THE ALBEMARLE-PAMLICO ESTUARINE STUDY

First Year Progress Report

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Project Director

March 15, 1988

Submitted to the Albemarle-Pamlico Estuarine Study Policy Committee and the US Environmental Protection Agency as a product of the Albemarle-Pamlico Estuarine Study

APES 88-04

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EXECUTIVE SUMMARY

The Albemarle-Pamlico Estuarine Study (APES) has made very strong progress in all major activities during its first full year of operation. Even so, few outwardly visible products have resulted to date. Enhanced public awareness of estuarine management issues, in large measure a result of APES staff activities, makes concrete progress toward the studies goals essential. This report summarizes progress to date and recommends strategies to continue the program's momentum through the change in director.

APES was recognized as the first National Estuary Program in the country to be designated consistent with the Clean Water Bill of 1987. A designation agreement was signed on October 20, 1987, laying out specific milestones for the remainder of the program. The most important milestones are a comprehensive report on status and trends in water quality and living resources (October, 1990) and a Comprehensive Conservation and Management Plan (November, 1992). Interim action can be taken through priority action plans, with federal funding.

Progress on technical studies has been strong once program funds were actually received (August-October, 1987). Nearly all projects are on schedule to produce draft reports by June-July, 1988. Areas of emphasis include: protection of resource critical areas, water quality and estuarine relationships, fisheries dynamics, and the human environment. Solicitations for this year's technical projects should be issued by about early April.

Public involvement is expanding rapidly, with the hiring of a new Public Involvement Coordinator in November, 1987. Funded projects are well underway. A newsletter will be released within weeks. The local government liaison network will be implemented in early summer. The citizen's monitoring network scoping study is producing excellent results, and should be implemented basinwide as soon as possible. Both Albemarle and Pamlico Citizens' Advisory Committees are meeting regularly and taking an active role in program direction.

Information management has begun more slowly, but Land Resources Information Services (LRIS) has now been directed to solicit work on the integrated data management system for the study. LRIS is already collaborating with EPA to produce the base map and numerous overlays. A baseline monitoring expansion draft has been produced, and the Technical Committee Subcommittee on Monitoring is working to produce a final document.

The continued success of the project depends upon the continuing flexibility and collaborative spirit shown to date by state, federal, local officials, and the people of the State of North Carolina. The beginnings have in some ways been painful, but a solid foundation has been laid to produce a long-term program of which citizens of North Carolina can be proud.

INTRODUCTION

The Albemarle-Pamlico Estuarine Study (APES) is a joint effort of the state, federal government and local interests, intended to facilitate effective management of the very valuable, productive resources in the major estuaries of northern and central North Carolina. It combines scientific research and evaluation of potential management alternatives to ensure the long-term productivity of our estuarine waters.

Although our estuarine areas do not display the very severe problems manifest in some others, similar warning signals are present. General declines in finfish fisheries have occurred since 1980. Striped bass catches in the Albemarle Sound have decreased dramatically in the last decade. Increasingly common outbreaks of fish diseases like red sore disease and ulcerative mycosis, crab diseases and large-scale fish kills throughout the region suggest that environmental tolerances are being exceeded. Massive blooms of blue-green algae occur almost yearly in some tributaries of the sounds. Also, the disappearance of rooted aquatic plants from the central part of the Pamlico River parallels similar disappearances in other more troubled estuaries.

APES is funding research intended to allow better management of our estuaries. Scientists are examining environmental problems to identify causal connections to human activities in the watersheds draining into the sounds (activities like farming, land-clearing and drainage, waste disposal, urbanization and habitat conversion). Other funded projects examine methods by which the processes contributing to the problems can best be managed to allow continued balanced use of our rich natural resources.

In addition to research by social and environmental scientists, APES is supporting the establishment of a comprehensive information management system, so that policy and management decisions can be based on the best available information. Finally, program funds are used to encourage public participation in this effort.

This project can achieve its full potential only with widespread public support. Two regional Citizens' Advisory Committees (CACs) have been appointed whose representatives have direct voting authority on both committees which determine funding priorities and project selection. A full-time staff member dedicated to public involvement is located in the NRCD Washington Regional Office. In addition, a local government liaison network is being constructed to facilitate communication with county and municipal governments. A more informal public participation process will also occur whereby all actions and studies recommended in the project will receive widespread comment in order to incorporate the wishes of the citizens of our state. Input from elected officials, state and local government professionals, special interest groups and researchers will assure full involvement of diverse segments of the community.

APES represents a unique opportunity for a partnership of scientists, resource managers, elected officials and citizens' groups. We can work together to protect our natural heritage and ensure the long-term productivity of our estuaries and the traditional human uses they support.

This report presents a brief perspective on the goals and importance of APES and summarizes progress to date in all major program areas: information acquisition, information management and public involvement.

GOALS AND NATIONAL SIGNIFICANCE

APES is authorized under the Clean Water Bill Amendments of 1987 as one of six projects under the auspices of the National Estuary Program (Section 320). The other five are: Long Island Sound, Buzzards Bay (MA), Narragansett Bay (RI), Puget Sound (WA), and San Francisco Bay. Of these, APES and San Francisco Bay are the most recent, with cooperative agreements between the Environmental Protection Agency (EPA) and affected states being signed in early summer 1986. In addition, the National Estuary Program builds upon the experience of the Great Lakes Program and the Chesapeake Bay Program from the 1970's. A number of other areas which probably will be nominated for inclusion this year include: Delaware Bay, Charleston Harbor, Santa Monica Bay (CA), Delaware Island Bays and Sarasota Bay (FL).

The Clean Water Bill clearly states the goals of the National Estuary Program to be:

> "...the attainment or maintenance of that water quality in an estuary which assures protection of public water supplies and the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife, and allows recreational activities, in and on the water...."

