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EDITORIAL

The North Carolina Coastal Research Program

The Coastal Research Program at North Carolina State University was established in June of 1966 and charged with the responsibility of investigating ways of retarding and eliminating coastal erosion in North Carolina. Since its inception, the program has carried out research on coastal erosion relevant to pressing problems in North Carolina. At present six persons in the Departments of Botany, Civil Engineering, Geosciences, and Soil Science are supported either wholly or partially by the program.

Research in botany and soil science has been directed toward developing methods of stabilizing coastal sand dunes and dredge spoil. This work has concentrated on the basic ecology of dune and marsh grasses and the use of these plants for stabilizing natural and man-made surfaces. A set of recommendations has been developed for planting of coastal sand dunes. These recommendations include kind of plants to be used, time of planting, and fertilization regime. In addition, a new strain of American beach grass called "Hatteras" has been developed. This strain has been released to the public and is available from several commercial nurseries in North Carolina.

The Department of Civil Engineering has carried out an extensive reconnaissance of the status of coastal erosion in North Carolina using aerial photographs. This study has identified sections of the coast that are particularly prone to erosion and has demonstrated the rates at which erosion, or accretion, is occurring. In September 1970 a qualified coastal engineer, Dr. Jerry L. Machemehl, joined the faculty in Civil Engineering. He is currently developing a research program in coastal erosion related to North Carolina problems. In addition, he is serving as a technical reviewer for all dredging permit applications submitted to state officials. Research in the Department of Geosciences has concentrated on processes relating to sand movement on and off North Carolina beaches. These studies provide the technical background by which processes of coastal erosion can be understood.

The members of the Coastal Research Program are available to provide advice on coastal erosion problems to North Carolina citizens and governmental agencies. Publications dealing with the results of the program research are available. In

addition, information on dune stabilization has been made available to all county agents in coastal counties and demonstration plantings of dune grasses have been made in all coastal counties. The program sponsored a symposium on coastal erosion problems in North Carolina at Wilmington in March of 1970. The proceedings of this symposium are being written up now and will be available to the public this spring. Hopefully, this seminar can be repeated again soon in the northern part of North Carolina so that information on erosion will be available to citizens in that part of our state.

The program welcomes contact with citizens and governmental agencies in the coastal part of our state. We feel that the information that we have to convey is of considerable importance to the citizens of eastern North Carolina in the management of their valuable coastal resources.

Arthur W. Cooper
Director
Coastal Research Program

NEW INSTITUTE REPORTS

Report No. 44: Factors Influencing the Residential Utilization
of Reservoir Shorelands in the Southeast

by

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and Shirley F. Weiss

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The present report draws on data for 74 multipurpose reservoirs in the Southeast to evaluate factors associated with shoreline residential use. Shoreline dwelling units adjacent to these impoundments range from a high of over 7000 residences adjacent to Lake Sidney Lanier, Georgia, to a low of only three residences adjacent to Fontana Lake in North Carolina. Influence factors considered include project characteristics, characteristics of the shoreline and area immediately surrounding a project, and characteristics of the region in which a reservoir project is located. This information was derived from a questionnaire completed by private power company, Corps of Engineers, and Tennessee Valley Authority personnel and various U. S. Census series.

Analysis of data indicates that various indicators of the size of a reservoir project (project area, reservoir surface area, and length of shoreline) have a high positive association with shoreline residential use. But contrary to expectations, neither the extent of project shorelands nor the percent of the shoreline included in the boundaries of a project adversely affect residential use. Higher water level fluctuations tend to be associated with a lower level of residential development, although this factor is statistically significant only for Tennessee Valley Authority reservoirs.

As expected, reservoirs in more visually attractive surroundings, reservoirs with nearby (within 25 miles) SMSA's, and reservoirs with a larger, more affluent number of persons living nearby have attracted more residential development than reservoirs with lower values for these indicators. These relationships are clearly demonstrated for Corps of Engineers reservoirs, but thus far cannot be shown to be significant in the determination of residential use adjacent to TVA reservoirs. Contrary to expectations, topography, soil characteristics, and the quality of access to a reservoir do not have a detectable influence on the number of shoreline dwelling units. Finally, except for Corps of Engineers reservoirs, regional (counties within 75 miles of a reservoir) population characteristics and alternative water-based locational opportunities appear to have little effect on the extent of shoreline development.

Although these analyses represent only a first effort at isolating key factors influencing the residential development of reservoir shoreline areas, the present pattern of shoreline development has at least one important policy implication. With the extent of taxable private shoreline investment as a criterion, local provision of public recreation facilities seems to be feasible for larger reservoirs located within relatively populous and affluent jurisdictions. In the case of smaller reservoirs in low-income and rural areas, however, local government should probably not be expected to provide such facilities nor, it seems, should local officials expect private recreational investment at multipurpose reservoirs to provide a windfall in the way of fiscal dividends through property taxes and other levies.

Report No. 45: Proceedings Workshop on Stream Channelization and Wetland Drainage

The proceedings of this workshop explores the beneficial and adverse effects of stream channelization and wetland drainage to facilitate more effective project review and identify research needs. Participants included representatives of federal and state agencies, North Carolina Wildlife Federation, League of Women Voters, and the University community.

Considerable emphasis was placed on the need for a statewide land use policy and plan as a framework for decisions on wetland management. Needed studies include:

- a. Before and after studies of stream channelization and wetland drainage to include:
 - (1) Fish and wildlife
 - (2) Forest Production
 - (3) Ground water recharge
 - (4) Effect on downstream flood conditions

- b. Inventory of wetlands including identification of lands which need to be preserved in their natural state, those which can support multiple use, and those which can be forfeited for other purposes.

- c. Effect of wetland drainage on regional water resources.
- d. Alternative approaches to the management of wetland systems together with their environmental impacts.

Report No. 47: Perception of Water Resource Information Sources and Educational Needs by Local Officials and Special Interest Groups

by
James M. Stewart
Department of Adult and Community Education
and
Professor David H. Howells
Director
Water Resources Research Institute

This reports one phase of a more inclusive research effort on communication and education techniques in water resource management, which includes information from questionnaires mailed to seven categories of local officials and interest groups. Seven out of ten respondents felt that the public does not know where to go for answers to water resource problems. Eighty percent indicated a need for additional information. An even higher proportion felt there is not an adequate public education program on water resources in North Carolina. Pollution control ranked first as the subject in which respondents desired additional information.

