

MINUTES

TECHNICAL COMMITTEE  
MAY 8, 1991

ARCHDALE BUILDING  
RALEIGH, NC

CALL TO ORDER

The meeting was called to order at 10:20 a.m. by Mr. Bowman Crum, co-chair of the Technical Committee. Mr. Rich Pepino, EPA Region III, was introduced as a new member of the Technical Committee. Attendees are listed in Attachment A.

CONSIDERATION OF MINUTES

Mr. Cecil Settle moved to approve the February 22 Technical Committee minutes as distributed; Dr. Robert Holman seconded and the motion carried.

PROGRAM REPORTS

Mr. Randy Waite noted the availability of several publications (Wildlife in North Carolina, NC Environmental Legislative Bulletin, NC's Coastal Islands, Carolina Conservationist, NCCF's Coastal Review, and a Budget for a Green Assembly) that mention the A/P Study and other environmental issues. Dr. B. J. Copeland said the Spring issue of "NC Business" magazine is devoted to North Carolina's rivers and estuaries. Waite asked for a copy of that issue.

Negotiations on the FY 91-92 projects selected for funding have resulted in ~\$55,000 in reductions toward the \$68,000 needed to balance the budget.

Waite explained the historical budget for the Study. The Study has reverted ~\$14,000 in state appropriations. Also, indirect costs of ~\$38,830 have been levied against the Study. These indirect costs have never been designated in the Study's budget but will be shown in the FY 91-92 budget. Waite has determined that there are ~\$27,000 of unobligated federal funds available for funding additional projects. Because of the split state/federal fiscal years there should be ~\$125,000 state funds appropriated on July 1 to cover the last quarter of the budget year. However, due to the State budget cuts, Waite hopes at least \$75,000 of the ~\$125,000 will be appropriated. Waite proposed applying \$13,000 of the ~\$27,000 federal excess to balance the FY 91-92 budget. The remaining ~\$14,000 federal excess would be used to fund two additional projects for FY 91-92: (1) \$2,000 to assist Dr. Stan Riggs (ECU) in a project entitled "Sediment Quality Survey of Northern Currituck Sound and North Landing River; and (2) \$10,000 to Dr. Robert Holman (WRI) for a project entitled "An Evaluation

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of Land Use Changes within the APES Area Utilizing the GIS." Copeland made a motion that the Technical Committee recommend that the Policy Committee approve the action by the Study's Project Director to fund ECU (Dr. Riggs) for \$2,000 and WRI (Dr. Holman) for \$10,000 to complete these projects. Dr. Michael Orbach seconded the motion which passed unanimously.

Waite reported that a Draft Annual Work Plan had been forwarded to EPA-OMEP as required prior to EPA releasing FY 91-92 funds. The Draft Work Plan was available to the Technical Committee. Comments will be considered until May 31 after which time the final will be sent to OMEP.

Jennifer Steel reported on the status of several reports:

At printers:

- 1) Eutrophication and Nuisance Algal Blooms/Paerl (UNC)
- 2) Virginia Animal Waste Management/Lewis (VA DSWC)

Finals expected by May 31, 1991:

- 1) Federal Consistency Review for APES/Duffin (RTI)
- 2) WQ/Public Attitudes Concerning APES Watershed/Hoban (NCSU)
- 3) Reduction of Nutrient Loading in Coastal Swamps/Kuenzler (UNC)
- 4) WQ as a Function of Discharge/Rulifson (ECU)

Finals expected in June, 1991:

- 1) Handbook on NPS Pollution/Hoban (NCSU)
- 2) Heavy Metals Concentrations in the Neuse/Riggs (ECU)
- 3) Coupling Study of Circulation/Pietrafesa (NCSU)
- 4) Viability of Striped Bass Eggs '89/Rulifson (ECU)
- 5) Shell Disease in Blue Crabs/Noga-Engel (NCSU-NMFS)

Drafts expected June/July, 1991:

- 1) Flow Patterns in Pamlico & Neuse/Bales (USGS)
- 2) Off-site Effects of BMPs/Bales (USGS)
- 3) Viability of Striped Bass Eggs '90/Rulifson (ECU)
- 4) Food/Feeding of Larval Fish/Rulifson (ECU)
- 5) Heavy Metal Concentrations in the Albemarle/Riggs (ECU)

The Executive Summary of research reports will be sent to Committee members and complete reports will be available upon request.