The specific purposes of all National Estuary Programs are listed in Section 320 to be:

1) assess trends in water quality, natural resources, and uses of the estuary;

2) collect, characterize, and assess data on toxics, nutrients, and natural resources within the estuarine zone to identify the causes of environmental problems;

3) develop the relationship between the inplace loads and point and nonpoint loadings of pollutants to the estuarine zone and the potential uses of the zone, water quality, and natural resources;

4) develop a comprehensive conservation and management plan that recommends priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of the estuary, including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish and wildlife, and recreational activities in the estuary, and assure that the designated uses of the estuary are protected;

5) develop plans for the coordinated implementation of the plan by the States as well as Federal and local agencies participating in the conference;

6) monitor the effectiveness of actions taken pursuant to the plans; and

7) review all Federal financial assistance programs and Federal development projects in accordance with the requirements of Executive Order 12372, as in effect on September 17, 1983, to determine whether such assistance program or project would be consistent with and further the purposes and objectives of the plan prepared under this section.

The APES Policy Committee considered these federal mandates and adopted the following statement of purpose:

> The purpose of the Albemarle-Pamlico Estuarine Study is to enable resource managers to better preserve the natural productivity of the estuarine area by expanding relevant knowledge about the impact of human uses upon its physical, biological, and social systems.

Generally, APES is designed as an initial five-year effort, with both state and federal fiscal contributions, to be followed by an expected 15-year implementation effort (Figures 1 and 2). The tool to ensure that a smooth transition occurs from planning to implementation is the Comprehensive Conservation and Management Plan, due at the end of the five-year "study". This document identifies not only what must be done, but at what cost, by whom, and who will pay for it. Because five years seem like a long time to delay action, a shorter-term avenue for action is also available: Priority Action Plans. Anytime the program determines that appropriate action is apparent, action plans may be designed and implementation funds requested.

APES was evaluated in fall, 1987 for consistency with the Clean Water Bill goals, and was the first program in the nation to demonstrate full consistency. This "designation agreement" was signed on October 20, 1987 by both EPA and State of North Carolina and announced formally on November 14, 1987, at a public meeting in Elizabeth City (Figure 3). This agreement sets forth a set of milestones to be met in order to guarantee solid progress toward the Comprehensive Conservation and Management Plan in November, 1992 (Figure 4). The most important is a Comprehensive Report on Status and Trends and Probable Causes of Environmental Problems expected in October, 1990.

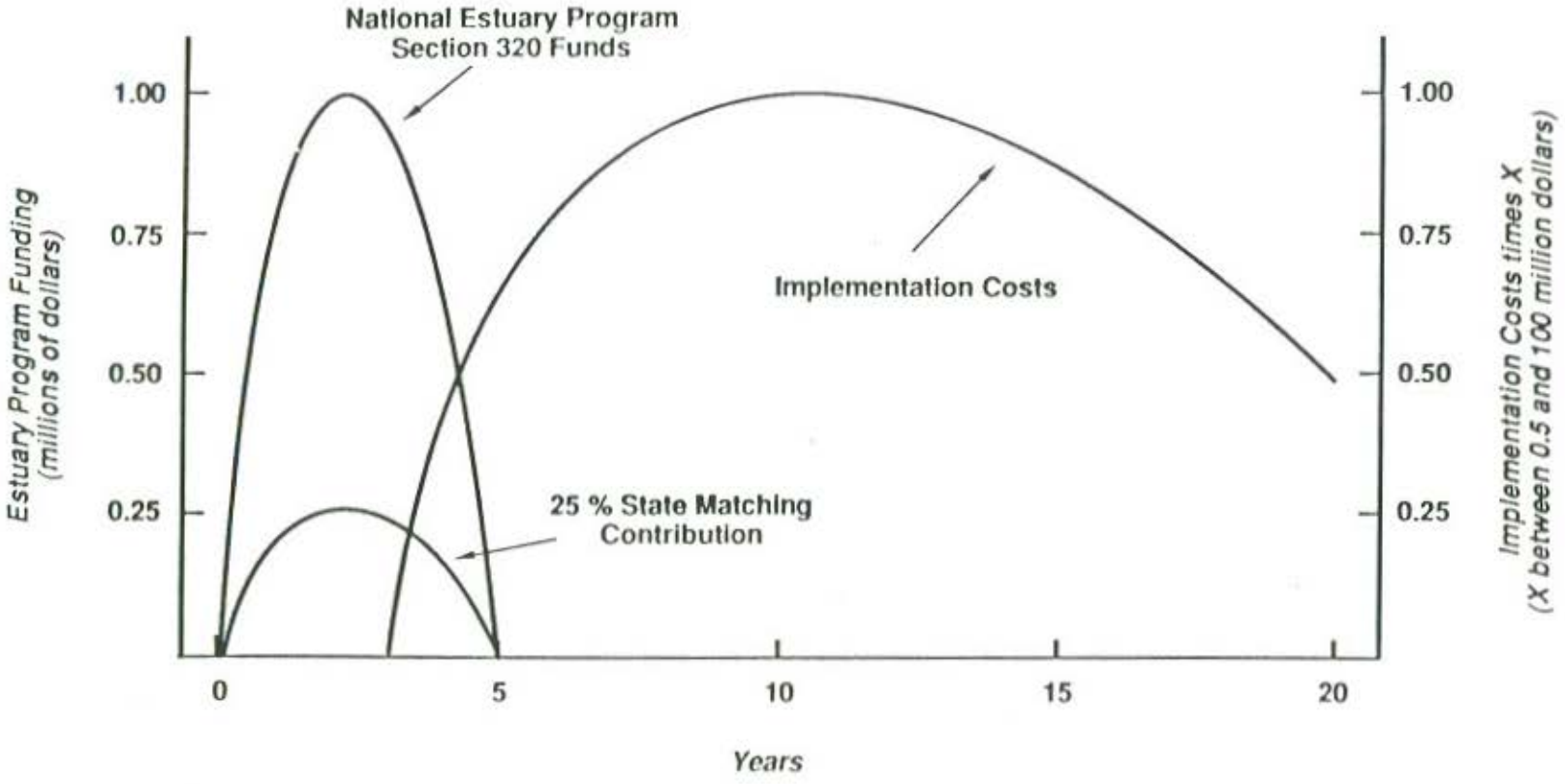
Clearly, all 100+ estuaries in the continental United States cannot be administered through National Estuary Program projects. The basic concept is that certain important or representative estuaries will lead the way to more general estuarine management through a comprehensive "Near Coastal Waters" program currently being developed by EPA. Thus, the achievements of APES will not be measured solely in protecting Albemarle and Pamlico Sounds, but also in the applicability of our solutions to other estuaries. APES is particularly important to other nonpoint-driven estuaries nationwide.