Report No. 48: Water Quality Characteristics of the New Hope and Lower Haw Rivers July 1966 - February 1970 With Estimates of the Probable Quality of New Hope Lake

by
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Department of Environmental Sciences and Engineering
University of North Carolina at Chapel Hill

The water quality characteristics of the lower Haw River and the New Hope River have been evaluated on the basis of 19 water quality parameters. One of the sampling stations on each river coincided approximately with the location of a gaging station of the U.S. Geological Survey. Flow records from these gages have been used to prepare estimates of mass transport of several of the water quality parameters.

The physical, chemical and biological analyses have provided data to develop representative estimates of the quality of the two river systems. Projections based on these estimates have been made as to the probable water quality that might be expected in the New Hope Lake. The existing rivers carry a substantial pollution load into the area to be flooded by the impoundment now under construction. Although water quality degrading materials transported by the Haw River are greater by factors of 5 to 7 times that of the New Hope, the oxygen balance in the Haw River at the location of the new lake indicates that the upstream contributions of oxygen consuming materials have been essentially stabilized and the oxygen resources of the Haw River are near normal. In contrast, although the New Hope River transports a substantially smaller pollution load in

terms of quality degrading materials per unit of time, oxygen assets have not recovered to the same extent as in the Haw.

Due to the circumstances of the dimensions and configuration of the impoundment, the flow of the Haw River will be retained for a relatively short period, estimated at five days whereas the flow of the New Hope will, on the average, be retained in the lake for over 400 days. With the major pollution load on the New Hope entering the new lake in its headwater areas, it is estimated that the overall quality of the waters in the new impoundment will be controlled primarily from pollution from the New Hope drainage.

Assessment of the dimensional characteristics of the two arms of New Hope Lake indicates that the arm of the lake that will be formed by the flooding of the valley of the Haw River will be a short, deep impoundment with small storage volume and small surface area. In comparison, the area to be flooded in the valley of the New Hope River will comprise the major portion of the total storage volume and surface area. Nevertheless, the flow in the Haw River is on the average about 4.5 times greater than the average flow of the New Hope River. The average retention time of the arm of the lake formed by the flooding of the Haw River will be only five days as compared to over 400 days for water in the portion of the lake formed by the New Hope River.

It can be concluded from the water quality data summarized in this report that the existing water quality is sufficiently poor to indicate that the usefulness of New Hope Lake for recreational pursuits will be questionable. The impounded water will also have quality characteristics that would make it undesirable as a raw water source for a municipal water supply. The initial and immediate effort in water quality improvement should be centered on the New Hope drainage and particularly the residual polluting materials being discharged in the effluents of the sewage treatment plants of the cities of Chapel Hill and Durham that drain to the New Hope River.

GUIDELINES ON ENVIRONMENTAL QUALITY

The Federal Council on Environmental Quality has proposed to revise its guidelines on the preparation of detailed statements on proposals for legislation and other major federal actions significantly affecting the quality of the human environment required by the National Environmental Policy Act.

The revised guidelines specify that draft statements on administrative actions by agencies be released to the public as soon as they are circulated for comment and that the proposed action not be taken for at least ninety days after public availability of the statements. The guidelines also call for public hearings where appropriate with draft impact statements available at least fifteen days before such hearings.

In another revision, CEQ notified federal agencies and departments that final environmental impact statements must be available at least thirty days before

final action is taken. Prior to this change, agencies and departments could act immediately upon filing the final statement.

Prior to adoption, consideration will be given to any comments, suggestions, or objections which are submitted in writing to the Council, 722 Jackson Place, N.W., Washington, D. C. 20006, Attention: General Counsel, within a period of forty-five days from publication in the Federal Register. Publication date was January 28, 1971.

A copy of the proposed guidelines is available for review at the Institute office.

NORTH CAROLINA'S SHARE OF WATER RESOURCE PLANNING FUNDS INCREASED

Final allocation of state water resource planning grants by the Federal Water Resources Council resulted in an increase in North Carolina's share from a previously announced (January News) \$55,000 to \$80,000. The amounts of the grants are based on the requests of the states, the area, population, economic conditions and the need for assistance within each state. Grant funds must be matched by state funds.

TWENTIETH SOUTHERN WATER CONFERENCE

Don't forget to mark your calendars for the 20th Southern Water Conference in Chapel Hill on April 1 and 2.

A regional conference of the Research Triangle Universities, it is sponsored this year by the Department of Environmental Sciences and Engineering. An outstanding program awaits water resource scientists, engineers and administrators from North Carolina and the other Southeastern states.

INTERSTATE CONFERENCE ON WATER PROBLEMS

Over 200 leaders in federal and state water and land resources agencies attended a national water and land resources seminar in Cincinnati, February 2-4. Sponsors of the seminar were the Interstate Conference on Water Problems and the U.S. Water Resources Council. The theme of the meeting was "Water and Related Land Resources--The Challenge Ahead." Major purpose of the seminar was to review and evaluate the five-year-old Water Resources Planning Act.

A policy of considering water resources on the regional level was stressed by James R. Smith, assistant secretary of the U.S. Department of Interior. He stated the administration viewpoint of the importance of decentralizing federal government.

Smith also emphasized the need for coordination and involvement of agencies, non-government as well as government at all levels.

Irving K. Fox, associate director of the Water Resources Center at the University of Wisconsin, suggested that some of the major concepts of the Water Resources Planning Act are about to become outdated. He agreed with the decentralization of the federal system, and also stated that the river basin concept for water resources planning and management should be replaced by selection of boundaries according to conditions and needs. Fox added that other changing concepts include the influences of water programs on income distribution and land use. He recommended development alternative plans, rather than a single "best" plan, in water resource conservation and management.

The president of the Conservation Foundation, Sydney Howe of Washington, D. C., called for a "major reshaping" of the 1965 Water Resources Planning Act, in order that it can be a useful tool in meeting contemporary social and environmental needs. He urged participation of "citizen environmentalists," along with joint participation of groups--civic, private, government--at all levels. Howe listed four "indicators of change" in resources planning as urban concentration, growing strength in state government, direct participation--activism and a lack of confidence in established institutions. In supporting legislation to implement a National Land Use Policy Act, Howe said that Provision should be made for regulation of flood plains as an essential part of a state's land-use planning and regulation program.