Joan Giordano reported on public involvement activities (Attachment B). She updated the Committee on CAC meetings, exhibits, outreach programs, education efforts, local government activities, the status of FY 91 projects, meetings attended, the status of the newsletter, and other activities. Giordano also reported that Robbie Blinkoff, the Citizens' WQ Monitoring Network director, has been asked to write a series of articles on

citizens' monitoring groups and their impact on coastal communities for the "Volunteer Monitor", the national newsletter of volunteer water quality monitoring. Blinkoff reported that the citizens' monitoring data is now compatible with the GIS and can be accessed by interested parties. The Citizens' WQ Monitoring Network has been recognized by the Environmental Success Index for Renew America. Activities are being coordinated with Streamwatch. State agencies have been helpful in working with the citizens in regional monitoring meetings to ensure quality assurance.

Waite told the Committee that two approved FY 91-92 projects have been revised. The Pamlico-Tar River Foundation will produce 6, four-page newsletters instead of 12, two-page newsletters. This change corrects greater than anticipated mailing charges. The RTI proposal on Fishing Practices Mapping and Literature Review will consist only of the Fishing Practices Mapping. RTI could not accomplish both components with the reduced funding (\$30,000) approved by the Policy Committee. Dr. Will Ambrose (ECU) has proposed that a graduate student conduct a Literature Review and consider both benthic and by-catch effects for \$4,000, which will double the amount of work proposed by RTI.

Negotiations are still ongoing for Blue Crab Shell Disease (Noga/Engel), Economic Valuation of Wetlands (Costanza) and a sediment toxicity project.

Ted Bisterfeld reported that the February NEP Science Symposium in Sarasota, Florida was attended by Waite, Steel and two APES researchers--Joe Rudek for Hans Paerl and Thomas Hoban--who reported on their projects. A compilation of abstracts from the Symposium is available. Bisterfeld reported further on the "Coastal America" program. It is an implementation effort and must include public education elements. The Albemarle and Pamlico Sounds are not assured as pilots as originally reported. Regional implementation teams will identify projects. Draft one-page abstracts of proposals must be submitted to Washington by July 15 and final proposals are due by September 16. Discussion concluded that Congressional approval for the "Coastal America" program is very uncertain however APES should be prepared to participate should funding be approved.

Copeland reported that on May 2 the U. S. House Merchant Marine Fisheries Committee recommended no money for Coastal American and that it be dropped from the NOAA Authorization Bill. That bill will be considered by the House on May 9. The Senate is more inclined to support it.

Copeland has been named chairman of the South Atlantic Regional Marine Research Board, one of nine regional boards established last year by federal legislation to protect the nation's water quality. Each board will include members appointed by NOAA, EPA and by the governors of the states located in the region. One of the NOAA appointees will always be a Sea Grant director, who will act as chairman. The South Atlantic region includes North

Carolina, South Carolina, Georgia, Florida, Puerto Rico and the U.S. Virgin Islands. North Carolina also is represented in the Mid-Atlantic region, which spans from North Carolina to New Jersey. In the first year, board members will assess coastal water quality of the region and develop a plan for protecting and improving it. The board may later be given federal appropriations to fund research and extension projects that relate to water quality.

Bisterfeld reported that three APES Action Plan Demonstration Projects were submitted to EPA-Washington on April 30: 1) County Water Use Ordinances (Clark/Sea Grant), 2) Improved Fishing Gear (Monahan/EHNR DMF), a new proposal which if accepted will be reviewed by the Technical Committee, and 3) Composting Farm Animal and Seafood Processing Waste (Cummings/EHNR DSWC). The Natural Areas Protection project (Roe/EHNR Parks) was not accepted as an action plan demonstration. The projects submitted total ~\$100,000. Selections should be announced by June 15.