Program Structure

A. ADMINISTRATIVE BOARDS

The Albemarle-Pamlico Estuarine Study is administered by four administrative boards: the Policy Committee, the Technical Committee, and two Citizens' Advisory Committees. The Policy Committee functions to

Estuary Program Funding

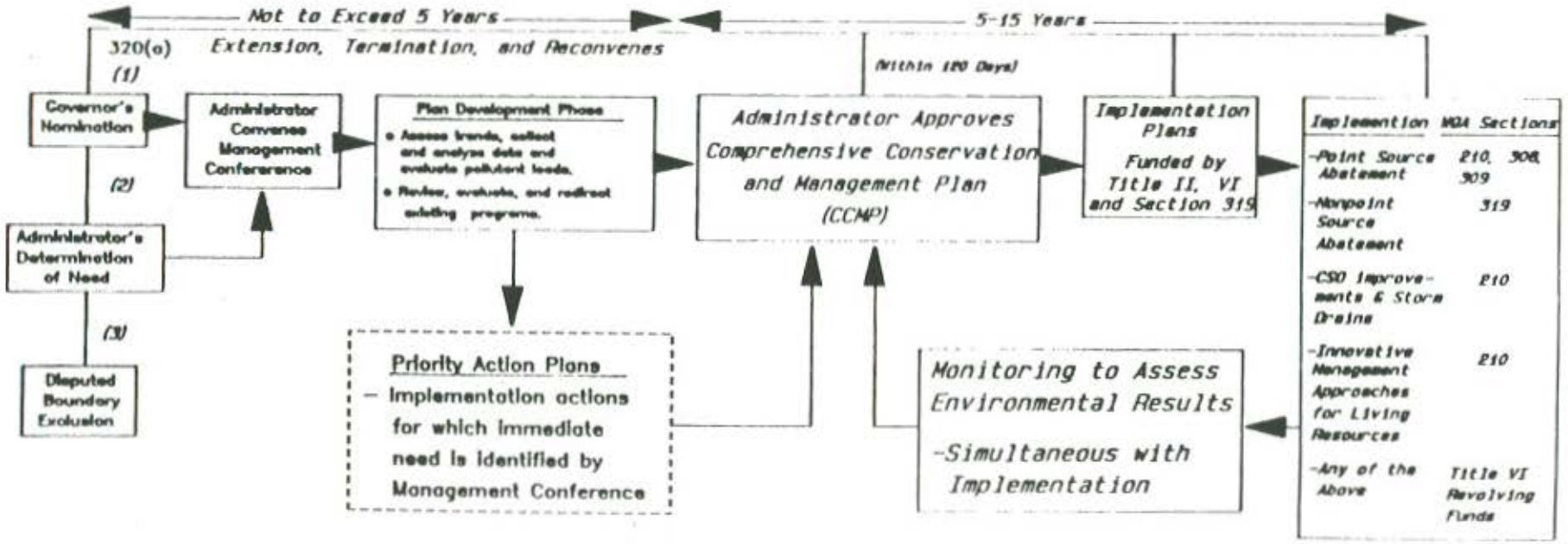


EPA *National Estuary Program*

Figure 1

Water Quality Act - Section 320

National Estuary Program
Section 320 of the Water Quality Act



EPA National Estuary Program

Figure 2

Figure 3

ALBEMARLE/PAMLICO SOUNDS

State/EPA Conference Agreement for National Estuary Program Designation Under the Water Quality Act of 1987

We recognize the need for a Management Conference on the Albemarle/Pamlico Sounds to better define the environmental concerns in the system; to address the extent, complexity and sources of pollutants; and to develop a comprehensive conservation and management plan for action. We further recognize that the States and EPA share the responsibility for management decisions and resources regarding priority issues in the system.

In signing this agreement, we are committing to products and schedules which will: assess trends in water quality, natural resources and uses; determine the causes of change through data collection, characterization, and analysis; evaluate point and non-point loadings and relate them to observed changes; write a comprehensive conservation and management plan which includes recommendations for priority actions; develop plans to coordinate implementation of a comprehensive plan with federal, state and local agencies; provide monitoring to assess the effectiveness of the implementation actions; and review Federal financial assistance programs and Federal development projects for consistency.

We also agree that the statutory requirements for Management Conference membership have been met and that we will participate in that Conference. Further, we commit that the statutory requirements for matching funds will be met to complete the characterization of priority problems and develop the comprehensive conservation and management plan.