William B. Nye, newly named director of the Ohio Department of Natural Resources and the Wednesday luncheon speaker, recommended that government at all levels become more responsive to the needs of people. Consolidation of state agencies was suggested by Nye as one means to increase state government efficiency. He also urged "the establishment of yardsticks of progress, to measure the environment in terms of quality and improvement, rather than by plans made, projects completed or dollars spent." Stating that "We need better water, not more reports," Nye mentioned the need for a strong effort to clean up Lake Erie. He stated that the present generation must accept youth's challenge and involve youth as well in solving the problems of pollution and waste.

Major General J. P. Koisch, Director of Civil Works, Corps of Engineers, stressed regional benefits of his agency's programs. He said that there is no conflict between Corps planning and construction functions, stressing the urgency of meeting environmental responsibilities. Koisch stated that all agencies, government and private, must be prepared for the development that will continue to come to this country. In referring to the Corps' permit system, for discharges into navigable

waters, Koisch said that 40,000 permits will be needed to meet requirements under the 1899 Refuse Act.

Highlights of Panel Sessions

Panel A (Coordinating Federal Programs)

The panel agreed that: While the Water Resources Council has performed adequately under the framework of the Water Resources Planning Act, a change in structure should be made to make the Council more effective in policy direction; the nation needs a clearly defined national water policy periodically updated to meet changing goals as well as new needs; early public involvement in planning is vital.

The panel recommended: That structural changes be made in WRC to provide a chairmanship which will increase WRC influence in policy area; that funds for comprehensive planning be appropriated to WRC for transfer to participating agencies; that WRC develop guidelines for earlier public participation in water resources planning.

Panel B (Providing Workable Field Programs)

The panel agreed: That land use and water planning should be integrated; that river basin commissions, with certain changes in existing laws, policies and regulations, can function effectively in joint planning processes; that new mechanisms for intensive management will be needed in the commission regions; that planning and construction functions should be related.

The panel recommended: That WRC encourage the establishment of mechanisms for federal-state cooperation for comprehensive water and land use plans for all regions of the U.S., with increased encouragement for the participation of local governments; that intrastate and regional organizations be brought into the coordinated planning processes, through river basin commission activities; that the authorities and responsibilities of river basin commissions should be construed as applying to water and related land resources of estuaries and the coastal zone, including the Great Lakes; that federal funds be supplied to the states during the first two years of planning studies to assure active participation by the states.

Panel C (Strengthening the States)

The panel agreed: That the efforts of groups (federal, state, local, non-governmental) must be joint, positive, cooperative and coordinated; that co-equal partnerships, of state, federal and local agencies, are a necessity in comprehensive water and related land resources planning; that participation of urban and other local interests, in water and land resources planning, can be coordinated through the states and river basin commissions.

The panel recommended: That all of the organizations and agencies, dealing with water and land resources, should be strengthened; that states should move toward long-range funding arrangements, at state levels, for water resources planning, development and management; that the Water Resources Council assist the states in developing grant consolidation; that full use be made of the comprehensive resources planning definitions, guidelines and principles of the Water Resources Planning Act and the concepts set forth in the proposed Land Use Policy Act.

REPORT TO THE CONGRESS ON INDUSTRIAL WATER POLLUTION

A recent report, "Controlling Industrial Water Pollution--Progress and Problems," by the Comptroller General to the Congress covering a study of fourteen waterways in five states--Georgia, Maine, Michigan, Ohio, and Washington--concluded:

More needs to be done in the reduction of pollution from industrial wastes.

Achievements vary from state to state.

Where state agencies had limited funds and staff, personnel spent much time on the review of engineering plans for waste treatment facilities but did not perform other important activities, such as plant visits and water quality monitoring.

Effective planning has been hampered by lack of data on the types and extent of pollution from industrial wastes and lack of knowledge of effects on water quality.

Enforcement action is hampered by a lack of:

1. Information upon which to act,
2. Authority to enforce specific effluent restrictions,
and
3. Authority to enforce dates set for implementing abatement measures without showing a violation of water quality standards or danger to health and welfare.

The report recommended that the Environmental Protection Agency should:

1. encourage the states to strengthen their staffs;
2. develop, in cooperation with the states, an inventory of industrial sources of pollution;
3. Obtain data on trends in water quality and on progress being made by industry in meeting target dates for the construction of abatement facilities; and

4. provide additional guidance to the Agency's regional personnel on enforcement procedures.

Recommendations to the Congress included:

1. Federal authority to establish and enforce specific effluent restrictions.
2. Expansion of federal jurisdiction to all navigable waters, both interstate and intrastate.
3. Failure to meet implementation schedules being considered cause for enforcement action.
4. National effluent charges to apply to all substances, other than domestic sewage, that detract from the quality of the water.
5. Additional grant funds to states for administering water pollution control programs. Factors to be considered in awarding additional grant funds include whether a state is providing adequate manpower and is instituting measures for recruiting and developing personnel.

CLOSED BEACHES AND FISH KILLS

The Environmental Protection Agency has instituted an annual public report of the number of beaches in the United States shut down by health authorities because of pollution, William D. Ruckelshaus, Administrator of the EPA, has announced.

A preliminary survey of beach closings was launched last July, and the fragmentary reports obtained in this initial effort showed that ninety-one beaches have been closed or posted as polluted in recent years. Some were closed or posted permanently, some temporarily.

The annual public report on beach closings will identify and situate the shutdown beach and include information on duration of shutdown, the number of persons who would normally use the beach, whether the beach is public or private, and the estimated economic loss resulting from closure.

EPA has also announced release of the tenth annual fish kill report. Fish fatalities in 1969 totaled 41 million, an increase of 170 percent over 1968.

By far the largest single pollution-caused fish kill reported in 1969-- 26.5 million fish--occurred in Lake Thonotosassa at Plant City, Florida. Effluent from industrial and municipal sewage treatment operations has been entering the lake untreated for some fifteen years. Nutrients in these wastes reduced the oxygen in January 1969 to a level in which fish could not survive.

Industrial operations led the report in both the highest number of incidents and the highest number of fish killed in 1969. Some 199 cases of industrial pollution were reported, resulting in the death of 28.9 million fish. Municipal pollution, which in 1968 accounted for most of the fish deaths--7.0 million--killed the fewest number of fish in 1969--1.2 million.

Copies of the report, entitled "1969 Fish Kills," may be purchased for 20 cents each from the Superintendent of Documents, Washington, D. C. 20402.

AATCC SYMPOSIUM: THE TEXTILE INDUSTRY AND THE ENVIRONMENT

Pollution control by the textile industry will be the dominant theme of a symposium sponsored by the Environmental Sciences Technology Committee of the American Association of Textile Chemists and Colorists at the Sheraton-Biltmore Hotel, Atlanta, Georgia, on Wednesday and Thursday, March 31-April 1, 1971. Chairman of the symposium is Joseph S. Ameen, Burlington Industries, Greensboro, North Carolina.