EPA base funding for FY 91-92 to APES is \$1 million. Grant awards will be issued upon approval of the Annual Work Plan and funding package preparation.

Waite will attend the NEP national meeting to be held May 28-31 in San Diego. Others invited are Doug Rader (NC Environmental Defense Fund), Jim Cummings (EHNR DSWC), Jess Hawkins (EHNR DMF), and Jed Kenworthy (NMFS Beaufort Lab).

The EPA Gulf Breeze Environmental Research Lab has agreed to do biotoxicity tests of sediments for APES. They will test ~ten samples including chemical analyses of organics and metals. Gulf Breeze can do this testing before July 15 or after October at a cost of ~\$10,000. The Policy Committee previously agreed to set aside \$25,000 in the FY 91-92 budget for this work.

Bisterfeld also reported that EPA is drafting guidelines for CCMP development. Waite is reviewing the draft guidelines and will submit comments to EPA. Finalized guidelines will be sent to the APES Committees.

#### SUBCOMMITTEE REPORTS

No reports were made by the Citizens' Affairs, Technical Review, Monitoring, Publications Review or Standard Operating Procedures Subcommittees.

#### Information Management Subcommittee

Holman reported on an upcoming meeting with the Nature Conservancy regarding land use and the Study's land use efforts. Also, communication has occurred with U.S. Fish & Wildlife Service and two wildlife refuges regarding land use mapping.

Waite said an April Bi-State meeting between Virginia and North Carolina held in Edenton was well attended by officials from both states. A GIS workshop will be held at the NCSU Faculty Club on May 9/10 to demonstrate how to use the GIS for local government planning with Carteret County as the pilot.

Discussion on the Hydrodynamics Workgroup raised concern on its lack of formal meetings and communications. It was requested that Waite relay these concerns to the workgroup and explore avenues to encourage the workgroup to become more active.

#### STATUS AND TRENDS REPORT

Steel reported that the revised STR and Executive Summary had been mailed to the Technical Committee. Steel indicated two sections will be revised according to new data supplied: 1) 89-90 fisheries data will be supplied by DMF and 2) comments regarding national trends of wetlands loss will be incorporated prior to the Policy Committee review on June 12. The Committee noted that no other national trends are incorporated in the document and should not be included for wetlands.

Copeland said the current STR is an APES document and reference to Jeri Gray and himself must be deleted as editors. He suggested a statement be inserted which acknowledges past input and that the document is based on the Preliminary Status and Trends Report.

There was discussion on the need for an Executive Summary and a Public Version STR. Orbach made a motion that the Technical Committee recommend to the Policy Committee that material from the original public document be added as an introduction to the Executive Summary which becomes the document distributed to the public to replace the original Public Version document. Bill Cole seconded the motion. Copeland suggested the staff write a new introduction. The motion was approved.

Discussion regarding the distribution of the original Public Version continued. Orbach moved to continue sending the original Public Version out when it is specifically requested plus send the finalized Executive Summary. The motion was seconded. Holman and Dr. Ernie Larkin suggested that the original Public Version be abandoned. The motion passed with one no vote.

Steel requested Technical Committee approval of the final STR minus the revisions for fisheries and wetlands.

Orbach made a motion to accept the STR as distributed to the Technical Committee for review (which did not include the national trends in wetlands loss or fisheries data) and that any changes other than editorial be submitted to the Technical Committee for review. Cole seconded the motion. The motion carried.

### ENVIRONMENTAL GOALS

The Committee expressed several concerns regarding the Environmental Goals (Attachment C). The question arose of whether the goals should be developed now or during the CCMP development process. Following discussion, Cole moved to rename these "Target Environmental Quality Goals". Jim Turner seconded the motion which carried unanimously. It was also recommended that growth management be included to cover the human environment.