S. Thomas Rhodes

S. Thomas Rhodes
Secretary
North Carolina Department of
Natural Resources and Community Development

Lee A. DeHihns III

Lee A. DeHihns, III
Acting Regional Administrator
Environmental Protection Agency
Region IV

Dated this 20th *day of* October, 1987

Figure 4

National Estuary Program Designation

Proposed Schedule, Albemarle-Pamlico Estuarine Study

TIME	MILESTONE
01/88	Inventory of existing monitoring programs completed
03/88	Baseline monitoring program designed
04/88	Identification of potential contributions by other federal agencies
06/88	Key data resources identified (draft)
08/88	Final list of data sets prepared and reviewed
12/88	Priority environmental concerns reviewed and reaccessed by the Policy Committee/Technical Committee/EPA
06/89	1. Databases prioritized (which useful for what purposes) 2. Probable causes of significant environmental changes identified
09/89	1. Inventory of relevant federal programs completed 2. Plan for addressing load/transport/fate relationships
11/89	"Probable cause" document reviewed by scientists/managers
12/89	1. Schedule for data management activities established 2. Federal consistency report completed
04/90	Key sections of Comprehensive Conservation and Management Plan identified
07/90	Draft monitoring plan (management effectiveness)
08/90	Draft report on status and trends and probable causes
10/90	Final combined report distributed to public
04/91	Potential management strategies defined and costs evaluated
08/91	Priority action plan to maintain/attain potential uses drafted (with authority needed, etc.)
11/91	Compliance schedule for action plans developed
01/92	1. Draft Comprehensive Conservation and Management Plan 2. Recommended alternatives to resolve federal inconsistencies
08/92	Institutional and financial commitments for action plans secured
11/92	Final Comprehensive Conservation and Management Plan

Also requires biennial reports on management action effectiveness to public

establish major policy guidelines, approve complete budgets, approve large fiscal actions and appoint members to the Technical Committee and Policy Committee. The Policy Committee will provide the final approval for the Comprehensive Conservation and Management Plan when it is issued. Members of the Policy Committee include:

Mr. S. Thomas Rhodes, Secretary, NC Department of Natural Resources & Community Development, (Co-chairman)
Mr. Greer Tidwell, Administrator, EPA Region IV (Co-chairman)
Mr. Dan Ashe, Committee on Merchant Marine & Fisheries, US Congress
Mr. Derb Carter, Chairman, Pamlico Citizens' Advisory Committee
Dr. Parker Chesson, Chairman, Albemarle Citizens' Advisory Committee
Dr. John Costlow, Director, Duke University Marine Laboratory
Dr. Bud Cross, Director, National Marine Fisheries Service, Beaufort Laboratory
Dr. Dirk Frankenburg, Chairman, UNC Curriculum on Marine Sciences
Ms. Mike Gantt, Field Supervisor, Division of Ecological Services, US Fish & Wildlife Service

Month-to-month administration is conducted by the Technical Committee, subject to Policy Committee approval in certain circumstances. The Technical Committee is charged by the Policy Committee with implementing the Albemarle-Pamlico Estuarine Study program by overseeing the issuance of calls for proposals, the review of proposed projects, and the choice of projects for funding in all areas of program development. In addition, the Technical Committee reviews and approves all final documents released by the program, and will direct the evaluations necessary to produce the Status and Trends Report and the Comprehensive Conservation and Management Plan. Technical Committee members include:

Mr. Bruce Barrett, Director, EPA Water Management Division (Co-chairman)
Dr. Ernie Carl, Deputy Secretary, NC Dept. of Natural Resources and Community Development (Co-chairman)
Mr. Mark Alderson, EPA/OMEP Water Resources Manager
Mr. Keith Buttleman, VA Council on the Environment
Dr. B. J. Copeland, Director, UNC Sea Grant Program
Mr. Tom Ellis, Dept. of Agriculture
Mr. Richard C. Hamilton, Deputy Director, NC Wildlife Resources Commission
Dr. William Hogarth, Director, NRCD Division of Marine Fisheries
Mr. Bobbye Jack Jones, US Soil Conservation Service
Dr. Ernie Larkin, Vice-chairman/Pamlico Citizens' Advisory Committee
Mr. Harry Layman, Director, NRCD Division of Forest Resources
Dr. Alvin Morris, US Environmental Protection Agency/ Region III
Dr. Michael Orbach, NC Marine Science Council Chairman
Mr. Dave Owens, Director, NRCD Division of Coastal Management

Mr. Larry Saunders, US Army Corps of Engineers
Mr. David Sides, Director, NRCD Division of Soil and Water Conservation
Mr. John Stallings, Vice-chairman/Albemarle Citizens' Advisory Committee
Dr. James M. Stewart, Associate Director, Water Resources Research Institute, NC State University
Mr. James Turner, Jr., District Chief, US Geological Survey
Mr. Paul Wilms, Director, NRCD Division of Environmental Management

Co-chairmen Barrett and Carl have appointed the following persons to subcommittees of the Technical Committee:

Standard Operating Procedures Subcommittee

Dr. Ernie Carl (Chair)
Mr. Bobbye Jack Jones
Dr. Michael Orbach
Mr. David Sides

Technical Review Subcommittee

Mr. James Turner, Jr. (Chair)
Dr. B. J. Copeland
Mr. Tom Ellis
Dr. William Hogarth
Mr. Dave Owens
Dr. James Stewart

Information Management Subcommittee

Mr. Bruce Barrett (Chair)
Mr. Mark Alderson
Dr. William Hogarth
Mr. Bobbye Jack Jones
Mr. Larry Saunders

Monitoring Subcommittee

Mr. Paul Wilms (Chair)
Mr. Mark Alderson
Mr. Bruce Barrett
Dr. Ernie Carl
Dr. B. J. Copeland
Mr. James Turner, Jr.