The symposium will begin on Wednesday, March 31, at 9:30 a.m. The topic for the first day will be the pollution problem--the economics involved, the effects of textile waste on the ecology and what is expected of the textile industry to overcome pollution. Thursday will be devoted to the technical approach in abating water pollution by the textile industry.

Requests for registration, accompanied by a check for \$60 (which includes registration fee, lunches and the book of proceedings) should be addressed to:

Symposium
AATCC Technical Center
P. O. Box 12215
Research Triangle Park, N. C. 27709

SALMON RETURN TO ONCE-POLLUTED STREAM

Dramatic examples of progress in pollution abatement are not too common. The Willamette River of Oregon is one of the most hopeful demonstrations in a long time.

Salmon have returned to this beautiful river, once so polluted that zero-oxygen blocks essentially eliminated the salmon fishing. Commercial Fisheries Review reports that the 1970 spawning run of coho and fall chinook salmon is greater than all previous migrations.

Oregon has implemented a plan for the development of a 200-mile Willamette River Greenway including a river park system of recreation camps, river access system

with boat launching sites, multi-purpose trails, scenic roads, and state and local parks. \$2.1 million in Federal Land and Water Conservation Funds have been made available for the purchase of land, scenic and recreation use easements. Total area is 22,443 acres.

PESTICIDES AND WILDLIFE

In a study of sixty-nine bald eagles found moribund or dead in twenty-five states during 1966-68, investigators of the Bureau of Sport Fisheries and Wildlife found polychlorinated biphenyls and DDE in all samples; residues of DDD in sixty-four; DDT, heptachlor epoxide, and DCBP less frequently. Eight specimens had levels of dieldrin in the brain within lethal range, and another probably died of DDT poisoning. This demonstrates widespread environmental contamination. The bald eagle, at the top of the food chain, is the final recipient of accumulations of environmental pollutants.

-- Pesticides Monitoring Journal
December 1970

NEW RFF PUBLICATIONS

New publications of Resources for the Future include:

Economics and the Environment--A Materials Balance Approach
by Kneese, Ayres, and d'Arge

132 pages, \$2.50

Regional Economic Development--The Federal Role
by Cameron

172 pages, \$4

Drought and Water Supply--Implications of the Massachusetts
Experience in Municipal Planning

by Russell

232 pages, \$8

Copies can be ordered from RfF, 1755 Massachusetts Avenue, N.W., Washington, D. C. 20036.

NEW RURAL ENVIRONMENTAL ASSISTANCE PROGRAM

Secretary of Agriculture Clifford M. Hardin has announced a new program, Agricultural Conservation Program (ACP) which permits resumption of the federal cost-sharing of various beneficial conservation practices with farmers. It makes, he said, farmers partners in the pressing problem of pollution.

A major thrust will be to reduce water pollution from agricultural wastes through water retaining and retarding measures such as dams and ponds, permanent grass cover, waterways, buffer strips, and tree plantings. These will be directed toward reducing pollution from silt, pesticides, fertilizers, and animal wastes.

Under the program, the federal government will pay about 50 percent of the cost of practices that achieve permanent benefits. It will be administered by the Agricultural Stabilization and Conservation Service. North Carolina's allocation of the \$150 million total for FY 1971 is \$4,129,000.

WATER BANK ACT OF 1970

One of the last pieces of legislation enacted by the 91st Congress was P.L. 91-559, the Water Bank Act.

To be administered by the Secretary of Agriculture, the Act authorizes a federal program to prevent the serious loss of wetlands and to preserve, restore, and improve such lands. It will begin on July 1, 1971.

The Secretary has authority to enter into agreements with landowners and operators in important migratory waterfowl nesting and breeding areas for the conservation of water on specified farm wetlands. Agreements shall be for periods of ten years. Payments are authorized.

GUIDE FOR INSTRUCTING TEENAGERS ON ENVIRONMENTAL PROTECTION

A 520-page classroom guide to instruct teenagers in the knowledge and skills of environmental protection has been developed for use in secondary schools, William D. Ruckelshaus, Administrator of the Environmental Protection Agency, has reported.

Entitled "A Curriculum Activities Guide to Water Pollution and Environmental Studies," the guide was prepared by teachers and students from public and private schools during the summers of 1969 and 1970 at Tilton School, Tilton, New Hampshire. The project was supported by a Federal Water Quality Administration grant of \$78,000 and a Ford Foundation grant of \$75,000. A total of fifty-seven teachers and sixty-eight students participated in the project.

Ruckelshaus said that the guide was "by far the most complete and accurate of the few environmental curricula in use." The available supply of the guide has been distributed nationally by the Training Grants Branch of FWQA. Comments are being requested from school systems, universities, science educators, and scientific and conservation organizations for possible revisions later.

TECHNICAL SEMINAR ON ADVANCED WASTE TREATMENT

The February 9-10 Technical Seminar on Advanced Waste Treatment Design at the Institute of Government attracted 124 registrants from the cities, consulting engineering firms, and university faculties of North Carolina, the State Department of Water and Air Resources, and the Environmental Protection Agency.

Arranged by the Water Resources Research Institute, Department of Water and Air Resources, and Charlottesville Regional Office of EPA, the seminar was presented by professional staff and consultants of the EPA Advanced Waste Treatment Program in Cincinnati.

Seminar evaluation by participants disclosed a very favorable response to course content and methods of presentation.

Facilities of the Institute of Government contributed much to the success of the seminar. These were made available through cooperation of Assistant Director Jake Wicker.

MUSKIE INTRODUCES OMNIBUS WATER QUALITY BILL

Senator Edmund S. Muskie (D-Maine) has introduced an omnibus water pollution control bill that would authorize a five-year, \$25 billion, national program for construction of waste treatment plants.

Under the Muskie bill, the federal government would contribute half of an estimated total of \$25 billion at the rate of \$2.5 billion a year. State and local governments would provide the other half of the program with matching funds.

The bill would extend application of water quality standards and effluent requirements to all the nation's water and would require implementation of the program within three years of federal approval.

Other sections of the bill would expand and tighten up existing federal authority. The new sections authorize criminal and civil penalties, prohibit the discharge of hazardous substances, regulate waste dumping in the coastal waters of the United States, authorize citizen suits, prohibit federal procurement from pollution violators, and require national standards for new sources of water pollution.