### CCMP STEERING COMMITTEE

Orbach stated concern regarding the development of a 40-person steering committee. Orbach made a motion that the Technical Committee recommend to the Policy Committee that (1) a more modest steering committee (~10) be organized from the present committee structure to advise staff on the drafting of CCMP elements; (2) that the staff be recognized as having the central drafting function of the CCMP; (3) all products of the Study, specifically the Blueprint for Action, be considered as elements of the CCMP are developed; and (4) all drafts of the CCMP be distributed to all APES committees plus outside expertise as necessary. Cole seconded the motion. Discussion took place regarding involving enough people in the process and the possibility of the CAC's selecting the chairperson for the steering committee. Orbach suggested the Policy Committee and staff determine the make-up of the steering committee. Larkin suggested asking the CAC chairs to provide a new scaled down list of possible members. The motion was approved.

### CCMP SCHEDULE

The schedule suggested for the CCMP (Attachment D) was discussed. The draft "mini-plan" development was deleted and a public review period was added between the first draft and second draft stages. The Technical Committee directed Waite to present the revised schedule to the Policy Committee in June with the understanding that it is an "estimated" timeframe.

### FINANCIAL PLANNING SEMINAR

Bisterfeld reported that a Financial Planning Workshop will be held by Apogee on June 12 at the Hilton in Greenville. Apogee has drafted possible funding sources to open the discussion. The workshop will be an exercise in determining where and how funds may be obtained to carry out the CCMP recommendations. All APES Committee members, local government officials, and the Financial Planning Committee are invited to attend.

FINANCIAL PLANNING COMMITTEE

The CAC recommendations for the Financial Planning Committee were reviewed (Attachment E). Yates Barber suggested adding Jean Meiggs. Other suggestions for this committee included a Z. Smith Reynolds representative (Joe Kirkpatrick or Tom Lambeth); a fee expert (DCM/CAMA--DMF [Hogarth]); the NC Farm Bureau Federation (Bob Jenkins); and a nominee from the League of Municipalities and Association of County Commissioners. The Technical Committee directed Waite to develop the committee using the recommendations and also to keep the committee bi-partisan.

ADJOURNMENT

The next Technical Committee meeting is schedule for August 20 in the Archdale Building in the Ground Floor Hearing Room.

The meeting adjourned at 3 p.m.

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## ATTACHMENT A

## TECHNICAL COMMITTEE ATTENDEES

MAY 8, 1991

<u>NAME</u>	<u>AGENCY</u>
KATE LOONEY	US FWS
JESS HAWKINS	EHNR DMF
JIM TURNER	USGS
BOB HOLMAN	NCSU WRRI
BILL COLE	US FWS
FRED HARRIS	NC WRC
ANN DEWITT BROOKS	VA COE
RICHARD PEPINO	EPA REGION III
LARRY EASTMAN	EHNR DCM
DAVID W. ENGEL	NMFS
CECIL W. SETTLE	USDA SCS
ERNIE LARKIN	PCAC
B. J. COPELAND	UNC SEA GRANT
MIKE ORBACH	ECU/MARINE SCIENCE COUNCIL
JENNIFER STEEL	APES
TED BISTERFELD	EPA REGION IV
RANDALL G. WAITE	APES
BOWMAN CRUM	EPA REGION IV
FRED WHITE	EHNR DFR
TOM STROUD	PTRF
ROBBIE BLINKOFF	ECU
TOM QUAY	PCAC
WILSON LANEY	US FWS
TOM ELLIS	DEPT OF AGRICULTURE
ERNIE CARL	EHNR
JOAN GIORDANO	APES
KARON DONNELLY	APES
KATHY NORRIS	APES



# WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

## NATIONAL WATER-QUALITY ASSESSMENT PROGRAM—The Albemarle-Pamlico Drainage

In 1991, the U.S. Geological Survey (USGS) began to implement a full-scale National Water-Quality Assessment (NAWQA) program. Long-term goals of the NAWQA program are to describe the status and trends in the quality of a large, representative part of the Nation's surface- and ground-water resources and to provide a sound, scientific understanding of the primary natural and human factors affecting the quality of these resources. In meeting these goals, the program will produce a wealth of water-quality information that will be useful to policy makers and managers at the national, State, and local levels.