Citizens' Affairs Subcommittee

Dr. Michael Orbach (Chair)
Mr. Tom Ellis
Dr. Ernie Larkin
Mr. Harry Layman
Mr. John Stallings

The program also is responsive to two Citizens' Advisory Committees, whose members are appointed by the Policy Committee to represent specific geographic areas. The Pamlico Citizens' Advisory Committee members are:

Mr. Derb Carter, Jr. (Chairman)	833-4859
Dr. Ernie Larkin (Vice-chairman)	551-4495
Mr. Alton Ballance	928-3251
Mr. Fred Bonner	779-9750
Ms. Grace Bonner	322-4522
Mr. Ralph Buxton	441-4124
Mr. Rann Carpenter	322-4111
Mr. Rodney Calhoun	833-4859
Dr. Don Ensley	757-6961
Mr. Garvin Hardison	249-1225
Mr. Tim Hodges	926-3531
Dr. Bill Jackson	946-7725
Mr. Ralph Jarvis	926-3861
Ms. Susan King	633-4915
Mr. Dick Leach	946-5497
Mr. Neal Lewis	726-6831
Mr. Todd Miller	393-8185
Ms. Katie Morris	225-4261
Mr. Doug Nelson	466-3631
Mr. David O'Neal	926-5721
Mr. Bill Paul	745-4337
Mr. Willy Phillips	923-3151
Dr. Thomas Quay	828-9874
Dr. Clark Rodman	946-9282
Mr. Stuart Shinn	757-0659
Mr. Frank Sommerkamp	322-5259
Mr. John Spagnola	757-3073
Mr. Garland Strickland	459-3579
Mr. Buddy Swain	638-4991

The Albemarle Citizens' Advisory Committee members are:

Dr. Parker Chesson (Chairman)	335-0821
Mr. John Stallings (Vice-chairman)	794-2183
Mr. John Acree	441-5731
Mr. Lloyd Ballance	441-2531
Mr. Yates Barber	338-3557
Mr. Quentin Bell	473-3388
Mr. Don Bryan	441-6486
Dr. Mike Corcoran	833-1923
Mr. Michael Daniels	473-5001
Mr. Don Flowers	426-5753
Ms. Carolyn Hess	426-9563
Capt. Al Howard	221-4977
Dr. Jimmy Jenkins	335-3227
Mr. Chuck Little	797-4046
Mr. William McGeorge	804/855-1328
Mr. Murray Nixon	221-4115
Mr. Gerald Perry	261-2757
Mr. William Piland	804/569-4512

Dr. Robert Powell	335-7617
Mr. Terry Pratt	356-2267
Mr. Bill Richardson	804/473-1600
Mr. Earl Roundtree	465-8354
Mr. Joe Stutts	398-3525
Mr. A. B. Whitley	823-3234
Mr. W. C. Witherspoon	335-0865
Mr. Glen Wood	851-7441
Mr. J. A. Wright	335-6569

These members were selected so that a broad spectrum of interests and localities were represented, basinwide. Geographic distribution appears as Figure 5.

The Citizens' Advisory Committees have the responsibility to direct the public involvement portion of the program by making recommendations on public involvement projects and reviewing proposals submitted in the area. Citizens' Advisory Committees also review and make recommendations about pertinent technical projects and review all documents before they become final. The Citizens' Advisory Committees will serve the role of catalyst in enlisting public support for the program and its recommendations among the people affected.

Lists of mailing addresses and telephone numbers for program people appears as Appendix A.

B. PROGRAM STAFF

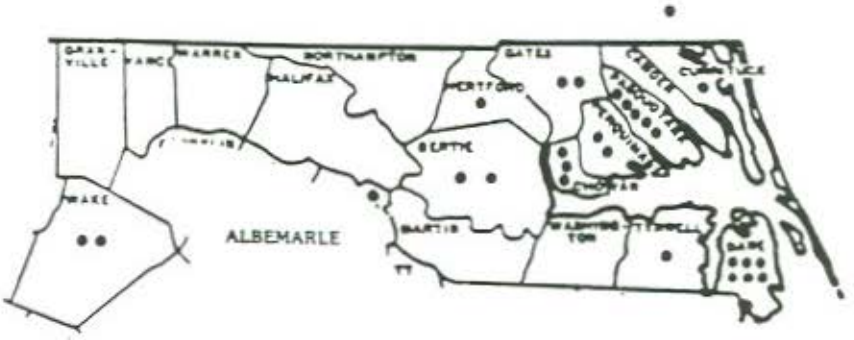
The program is conducted currently by a staff of four. The Project Director for the past 16 months has been Dr. Douglas N. Rader. Dr. Rader has just resigned to join the new office of the Environmental Defense Fund in North Carolina, and as such will continue to work on North Carolina coastal issues, and is available at any time for public inquiry or comment at 919/821-7793. The new project director is currently being selected from an excellent field and should be available by late March, 1988. The project director has the specific responsibility to execute all directives of the Policy Committee and Technical Committee to implement all aspects of the program: information acquisition, information management and public involvement. He must produce all reports requested by those bodies, oversee scientific research, direct budgetary considerations, and conduct program liaison with the Environmental Protection Agency (EPA), other federal and state agencies, the legislature, other states' officials and the other national estuary programs.

The director is aided in this responsibility by the full-time EPA project officer, Mr. Ted Bisterfeld. Mr. Bisterfeld has conducted excellent work on the program to date and is available at any time at 404/347-3866.

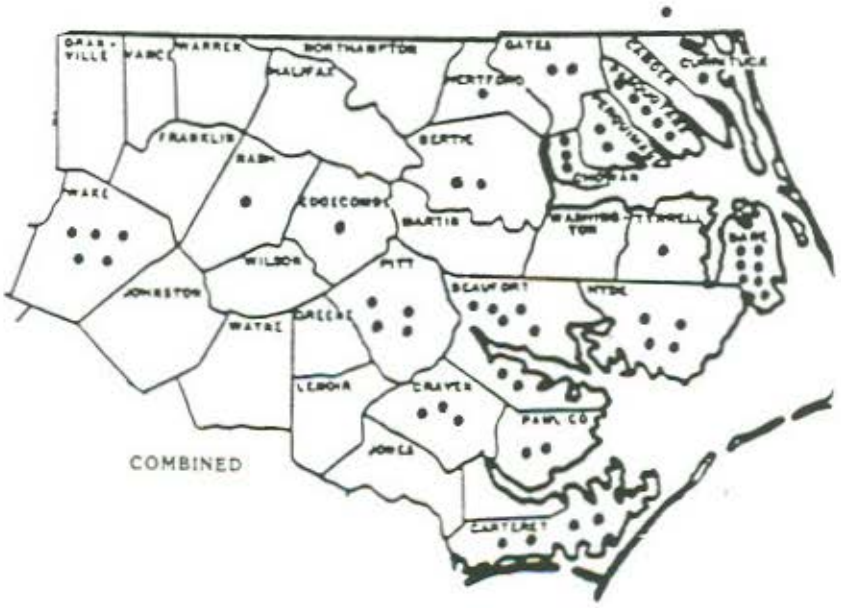
Other program staff include the public involvement coordinator, an information management coordinator and a full-time clerk. Ms. Joan Giordano has been on board as the public involvement coordinator since November, 1987, and is located in the Washington Regional Office of NRCD, at 919/946-6481.

