Quality Management

- "Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water," (#156), 2/81, by J. C. Means, et al., WRC, U. of IL, 2535 Hydrosystem Lab., 208 N. Romine, Urbana, IL 61801.(05A)
- "The Nitrogen Cycle in the Delaware River," 2/81, by R. B. Tiedemann, et al., NJ WRRRI, Rutgers, New Brunswick, NJ 08903. (05B)
- "Radon-222 in Potable Water Supplies in Maine: The Geology, Hydrology, Physics and Health Effects," 7/79, by C. T. Hess, L&WRC, UME at Orono, 11 Coburn Hall, Orono, ME 04469. (05A)
- "The Relationship Between High Sodium Levels in Municipally Softened Drinking Water and Elevated Blood Pressures," (#158), 4/81, by G. R. Breneman, et al., WRC, U. of IL, 2535 Hydrosystem Lab., 208 N. Romine, Urbana, IL 61801 (05C)
- "Modeling Soil Water Contents and Their Effects on Stream Flow in Kentucky," (#128), 1981, by G. W. Thomas, et al., WRRRI, U. of KY, Lexington, KY 40506. (02G)
- "Responses of Submersed Vascular Plant Communities to Environmental Change," (FW/OBS-79/33), 8/80, by G. J. David, et al., avail. from Information Transfer Specialist, U. S. Fish and Wildlife Service, Eastern Energy and Land Use Team, Route 3, Box 44, Kearneyville, WV 25430. (02I)

Water Quantity Management

- "Manual of Practice for Urban Drainage," (#104), 1980, by Training & Technology Transfer Div. (Water), Environmental Protection Service, Environment Canada, Ottawa, Ontario, K1A 1C8. (04A)
- "Proposed Model Policies for Urban Drainage Management," (#102), 1980, by Urban Drainage Policy Comm., avail. from Training & Technology Transfer Div. (Water), Env. Protection Service, Env. Canada, Ottawa, Ontario, K1A 1C8. (04A)
- "Rock Type and Minimum 7-Day/10-Year Flow in Virginia Streams," (#116), 4/81, by W. Smith, VA WRRRC, VPI & SU, 617 N. Main St., Blacksburg, VA 24060, Price: \$6/copy. (02E)
- "Water Resources Data for North Carolina (Water Year 1980)," (NC-80-1), '81, by USGS, Water Resources Division, USGS, 436 Century Station Post Office Bldg., 300 Fayetteville St., Raleigh, NC 27602. (07)

Miscellaneous

- "Report of the Governor's Task Force on Waste Management," 2/81, by B. G. Greenberg, avail. from Office of the Governor, Suite 810, Capitol Club Building, 16 W. Martin Street, Raleigh, NC 27611. (05E)

SPECIAL

Water Problems of the Albemarle-Tidewater Region

The critical nature of water problems in northeastern North Carolina was made clear in a talk by Dr. Neil S. Grigg at the recent State Water Conference in Raleigh.

Grigg, Assistant Secretary for Natural Resources, said there are two major impediments to finding solutions--scientific uncertainty as to the problems' causes (with diminishing funds for future research) and institutional problems ("patchwork" jurisdiction, fragmented authority)--but that efforts must continue on all fronts in spite of these difficulties. To do otherwise, he said, will allow the deterioration of a vastly productive region of the state. The Albemarle-Pamlico system, which drains over 30,000 sq. mi., should be considered a national resource, comparable in importance to the better-known Chesapeake Bay system, he said. The future of the area is being threatened, however.

"North Carolina has in the Albemarle and Tidewater region, together with Virginia, a series of emerging water crises, which we only now are beginning to understand, but which are defying the usual channels of government action," he said.

The best known of the problems exists on the Chowan River and is an example of how scientific uncertainty can hinder progress. Overenrichment of the River from a number of sources has caused nuisance algal blooms, fish diseases, and aesthetic problems. About 25 percent of the drainage comes from N. C., about 75 from Virginia. The main sources of these nutrients--industries, agriculture, forestry, and municipalities--include strong constituent groups, and to control their nutrient input requires exact answers on the causes of the algal blooms. Much progress has been made, but still, such answers are still lacking, even after one and one-half million dollars has been spent on this cause. And, said Grigg, "it is not likely that we're going to get another million and a half dollars" to seek answers."

Another problem for northeastern North Carolina is water supply, specifically, the interbasin transfers from the Chowan River system to the water-short Norfolk area. Some are large, with a capacity of 20 to 40 million gallons a day. Such transfers, said Grigg, take "water that belongs to northeastern North Carolina for the future and put it in another region." They also remove water that would provide much-needed flushing action to deal with algae blooms downstream. Institutional problems stand in the way of resolving the water supply issue. Two states are involved, two EPA regions, two Corps of Engineers districts, and various local governments--none with complete control.

A third critical issue for the area is groundwater. Withdrawals such as the Union Camp Corporation's 40 million gallons a day for pulp and paper processing in Franklin, VA., lower water tables, drying up farm ponds and increasing pumping costs in both North Carolina and Virginia.

If these problems--the Chowan, water supply, and groundwater--are not solved, the impacts will be great. Of the Chowan, Grigg said, "If we don't solve the Chowan River problem, (the people of the Albemarle region) can forget about any economic development for their region in the future." Commercial fishing will also be lost. Failure to resolve the water supply issue will threaten "the health, welfare, and economic development of the Norfolk-Virginia Beach-Tidewater region, which is a major population center of this part of the world," Grigg said. And if the groundwater problem is not solved, he added, "we will be robbing Peter to pay Paul," and damaging agriculture, industrial development, and economic potential for the future.

For these reasons, Grigg said, work must move ahead despite federal budget cuts and other difficulties. "We just don't have scientific certainty, we don't have the money to put into it, we've got to find a way to manage these resources without the scientific uncertainty being completely resolved, while at the same time we move ahead with the best scientific talent that we can marshal and find the answers." Money must be sought to continue University research, even as other efforts continue, he said, because ultimately research will provide the key to management decision.

Efforts underway include the implementing of a Governors' agreement between North Carolina and Virginia to work together on the problems; implementing an agreement by the two states on a planning process; and a commitment by North Carolina to help Virginia solve its water supply problems.

Grigg concluded by citing the four most important ingredients for solving problems in the Albemarle-Tidewater region: (1) outstanding political and technical leadership; (2) sustained money and support from state or federal government ("I don't see it coming from another source," he said); (3) a sustained high level of local interest and pressure; and (4) a high level of scientific effort ("applied research to solve real problems").

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