Study-unit investigations constitute a major component of the NAWQA program, forming the principal building blocks on which national-level assessment activities are based. The 60 study-unit investigations that make up the program are hydrologic systems that include parts of most major river basins and aquifer systems. These study units cover areas of 1,200 to more than 65,000 square miles and incorporate about 60 to 70 percent of the Nation's water use and population served by public water supply. In 1991, the Albemarle-Pamlico drainage was among the first 20 NAWQA study units selected for study under the full-scale implementation plan.

The Albemarle-Pamlico drainage study will examine the physical, chemical, and biological aspects of water-quality issues in a coordinated investigation of surface water and ground water in the Albemarle-Pamlico drainage basin. The quantity and quality of discharge from the Albemarle-Pamlico drainage basin contribute to the water-quality problems in the biologically sensitive waters of Albemarle and Pamlico Sounds. A retrospective analysis of existing water-quality data will precede a 3-year period of intensive data-collection and analysis activities. The data resulting from this study and the improved understanding of important processes and issues in the upstream part of the study unit will enhance understanding of the quality of water in Albemarle-Pamlico Sounds, the second largest estuarine system in the United States.

### DESCRIPTION OF THE ALBEMARLE-PAMLICO DRAINAGE STUDY UNIT

The Albemarle-Pamlico drainage study unit area encompasses about 27,500 square miles and excludes the open waters of Albemarle and Pamlico Sounds. Total population (1990) of the counties and cities that are wholly or partly drained by streams in the study unit is about 3.2 million. The largest cities entirely in the study unit are Raleigh (208,000), N.C., and Roanoke (96,000), Va. Those partly in the unit are Virginia Beach (393,000) and Chesapeake (152,000), Va., and Durham (136,000), N.C. Important industries in the study unit include the manufacture of paper, textiles, furniture, chemicals, apparel, and electrical machinery, and fishing. About 5 percent of the land in the study unit is developed for urban and industrial use, about 30 percent is used for crops (tobacco, soybeans, corn, wheat, and peanuts) and livestock (hogs, poultry, and cattle), about 50 percent is forested, and about 15 percent is wetland (swamp and marsh).

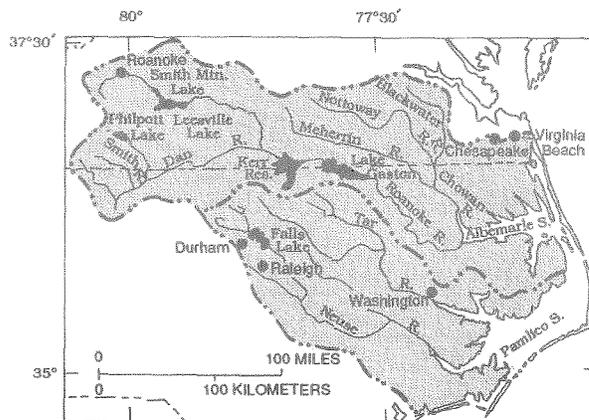
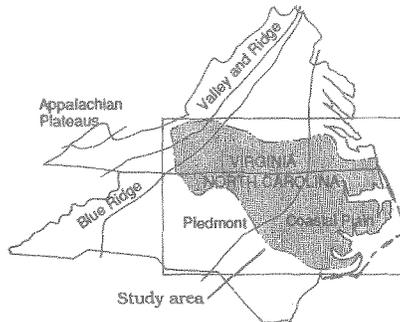
Fifty-six percent of the study unit area is in the Valley and Ridge, Blue Ridge, and Piedmont physiographic provinces, and 44 percent is in the Coastal Plain. Land-surface elevations range from about 3,700

feet above sea level in the Valley and Ridge and Blue Ridge parts of the study unit to sea level in the eastern Coastal Plain.