Figure 5

GEOGRAPHIC DISTRIBUTION
APES
CITIZENS' ADVISORY COMMITTEES



● ACCEPTED



Ms. Giordano is available at any time to address citizen or local government comments, inquiries or reports of environmental problems. She directs the public involvement portion of the study, staffs the Citizens' Advisory Committees, and conducts liaison with local governments, the press, citizens groups and oversees public involvement grants under the program. The information management coordinator position is in the process of being created; the new project director will be able to fill the slot as a first duty. The information management coordinator position is responsible for direction of the information management portion of the study: oversight of the integration of existing computer systems for the Albemarle-Pamlico Estuarine Study data system, production of a narrative data base (studies and results), and liaison with potential users of the system. The final existing position is the program clerk position filled by Ms. Kathy Norris. Ms. Norris conducts day-to-day administration of office matters, coordinates communications and answers citizen inquiries about programmatic matters (919/733-0314). A fifth position is anticipated in the coming fiscal year, to conduct the citizen's monitoring program and oversee the monitoring portion of the study. This position will probably also be a field position (in Washington, NC or an alternate coastal locale).

Information Acquisition

The original workplan for the study (APES 87-02, available from the program office) lists 21 pages of technical studies of natural resources and their management which APES concluded were needed for effective management to result. Generally, these studies fell into the following categories:

1) identification and management of resource critical areas,

2) water quality and estuarine relationships,

3) fisheries dynamics: stock assessment and disease, and

4) the human environment.

The original plan contained prioritized areas for work, including characterization, evaluation, and implementation.

Studies for FY 1987 were chosen by a complex pathway. The draft workplan was released in March, 1987. A call for proposals (with instructions to authors) was issued on April 1, 1987, for the full range of prioritized topics. By May 1, 1987, over 100 proposals for work had been received. Over 600 outside reviews were directed by the Joint Peer Review Committee (Dr. Frankenburg, chairman; Dr. Costlow; Dr. Carl; Mr. Bisterfeld, for Mr. Barrett; and Mr. Turner). Review by technical authorities, managers, and program staff were considered to produce a proposed slate of projects for 1987-88. Several areas were identified as important, but needing clearer resolution before work proceeded (fish diseases, remote sensing, hydrologic and water quality modeling, natural areas and endangered species, striped bass, toxic and fecal contamination, and recruitment). These areas were targeted for either workshops or working groups. The Technical Committee review and approved the slate, as did the Policy Committee. Shortly after June 1, 1987, all pertinent documents were submitted to EPA to initiate those projects. Approval for work

to begin was received from EPA between August and October, 1987. In addition, several projects were identified for funding as money was available. Table 1 lists the seventeen projects funded initially and the three recommended for funding as soon as possible. A brief description and current status of each funded project follows:

A. RESOURCE CRITICAL AREAS

1. Environmental determinants of oyster bed success
(John Sutherland, Sonya Ortega and Peter Peterson; Duke University Marine Lab and University of North Carolina)

This project will answer the following questions:

Are all places in the Albemarle-Pamlico system suitable for oyster settling? Can oyster beds in historically important areas be reestablished? What are the conditions required for establishment of viable oyster beds? How does demography vary in space and time and which demographic variables determine the success of an oyster bed?

The statement of work includes: identification and characterization of oyster beds, evaluation of conditions required for establishment of oyster beds in historically productive areas, and evaluation of the relation between spatial and temporal variation in demographic variables and oyster success.

Status: Initial data characterizations are complete using Division of Marine Fisheries data from Jones Bay. Experimental and data analysis equipment have been obtained and are ready to go. Field work begins in March and continues until October of this year in two rivers, the Neuse and the Pamlico.

2. Analysis of nursery area data
(Mike Street and Liz Noble, NC Division of Marine Fisheries)

This project is designed to compile and analyze all existing data on primary nursery areas, secondary nursery areas, inland nursery areas and anadromous fish spawning and nursery areas to determine adequacy of designations, to establish baselines and to identify impaired or impacted areas.

Status: Funds for this project were not received until October, and staffing was not completed until January, 1988. Data evaluation is underway, agency meetings have taken place and analytical procedures have been established. The project will probably be completed by the 12-month time as scheduled.

3. Aerial survey of submerged aquatic vegetation
(Team leader-Gordon Thayer, National Marine Fisheries Service)

This project will produce maps of all submerged aquatic vegetation (SAV) in the study area by the time it is completed in three years.

SAV is critical fisheries habitat, and also is an important indicator of environmental health. Maps produced from aerial photography will provide an SAV status report and a baseline for future surveys. The initial work centers from Core Sound to Currituck Sound in eastern Pamlico Sound. Next year's work is anticipated to address western Pamlico Sound and its major tributaries.

Status: All activities are on schedule. A full-time technician (Lisa Wood) has been hired and is completing species composition work on historical cores. Team staff are completing work on Core Sound and planning spring aerial photography for the Core-Sound-to-Avon stretch. Groundtruthing in southeastern Pamlico Sound will be conducted this spring. Additional funds have been requested to meet unanticipated equipment needs.

4. Distribution of submersed aquatic plants
(Graham Davis, East Carolina University)

This project complements the National Marine Fisheries Service SAV study to produce a comprehensive view of SAV distribution patterns. Dr. Davis' work concentrates on groundtruthing for the NMFS work, and on the potential for reestablishment of native macrophytes in historical SAV bed areas. Currituck Sound and the Pamlico River (where macrophytes virtually disappeared in 1978-79) are the areas of concentration for experimental work. An SAV management plan will be developed during 1989.