PRESIDENT'S FY 1972 BUDGET FOR WATER POLLUTION

The President's budget for FY 1972 increases funding of the water quality program from \$1,116-million this year to \$2,138-million. Waste treatment grants would be doubled from \$1-billion this year to \$2-billion.

Ruckelshaus said that the President's budget will provide for accelerating state and local river basin planning and increased financial support to state pollution control agencies.

Budget authorities for water quality are as follows:

	<u>Fiscal Year (thousands of dollars)</u>		
	<u>1970</u>	<u>1971</u>	<u>1972</u>
Operations, research & facilities	\$ 81,000	\$ 116,304	\$ 137,612
Construction grants	800,000	1,000,000	2,000,000
Scientific activities overseas	-	-	727
TOTAL	\$ 881,196	\$1,116,304	\$2,138,339

POLLUTION TAX

In its annual economic message to Congress, the President's Council of Economic Advisers disclosed that the Administration is considering a system of issuing permits to firms discharging wastes into air and water. Permits would be limited to the amount of pollution the air and water would tolerate and be sold to the highest bidder.

STATUS OF WATER RESOURCES IN NORTH CAROLINA

At the end of January the flow of streams throughout the state was substantially greater than at the end of December. However, flows remained below normal in all sections of the state except the Coastal Plain. January was the ninth consecutive month that the flow has been below normal in the Neuse River Basin.

Groundwater levels rose in the Mountains, Piedmont and Coastal Plain but remained below average in the eastern Piedmont and in the Coastal Plain.

FEDERAL AID FOR WATER PROJECTS

<u>Agency</u>	<u>Community</u>	<u>Amount</u>	<u>Project</u>
EPA	Charlotte	\$1,485,000	Improvements to sewage treatment plants
EPA	Mecklenburg County	\$1,622,700	Interceptor sewer
HUD	Salisbury	\$ 500,000	Addition to water treatment plant
EPA	Raeford	\$ 59,910	Interceptor sewer

WATER RESOURCES LEGISLATION IN THE NORTH CAROLINA LEGISLATURE

Bills Introduced

S 51 Highway litter fine
"To increase the fine for placing trash on the highways."

S 65 Tax refund-sewerage districts
H 103 "To provide for sales tax refunds to metropolitan sewerage districts."
Rewrites GS 105-164.14(c) to provide that metropolitan sewerage districts shall be entitled to the same refunds of state sales and use taxes as are presently granted to counties, cities, towns, and sanitary districts.

S 76 School sewer easements
"To amend GS 40-2(5) to authorize certain school authorities to exercise the right of eminent domain in order to provide adequate sewage systems for schools."

Amends cited section to authorize governing authorities of various public and private educational institutions at higher education and public school levels to exercise the power of eminent domain in order to obtain a pure and adequate water supply (as now) and for a "sewage system, or other such appropriate easements as may be necessary for proper development of such school, college or university." (Adds quoted words)

S 96 Environmental bill of rights
"To amend the Constitution to provide for the protection of natural resources"

Adds new section 5 to Article XIV of North Carolina Constitution, which section: (1) expresses policy of state to conserve and protect environment and natural resources; (2) directs General Assembly to implement policy by providing for abatement of air and water pollution and of excessive and unnecessary noise, protection of agricultural lands, wetlands, estuarine areas and shorelines, and development and regulation of water resources; (3) provides conservation and protection of natural resources by state, county or municipality is for public purpose; (4) instructs General Assembly to provide for acquisition and improvement of land and waters which because of their natural beauty, wilderness character, or geological, ecological or historical significance shall be preserved and administered for use and enjoyment of people, such properties to constitute state nature and historical preserve and not to be taken or otherwise disposed of except by law enacted by two successive regular sessions of General Assembly. Prescribes form of ballot for proposed amendments. Amendment to take effect July 1, 1973.

S 113 Right of withdrawal-stored water
H 170 "To amend Article 21 of Chapter 143 of the North Carolina General Statutes, by providing for rights of withdrawal of impounded water."

(1) A "person" who lawfully "impounds" water shall have a legally protected "right of withdrawal" of "excess volume of water" attributable to the impoundment, which, as quoted words are defined, means that--(a) Protected withdrawals under act may be made directly from impoundment or from water-course below impoundment or both. (b) Protection provided by act applies to one who finances or guarantees part of storage cost as well as to builder of reservoir, and applies to public storage projects as well as private (individual, corporate or unincorporated group) projects. (c) Person

entitled to right of withdrawal can prevent intervening, non-contributing riparian owners from withdrawing stream flows augmented by such storage. (d) Right of withdrawal may be transferred or assigned to others. (e) Local public water suppliers having a right of withdrawal may assert the right for water supply purposes, as well as other purposes. (f) Rights of withdrawal may be interpreted and applied by regulations adopted under the general rulemaking power of the North Carolina Board of Water and Air Resources (BWAR) under GS 143-215.3(a)(1), and are subject to the other general provisions of GS Ch. 143, Art. 21.

(2) Makes rights of withdrawal subject to following restrictions and exceptions: (a) Act protects only claims to excess water created by storage, over and above natural flow. (b) Protection applies only to water impounded for the purpose of withdrawal, and thus not to projects whose historical purposes did not include water withdrawal. (c) Rights of withdrawal are subordinate to claims that water was diverted without authority from the basin, that method of releasing or discharging water is improper, and that water quality has been impaired by withdrawal or release of water or return of water to stream, as well as being subordinate to arrangements for streamflow augmentation for water quality control. (d) Whether rights of withdrawal take effect in a "capacity use area" developed under GS 143-215.11 et seq. is left to discretion of BWAR, and this Act is made subject to Water and Air Resources Act and Dam Safety Law.

(3) Amends GS 143-215.8 to extend to violations of BWAR regulations, the procedure whereby BWAR may secure injunctions against violations of statutes administered by BWAR.

S 131 ✓

Rapid growth-small water systems (Iden. H 213)

"To control the rapid growth in the number of small water supply systems, and to authorize the State Board of Health to require all public water supply systems to meet certain requirements."