Annual temperatures average about 49 degrees Fahrenheit in the mountains and about 61 degrees Fahrenheit near the coast. Average annual precipitation ranges from about 40 to 52 inches, the largest amounts in the eastern and westernmost parts of the study unit. Precipitation generally is evenly distributed throughout the year. Annual snowfall averages 20 inches in the mountains and less than 2 inches near the coast.

The Valley and Ridge province is underlain by consolidated limestone, sandstone, and shale. Consolidated metamorphic, igneous, and sedimentary rocks underlie the Blue Ridge and Piedmont. The Coastal Plain is underlain by unconsolidated sand, silt, and clay, and consolidated to partly consolidated limestone, shell, and sand beds. The soils that have developed in the study unit area include thin, sandy soils on steep slopes in the mountains; thick, clayey soils on moderate to gentle slopes in the Piedmont; clayey and organic soils on very gentle slopes in the Coastal Plain; and sandy soils in the Coastal Plain.

About two-thirds of the average annual precipitation is returned to the atmosphere by evapotranspiration. The remaining 12 to 18 inches, which amounts to about 0.65 million gallons per day per square mile



of drainage area, constitutes the average annual runoff or streamflow. The 7-day, 10-year low runoff ranges from 0.2 to 0.5 million gallons per day per square mile in the mountains to less than 0.005 million gallons per day per square mile in the eastern Piedmont and eastern Coastal Plain. Runoff for December through March averages about twice that for April through November because of large water losses to evapotranspiration during the growing season. The streambed slopes of the rivers in the Chowan basin are the lowest in the study unit, which produce sluggish flows for long periods and flatter, relatively long-lasting flood peaks. Extensive regulation on the Roanoke River and its major tributaries decreases streamflow variability, reduces flood peaks, and augments low flows. The Tar River is swift and rocky at its headwaters, but slows and broadens as it nears Washington, N.C., where it becomes the Pamlico River. Several rivers and creeks drain into Falls Lake near Raleigh and Durham. The Neuse River begins at the outfall from Falls Lake. Flooding is a problem along the Neuse and on tributaries in newly developed urban and suburban areas near Raleigh.

Generally, more than 50 percent of the runoff in the study unit moves through the soils and underlying aquifers before it discharges to streams. The rest discharges directly to the streams as overland runoff. Intense precipitation, clayey soils, steep slopes, and impermeable underlying rock or frozen ground, however, may result in overland runoff being 75 percent or more of the total streamflow. In the central and western parts of the study unit, ground water occurs in and moves through weathered rock or regolith near land surface and fractured metamorphic, igneous, or sedimentary rocks at depth. In the Coastal Plain, ground water occurs in and moves through pore spaces between the sedimentary particles of the deposits. Wells as deep as 700 feet may obtain freshwater from aquifers in the study unit, but most natural ground-water circulation occurs at shallow depths.

Several hydroelectric dams are on the Roanoke River, including Smith Mountain Lake (storage capacity 1,142,000 acre-feet), Leesville Lake (94,960 acre-feet), Kerr Reservoir (2,770,000 acre-feet), and Lake Gaston (515,000 acre-feet). Another hydroelectric project is at Philpott Lake (247,400 acre-feet) on the Smith River, tributary to the Dan River in the Roanoke basin. The largest impoundment in the Neuse River basin is Falls Lake (396,000 acre-feet). Hundreds of smaller man-made lakes or reservoirs are scattered throughout the study unit.

The average daily water use in the study unit in 1985 was approximately 3,000 million gallons per day, of which about 92 percent was from surface-water sources. Water for cooling at four thermoelectric power-generating plants amounted to a total of 2,250 million gallons per day; nearly all was supplied from and returned to surface-water sources. Self-supplied industrial withdrawals totaled 268 million gallons per day. Surface water provided nearly 80 percent of this total. Mining activities used an average of 72 million gallons per day, nearly all from ground-water sources. Public-water suppliers withdrew 177 million gallons per day from streams or lakes, and 49 million gallons per day from aquifers. Aquifers also supply 75 million gallons per day to self-supplied domestic users in rural areas. Irrigation accounted for 126 million gallons per day, about 94 percent from surface-water sources.