Status: Surveys of SAV beds in Pamlico River and tributaries, and less intensive surveys of the upper Neuse River, Currituck Sound, Kitty Hawk Bay and Back Bay have been completed. For the first time since 1980, a few wild celery plants were found in the Pamlico River. Neuse River wild celery beds were found to be robust, and will be used for 1988 transplant experiments. Transplant experiments showed a serious problem with epiphyte growth in the Pamlico River. Silt and organic material appeared to inhibit stolon growth in bottom bags. All studies are on course as scheduled.

5. Ecological functions and values of fringe swamps
(Mark Brinson, East Carolina University)

This project is designed over several years to answer the following questions:

What is the potential for fringe swamps to regenerate after disturbance by timber removal and other impacts? What is the role of fringe swamps in maintaining water quality in freshwater and oligohaline zones of North Carolina's estuaries? Do fringe swamps provide food and cover for fish communities of the sound and for wildlife populations in the region?

The first phase concentrates on site selection and characterizing existing information on fringe swamps. Later phases address specific questions on management issues.

Status: This project is progressing slowly. Dr. Brinson has asked that the project be continued for additional time at no additional cost, to allow him to meet his obligation to APES.

6. Obstructions to anadromous fish migration and an evaluation of potential mitigation measures
(Ries Collier, US Fish & Wildlife Service)

A major factor in the obvious declines of anadromous fish is the loss of spawning habitat by conversion of the areas themselves or by loss of access caused by obstructions by dams, roads, and other water-development projects and natural processes. This project is developing baseline information on the historical extent of anadromous fish excursion, the present utilization of habitat and the locations of barriers to migration. The next phase will design a program to restore impacted areas.

Status: Historical data gathering is underway.

7. Other activities

A. Alternative Wetland Protection Strategies
(Dave Adams, North Carolina State University)

This effort is intended to evaluate the effectiveness of various wetland protection strategies. This project was slated for "December" funding, as money became available. The Technical Committee on December 15, 1987, approved the initial $7,500 to begin the project. Dr. Adams, however, had previously requested an upgrade of his request to $15,000 to allow him to retain an unusually talented and qualified person to execute the project. Dr. Adams has since lost this person for lack of funds.

Status: The project has not been initiated to date. NRCD Procurement is finalizing a contract for the $7,500 approved, but Dr. Adams' plans are uncertain at the moment.

B. National Wetland Inventory

The US Fish & Wildlife Service has made a large commitment of their funds to complete the NWI in North Carolina. This very important action will be pivotal to future wetland regulation and analysis of patterns of change.

B. Water Quality and Estuarine Relationships

1. The potential for eutrophication and nuisance algal blooms
(Hans Paerl, University of North Carolina)

This project is designed to:

examine the relative importance of nitrogen vs phosphorus as phytoplankton growth-limiting nutrients in the mesohaline waters of the Neuse Estuary and Pamlico Sound;

examine the relative importance of sediment-associated vs soluble nutrients as eutrophicating factors in these waters;

establish bloom "thresholds" in relation to specific nutrient (N and P) loading scenarios for these waters;

evaluate the potential for hypolimnetic anoxia associated with maximum periods of phytoplankton biomass production in these waters; and

test the hypothesis that "analog" nuisance bloom species (relative to know freshwater nuisance taxa) may exist and potentially proliferate in these waters.

Status: Preliminary assay work has been completed in Pamlico Sound to complement long-standing work in the Neuse River. A graduate student (Joe Rudek) will be concentrating effort on Pamlico Sound when the field work gets underway in late March or early April.

2. Hyde County detailed soil survey
(NC Division of Soil & Water Conservation, Hyde County, US Soil Conservation Service)

The nature of soils strongly affects the concentration of pollutants in nonpoint-runoff from farms, fields and cities. Hyde County is a major gap in our knowledge of soils near the coast. It is especially critical because of the wetlands present and its close proximity to fragile nursery areas.

Status: Soil mapping has been underway since July and is on schedule to complete the county in three years as designated.

3. Analysis of existing hydrologic and water quality data
(Jerad Bales, US Geological Survey)

This project is designed to consolidate and analyze existing water quality and hydrologic data on Albemarle and Pamlico Sounds and their tributaries to evaluate trends and explore causal relationships to human activities. Specific goals are to:

summarize known or presumed hydrologic and water-quality impacts from the various types of land-use change in the Albemarle/Pamlico region;

collect and analyze existing information on artificial land drainage for areas directly tributary to the Albemarle/Pamlico Sounds;

collect existing information on the hydrology and hydrodynamics of the Albemarle/Pamlico system. Using these data and information from items 1 and 2, analyze temporal and spatial trends in flows into and out of the sounds; analyze spatial characteristics and define governing or controlling phenomena for flows within the system;

collect and summarize historical information on point source discharges;

collect existing information on water quality in the sounds. Analyze water-quality data to identify and define spatial and temporal trends in parameters. Identify relationships between water quality and influencing factors such as point-source inflows, land-use change, meteorological events, and flow conditions;

determine the usefulness of watershed, hydrodynamics, and water-quality models for (a) gaining insight into important processes in the Albemarle/Pamlico system and (b) ongoing Albemarle/Pamlico management programs; and

based on the preceding analyses, identify needed information and develop hypotheses regarding relationships between water-quality conditions and potential governing processes.

Status: A comprehensive bibliography of water quality and hydrographic data sources has been produced. Data analysis is underway. Draft reports are expected as scheduled.

4. Flows and flow patterns in the Neuse and Pamlico River systems
(Jerad Bales, US Geological Survey)

The general objective of this research is to collect, analyze, and interpret data related to flow and flow patterns in the Pamlico River Estuary and the Neuse River Estuary. Continuous records of flow in the estuaries will be provided for use in conjunction with other research conducted as a part of the APES. Information on flow patterns, as well as continuous flow records, will be developed to meet current water-quality management needs.