Adds new GS 130-161.1, reciting problems associated with rapid growth of inadequate small water supply systems and giving North Carolina Board of Health following new powers: (a) to adopt design and construction standards for public water supplies; (b) to require chlorination of all public water supplies (beginning 7/1/71 for new systems and by 7/1/73 for existing systems); (c) to require that water system plans provide for adequate supplies to anticipated service areas, and be adaptable to future interconnections; (d) to require that plans be prepared by a licensed engineer; (e) to require that proposed water supply plans be coordinated with land use plans and (by a notice-and-response procedure) with water supply plans of neighboring suppliers; and (f) to require submission of evidence of financial responsibility by developers of privately owned public water supplies. Specifies that all public water supply system plans be approved by North Carolina Board of Health, and that powers granted are supplemental to existing powers concerning water systems of North Carolina Board of Health under GS Ch. 130 and NC Utilities Commission under GS Ch. 62.

H 33

North Carolina Estuary Study

"To amend Chapter 1164, 1969 North Carolina Session Laws, substituting an earlier date for the submission of a final report on the estuary study to the General Assembly."

As title indicates, requires Commissioner of Commercial and Sports Fisheries to submit his final study report concerning a comprehensive plan for the conservation of estuarine resources to the Director of the Department of Conservation and Development by January 1, 1973, rather than November 1, 1973.

- H 52 Navigable waters grants
"To clarify the provisions of GS 113-205 and to clarify its application."
Amends GS 113-205 by adding thereto a subsection (c), which defines "navigable waters" as used in that section as being "'estuarine waters' as defined in GS 113-229(n)(2) that are deemed navigable." Purpose is to make clear that law requiring registration of private fishery rights applies only to navigable estuarine waters.
- H 77 Highway littering presumption
"To create a presumption that the driver of a motor vehicle from which trash is dropped upon a highway is guilty of a violation of GS 14-399."
- H 98 Tax exemption-water companies
"To exempt real and personal property of non-profit water associations from ad valorem taxation."
- H 116 Navigable waters trash
"To establish a prima facie rule and a more severe punishment for deposit of trash in navigable waters."
Adds to GS 76-40(a) provision that whenever trash is dropped into navigable waters from a boat licensed in North Carolina, proof of ownership of the boat and proof that owner was present at time of the violation shall constitute prima facie evidence that owner is guilty of violation, and his license for boat operation shall be automatically suspended for six months upon a finding of the violation.
- H 118 Detergents nutrient control
"To control the nutrient content of detergents."
Adds new subsection (13) to GS 143-215.3(a), giving Board of Water and Air Resources power to adopt regulations limiting phosphate, nitrate and other plant nutrient content of detergents used in state, with aim of eventual total elimination of nutrient content. Requires Board to take into account availability, cost, efficiency, and possible environmental effects of detergents with reduced nutrient content. Authorizes Board to ban detergents with excessive nutrient content by adoption of regulation effective on date set in regulation, giving Board power to require manufacturer, seller or distributor of detergent to provide analysis of contents and to conduct tests to determine environmental effects.
- H 119 New industry environmental impact
"To provide for investigation of environmental impact of proposed new industry."

WATER RESOURCES LEGISLATION IN THE CONGRESS

Reports from the present Congress are not yet available. Bills introduced to date will be summarized in the next issue of the News.

NEW PUBLICATIONS RECEIVED BY THE INSTITUTE

(These may be borrowed 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

"Crabtree Creek Watershed Seminar, A Summary," sponsored by Chamber of Comm. of Raleigh, Higher Ed. Act of 1965, Title I, League of Women Voters Ed. Fund., N.C. Wildlife Fed., NCSU, Wake Watershed Improvement Comm., May 20, 1970.

"A Guide to Using Interest Factors in Economic Analysis of Water Projects," by B. P. Glenn, Sup. of Doc., USGPO, Wash., D.C. 20402, Price - \$1.50, Dec. 1970.

"A General Analysis of Economic Characteristics of Areas Affected by the Texas Water Plan," by V. T. Clover, Dept. of Econ., Texas Tech. Univ., Lubbock 79309, 1970.

"An Economic Reappraisal of the Toledo Bend Multiple-Purpose Water Project," by L. H. Falk, et al, La. WRRRI, La. St. Univ., Baton Rouge 70803, Oct. 1970.

The following publications are available from Temporary Study Committee on the Future of the Adirondacks, 41 State St., Albany, N. Y. 12207, 1970:

"The Future of the Adirondack Park"

"Private & Public Land," Tech. Rept. 1 Vol. A & Vol. B

"Wildlife," Tech. Rept. 2

"Forests, Minerals, Water and Air," Tech. Rept. 3

"Transportation and the Economy," Tech. Rept. 4

"Recreation," Tech. Rept. 5

"Local Government," Tech. Rept. 6

"Financial Implementation," Tech. Rept. 7

"Kanawha Basin Comprehensive Study," by U.S. Army Corps of Engrs., Huntington, W. Va. 25704, Dec. 1970.

"Land Policy in North Carolina," by D. A. LeSourd, St. Plan. Div., Dept. of Adm., P. O. Box 1351, Raleigh, N. C. 27602, May 1970.

"Analog Simulation of Population Age Structures," by D. R. Heinle, WRRRC, Univ. of Md., College Park 20740, Sept. 1970.

"Price, Demand, Cost, and Revenue in Urban Water Utilities," by Hittman Associates, Inc., P. O. Box 810, Columbia, Md., 21043, Sept. 1970.

"Local Public Land Activity in Selected Communities of North Carolina," by Arnold Zogry Assoc., Inc., St. Plan. Task Force, Dept. of Adm., P. O. Box 1351, Raleigh, N. C. 27602, Apr. 1969.

"Proposal for Meeting the Basic Requirements for Resource Planning-" by C. V. Lyle, EPA, FWQA, OWQ, S.E. Reg., 1421 Peachtree St., N.E., Atlanta, Ga. 30309, Jan. 1971.

"The Southern River Swamp - A Multiple-Use Environment," by C. H. Wharton, et al, Ga. St. Univ., 33 Gilmer St., S.E., Atlanta, Ga. 30303, 1970.

"Federal Domestic Assistance Programs and State Land Policy Development," by Wm. Crosswhite, St. Plan. Task Force, Dept. of Adm., P. O. Box 1351, Raleigh, N. C. 27602, May 1970.

"Systems Analysis for Great Lakes Water Resources," supported by OWRR, USDI, and Ohio St. Univ., Proceedings of 4th Symposium on Wa. Res. Res., The Ohio St. Univ., WRC, 1791 Neil Ave., Columbus, Ohio 43210, Oct. 1969.