## MAJOR WATER-QUALITY ISSUES

Surface-water quality issues in the Albemarle-Pamlico drainage study unit are primarily related to sediments, nutrients, trace metals, and organic constituents such as pesticides. For example, sediment, the most frequently cited cause of stream degradation in the study unit, affects water quality in several ways, including reducing clarity of surface water; transporting phosphorus, trace metals, and hydrophobic organic compounds; and reducing the flow capacity of streams and the storage capacity of lakes and reservoirs.

Overabundance of nutrients, especially phosphorus and nitrogen, causes accelerated eutrophication of lakes, reservoirs, and slow-moving streams in the study unit. Algal blooms occur in nutrient-rich waters.

Decaying algae depletes oxygen available in the water, which kills fish. Fish populations may also be affected by changes in dominant algal species caused by fluctuations in the availability of nutrients. Trace-metal accumulation in bottom sediments, a problem in several reaches of the major rivers in the study unit, adversely affects aquatic life and can enter the food chain. Under certain circumstances, trace metals remobilize and affect the suitability of water for public supply. Pesticides, which are introduced to surface waters by runoff from agricultural lands and lawns, have toxic effects on aquatic life and affect the suitability of water for drinking. Some pesticides also enter the food chain.

Acid precipitation is a problem, too, in poorly buffered streams in the headwaters of the Roanoke basin. Decreased pH levels caused by acid precipitation reduce biological diversity and productivity in streams and mobilize trace metals associated with soils and sediments. Acid precipitation, however, is an important source of nitrogen in nutrient-rich waters. Conversion of wetlands to croplands or managed forests also adversely affects water quality and wetland ecosystems. Wetlands produce oxygen, trap nutrients and sediments, and slow floodwaters. Nearly 60 percent of the original Great Dismal Swamp, a large wetland in the study area, has been converted to croplands.

The quality of ground water in the Albemarle-Pamlico drainage study unit generally is suitable for most uses, but ground-water issues that are related to excessive concentrations of constituents in water do exist. For example, excessive chloride concentrations (more than 250 milligrams per liter) occur naturally in ground water at depths in Coastal Plain aquifers and where aquifers are adjacent to tidal rivers and sounds or to the ocean. Chloride contamination also occurs from road salt that is used to deice highways. Radon-gas emissions, which occur in areas underlain by Piedmont granite and granite-gneiss aquifers, is derived from the decay of radium in many of these aquifers and is soluble in ground water. Long-term exposure to radon gas may be hazardous to human health.

Nitrate and phosphate concentrations greater than about 2 milligrams per liter occur locally in ground water from shallow aquifers in the area. Such concentrations generally indicate contamination from barnyards, septic tanks, or fertilized cropland. Nitrate concentrations of 10 milligrams per liter or more, which affect human health, are known to occur most frequently in water from the Valley and Ridge limestone aquifers and the shallow sand aquifers in the Coastal Plain. Pesticides, petroleum and other organic compounds, and bacterial contamination in ground water have been increasing throughout the area. Potential sources of these contaminants include point sources such as landfills and nonpoint sources such as agricultural croplands.

## COMMUNICATION AND COORDINATION

Communication and coordination between USGS personnel and other interested scientists and water-management organizations are critical components of the NAWQA program. Each of the study-unit investigations will have a local liaison committee consisting of representatives who have water-resources responsibilities from Federal, State, and local agencies, universities, and the private sector. Specific activities of each liaison committee will include exchange of information about water-quality issues of regional and local interest; identification of sources of data and information; assistance in the design and scope of project products; and review of project-planning documents and reports. The liaison committee for the Albemarle-Pamlico drainage study unit will be formed in 1991.

Information on technical reports and hydrologic data related to the NAWQA program can be obtained from:

District Chief, Water Resources Division  
U.S. Geological Survey  
3916 Sunset Ridge Road  
Raleigh, North Carolina 27607

Open-File Report 91-156

O.B. Lloyd, C.R. Barnes,  
and M.D. Woodside, 1991