- "Major Uses of Land and Water in the U.S. with Special Reference to Agriculture, Summary for 1964," by USDA, Sup. of Doc., USGPO, Wash., D. C. 20402, Nov. 1968.
- "A Water and Recreation Study of the Blackfoot River System, Montana," by C. Malouf, Montana WRRRC, Montana Univ. & Montana St. Univ. Bozeman, Mont. 59715, Nov. 1969.
- "Hydrological and Environmental Controls on Water Management in an Arid Urban Area," by S. D. Resnick, et al, WRRRC, Univ. of Ariz., Tucson, Ariz 85721, Dec. 1970.
- "Water Regulation on Forest Land," by R. A. Klawitter, Northeastern Forest Exp. Sta., 6816 Market St., Upper Darby, Penn. 19082, 1970.
- "The Long Count on Dempsey: No Final Decision in Water Right Adjudication," by A. W. Stone, Montana WRRRC, Mont. Univ. & Mont. St. Univ., Bozeman 59715, Fall 1969.

Water Quality Management

- "The Development of A Fluidized-Bed Technique for the Regeneration of Powdered Activated Carbon," by Battelle Memorial Inst., Columbus, Ohio, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - 50¢, March 1970.
- "Advanced Wastewater Treatment Using Powdered Activated Carbon in Recirculating Slurry Contractor-Clarifiers," by C. F. Garland, et al, Sup. of Doc., USGPO, Wash., D.C., 20402, Price - 75¢, July 1970.
- "Determination of the Feasibility of Removal of Algal Nutrients in Lake Water by Ion Exchange," by O. T. Zajicek, Univ. of Mass., WRRRC, Amherst, Mass. 01002.
- "Bactericidal Effects of Algae on Enteric Organisms," by E. M. Davis, et al, Sup. of Doc., USGPO, Wash., D.C., 20402, Price - \$1.25, Mar. 1970.
- "Granular Carbon Treatment of Raw Sewage," by C. B. Hopkins, et al, Sup. of Doc., USGPO, Wash., D. C., Price - \$1, May 1970.
- "Crusade for Clean Water," by D. D. Dominick, FWQA, EPA, Wash., D. C. 20240, Aug. 1970.
- "Community Water Supply Study," Significance of National Findings, USDHEW, Bu. of Water Hygiene, Env. Hlth. Serv., Wash., D. C. 20240, July 1970.
- "The Ecology of the Second Trophic Level in Lakes Superior, Michigan and Huron," by W. R. Swain, et al, WRRRC, Univ. of Minn., St. Paul, Minn. 55114, Oct. 1970.
- "Mathematical Model of the Electrodialysis Process," by K. T. Pruyn, et al, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - 70¢, July 1969.
- "Exchange of Diquat in Soil Clays, Vermiculite, and Smectite," by J. B. Dixon, et al, WRRRC, Auburn Univer., Auburn, Ala., 36830, 1970.
- "Prediction of Solar and Atmospheric Radiation for Energy Budget Studies of Lakes and Streams," by W. C. Huber, et al, WRRRC, 220 Env. Engr. Bldg., Univ. of Fla., Gainesville 32601, 1970.
- "Controlling Erosion on Construction Sites," by USDA-Soil Conser. Serv., P. O. Box 27307, Raleigh, N. C. 27611, Dec. 1970.
- "The Role of Aquatic Vascular Plants in the Eutrophication of Selected Lakes in Western Mass.," by R. B. Livingston, et al, WRRRC, U. of Mass., Amherst 01002.
- "1969 Fish Kills Caused by Pollution," by FWQA, USGPO, Sup. of Doc., Wash., D. C. 20402, 1969. Price - 20¢.
- "Forest Fertilization and Water Quality in the Pacific Northwest," by D. G. Moore, Pacific NW Forest & Range Exp. Sta., P. O. Box 3141, Portland, Ore. 97208, 1970.
- "Index to Water Quality Section," by USDI, Geological Survey, Office of Water Data Coordination, USGS, Wash., D. C. 20242, 1970.

- "A Study of the Effect of Water Quality and Management on the Physical and Chemical Properties of Selected Soils under Irrigation," by F. W. Schroer, WRRI, N.D. State Univ., Fargo, N. D. 58103, Feb. 1970.
- "Optimizing Lipid Biostabilization," by Wm. Garner, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - 60¢, May 1970.
- "Neutralization of High Ferric Iron Acid Mine Drainage," by R. C. Wilmoth, et al for FWQA, USDI, Aug. 1970. Avail. from USGPO, Wash., D. C. 20402 - Price - 50¢.
- "New Mine Sealing Techniques for Water Pollution Abatement," by Halliburton Co., Duncan, Okla., Sup. of Doc., USGPO, Wash., D. C. 20402, 1970, Price - \$1.50.
- "Feasibility Study of Mining Coal in an Oxygen Free Atmosphere," by Island Creek Coal Co. & NUS Corp. for FWQA, USDI, Aug. 1970. Avail from USGPO, Wash., D. C. 20402 Price - \$1.50.
- "Basic Salinogen Ion-Exchange Resins for Selective Nitrate Removal from Potable and Effluent Waters," by A. L. Walitt, et al, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - \$1, Dec. 1969.
- "Evaluation of Selected Earthmoving Equipment for the Restoration of Oil-Contaminated Beaches," by URS Research Company, San Mateo, Cal., USGPO, Wash., D. C. 20402, Price - \$1.50, October 1970.
- "Ultrafiltrative Dewatering of Spent Powdered Carbon," by C. W. Desaulniers, et al, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - 70¢, Mar. 1970.
- "Primary Production and Chemical and Physical Characteristics of Lake Ashtabula Reservoir, N. D.," by J. J. Peterka, et al, WRRI, N.D. St. Univ., Fargo 58103 1967.
- "Mathematical Model of Recalcination of Lime Sludge with Fluidized Bed Reactors," by G. J. Ducar, et al, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - 55¢, Sept. 1970.
- "Observations on Water Content Changes in Stratified Sediments During Pit Recharge," by L. G. Wilson, WRRRC, U. of Ariz., Tucson, Ariz. 85721, 1969.
- "The Design of an Experimental Artificial Recharge Well at Tucson, Arizona," by L. G. Wilson, et al, WRRRC, U. of Ariz., Tucson, Ariz. 85721, Sept. 1969.
- "Development of a Pilot Plant to Demonstrate Removal of Carbonaceous, Nitrogenous and Phosphorus Materials from Anaerobic Digester Supernatant and Related Process Streams," by G. E. Bennett, Sup. of Doc., USGPO, Wash., D.C. 20402, May 1970, Price - \$1.
- "Removal of Lignin by Foam Separation Processes," by T. E. Wilson, et al, WRRI, Rutgers Univ., New Brunswick, N. J., 08903, Nov. 1970.
- "Removal of Phosphate from Waste Water by Aluminum and Iron," by Pa Ho Hsu, WRRI, Rutgers Univ., New Brunswick, N. J., 08903, Dec. 1970.
- "An Electrochemical Method for Removal of Phosphates from Waste Waters," by S. E. Sadek, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - 50¢, Feb. 1970.
- "Sedimentation in Third Creek Subwatershed No. 7A, North Carolina," by H. E. Reeder, USGS, P. O. Box 2857, Raleigh, N. C. 27602, 1970.
- "Dispersal of Plating Wastes and Sewage Contaminants in Ground Water and Surface Water, South Farmingdale-Massapequa Area, Nassau County, New York," by N. M. Perlmutter, et al, For Sale by USGPO, Wash., D. C. 20402, 1970.
- "Technical and Institutional Aspects of Sewage Effluent-Irrigation Water Exchange, Tucson Region," by C. B. Cluff, et al, WRRRC, U. of Ariz., Tucson 85721, Oct. 1970.

- "Microbiology of Sewage Lagoons - Role of Purple Sulfur Bacteria in the Stabilization of Industrial Wastes," by J. W. Vennes, WRRRI, N. D. St. Univ., Fargo 58103, Apr 1970.
- "Microbiology of Sewage Lagoons - Effects of Industrial Wastes on Lagoon Ecology," by J. W. Vennes, WRRRI, N. D. St. Univ. Fargo, 58103, Aug. 1969.
- "Occurrence of Purple Sulfur Bacteria in a Sewage Treatment Lagoon," by H. W. Holm, et al, WRRRI, N. D. St. Univ., Fargo 58103, June 1970.
- "Field Observations on Changes in the Subsurface Water Regime During Influent Seepage in the Santa Cruz River," by L. G. Wilson, et al, WRRRC, Univ. of Ariz., Tucson, Ariz. 85721, Dec. 1968.
- "Urbanization and Its Effect on the Temperature of the Streams on Long Island, New York," by E. J. Pluhowski, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - \$1.25 1970.
- "Glycerol Vapor Adsorption on Clay Minerals and Montmorillonitic Soil Clays," by D. E. Moore, et al, WRRRI, Auburn Univ., Auburn, Ala., 36830, 1970.
- "Engineering Feasibility Demonstration Study for Muskegon County, Michigan, Wastewater Treatment Irrigation System," by Muskegon Co. Bd. & Dept. of Pub. Works for FWQA, USDI, Sept. 1970. Avail. from USGPO, Wash., D. C. 20402 - Price \$1.50.
- "Productivity of Phytoplankton and Quantities of Zooplankton and Bottom Fauna in Relation to Water Quality of Lake Ashtabula Reservoir, N. D.," by J. J. Peterka, WRRRI, N. D. St. Univ., Fargo 58103, Feb. 1970.
- "Mathematical Programming for Regional Water Quality Management," by Grad. Sch. of Bus. Adm., Univ. of Cal., Sup. of Doc., USGPO, Wash., D. C. 20402, Price - \$1.25, Aug. 1970.

Water Quantity Management

- "Flood Plain Information," by U.S. Army Corps of Engrs., Charleston, S. C., N. C. Dept. of W&AR, P. O. Box 27048, Raleigh, N. C. 27611, Jan. 1971.
- "Flow Concentration Groins for Reaeration in Passaic River - A Hydraulic Model Study," by E. L. Bourodimos, et al, WRRRI, Rutgers Univ., New Brunswick, N. J. 08903, Sept. 1970.
- "Some Principles of Forest Hydrology Pertinent to Even-aged Management of Eastern Hardwoods," by J. H. Patric, Northeastern Forest Exp. Sta., 616 Market St., Upper Darby, Penn. 19082, 1970.
- "Subsidence and Ground-Water Offtake in the Baton Rouge Area," by W. A. Wintz, Jr., et al, La. WRRRI, La. St. Univ., Baton Rouge, La., 70803, Oct. 1970.
- "Index to Surface Water Section," by USDI, Geological Survey, Office of Water Data Coordination, USGS, Wash., D. C. 20242, 1970.
- "Measurement of Water Potential with Thermocouple Psychrometers: Construction and Applications," by R. W. Brown, Intermountain Forest & Range Exp. Sta., 507 25th St., Ogden, Utah 84401, 1970.
- "Realistic Rainfall Simulation for Field Investigation," by J. Morin, et al, WRRRC, Univ. of Ariz, Tucson, Ariz. 85721, Apr. 1970.
- "Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs," by U.S. Army Corps of Engrs., The Hydrologic Engr. Cntr., Corps of Engrs., Davis, Cal. 95616, Apr 7-9, 1970.

- "Fluid Model Studies of the Storage of Freshwater in Saline Aquifers," by O. K. Kimbler, La. WRI, La. St. Univ., Baton Rouge, La. 70803, Oct. 1970.
- "Generalization of Streamflow Characteristics from Drainage-Basin Characteristics," by D. M. Thomas, et al, Sup. of Doc., USGPO, Wash., D. C. 20402, Price - 35¢, 1970.
- "Proceedings of a Seminar on Urban Hydrology," by The Hydrologic Engr. Cntr., Corps of Engrs., Davis, Cal., 95616, Sept. 1970.
- "Influence of Low Rates of Water Application by Sprinklers on the Microclimate," by Dr. J. L. Wiersma, S. D. St. Univ., Brookings, So. Dak. 57006, Dec. 1970.
- "Water From the Forests," by I. C. Reigner, Div. of Forest Env. Res, Forest Serv., USDA, Wash., D. C. 20250, 1970.

Miscellaneous

Annual Reports - Water Resources Research Institutes

University of Arizona - Annual Report No. 6
West Virginia University
Montana University Joint
University of Maryland - 6th Annual Report
Auburn University - 6th Annual Report

"Great Lakes Basin Commission," Annual Report, City Cntr. Bldg., 220 East Huron St., Ann Arbor, Mich. 48108.

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The Institute has not imposed charges for publications in the past. Because of rising costs and a steadily increasing number of requests, this practice has been changed. Free single copies will continue to be made available to Federal water resource agencies, State water resources research institutes, other water research institutions with reciprocal agreements, and public agencies, institutions, industries and private citizens of North Carolina. A uniform charge of \$2.50 per copy will be made for all other requests.

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