Status: Locations for gauges and monitors have been determined and permission obtained. Equipment has been ordered, but implementation was delayed at the request of program staff to integrate aspects of the expanded baseline monitoring system. Otherwise, all work is on schedule.

5. Reduction of estuarine nutrient loading by coastal swamps
(Edward Kuenzler, University of North Carolina)

Nutrient loading in tributaries to estuaries can be greatly modified by coastal swamps. This process of nutrient reduction has great implications not only for evaluation of waste impacts, but also the citing of municipal treatment facilities.

Status: Preliminary work on site selection is almost complete. Field work on potential sites is beginning, in liaison with state resource managers. A workshop is planned for April to help target specific questions to be answered during the field portion of the project. IR aerial photos of potential sites have been obtained and are being evaluated.

6. A scoping study of the distribution, composition and dynamics of water-column and bottom sediments
(John Wells, University of North Carolina)

This study is designed to synthesize all existing sediment data from the Albemarle/Pamlico system. All data will be quality-controlled and then analyzed to produce a synoptic map of sediments throughout the system.

Status: This project is right on schedule. All existing data have been "captured" and are being analyzed. Field work to acquire modest "fill-in" data will begin within one month. Land Resources Information System personnel have met with project staff and agreed to digitize the information to produce the final map.

7. Offsite effects of Best Management Practices
(Jerad Bales, US Geological Survey)

The primary objectives of this investigation will be to (1) evaluate the off-site effects of water-control structures on surface flow and water quality in channels that drain cropland in the Albemarle/Pamlico region and (2) quantify the short-term effects of drainage from cropland on estuarine salinity in the Pamlico River Estuary.

Status: All preliminary siting evaluations are complete. Local Soil Conservation District and Department of Agriculture officials were consulted in the siting process. All activities are on schedule for this three-year investigation.

8. Other Activities

A. Land-use mapping

Steve Walsh of the University of North Carolina has submitted a multiyear, half-million dollar proposal to NASA to fund remote-sensing of land use and water quality in Albemarle/Pamlico drainage basins. If it is successful, this endeavor will provide comprehensive land use data that is updateable. The technology development phase would be followed by a transfer phase, where LRIS receives all data and software to implement the system, gratis, as well as being trained in its use. By that time, the Pamlico River Basin would be completed and could be expanded to the entire study area (or state).

B. EPA aerial photography

EPA has requested high-quality aerial photography of much of the study area in its Special Case Designation of North Carolina pocosin wetlands (Howard Marshall, Lee Pelej per. com.). For modest additional funds, we could get the remainder of the study area flown ($5000-$6000?).

C. Point-source map

LRIS, DEM, and APES have negotiated a mutual effort to result in an updateable point-source map for the study area. Specific overlays are listed in the Information Management Section of this report.

D. Workshop on Remote Sensing

Water Resources Research Institute contracted with APES to hold a workshop on Remote Sensing and Land Use in the Albemarle-Pamlico System. The workshop was successfully held on October 27/28, 1987, and a proceedings volume is almost complete. Included in that volume are recommendations on this topic to the APES administrative boards.

E. Workshop on Hydrologic and Water-Quality Modeling

Water Resources Research Institute contracted with APES to hold a workshop on this topic as well. The workshop was held on September 3/4, 1987. The proceedings volume is partially written, but awaits renewed funding of the SCI, Inc. contract with Marguerite Duffy to complete. NRCD Procurement has been working on that contract for quite some time. Ms. Duffy has been working on it on her own time in the interim.

Figure 6

UNITED STATES GOVERNMENT

memorandum

DATE: December 23, 1987

APES

DEC 29 1987

REPLY TO ATTN OF: Mike Gantt, APES Policy Committee Member

SUBJECT: Wetlands/Natural Areas/Endangered Species Workshop

TO: Doug Rader, Albemarle Pamlico Estuarine Study (APES) Coordinator, DNRCD, Raleigh, NC

INTRODUCTION:

On December 1, 1987, the subject workshop was held in room 482 of the Federal Building, 310 New Bern Avenue, Raleigh. Participants were the major authors of the endangered species research proposals including: Nora Murdock (FWS-Asheville); Debbie Paul (WRC-Raleigh); Rob Sutter (NCDOA-Raleigh); Chuck Roe (NHP-Raleigh); Brian Cole (FWS-Asheville), and, I served as facilitator. The objective of this working session was to prioritize and reach a concensus on the research studies needed to assist managers and decision makers in the APES study area.

METHODOLOGY:

To begin our discussions from a common baseline knowledge level, each potential investigator briefed the others present on the major components of his/her research proposal. A joint decision was then made to rank the various proposals based on the following four criteria: (1) relevance of the project to the overall APES program; (2) management need; (3) degree of threat; and (4) vulnerability (rareness; tolerance to perturbations; sensitivity). Upon numerical ranking, a subjective ranking took place to break tie votes.

RESULTS:

The following list presents the various wetlands/natural areas/endangered species research proposals according to priority ranking by the authors:

Proposal	Approx. Cost
1. Distribution and Status of the Unionidae of Northeastern North Carolina River Basins (Wildlife Resources Commision)	$63K
2. County and Regional Natural Areas Inventory (Natural Heritage Program)	55K
3. Intertidal/Coastal Swale Inventory for rare plants	20K
4. Distribution of Piping Plover (Th) (Inventory Study 1st Year)	35K

OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114
* U.S.G.P.O. 1988-491-248/20641

5. Wet Pine Savannahs - Rare Plant Inventory 17K

6. Inventory of Rare, Freshwater Aquatic Plant Species 11K

7. Sea Turtle Study 55K

8. Red-cockaded Woodpecker Inventory

9. Waccamaw Killifish Inventory

10. Management Protection Activities and Restoration of Calcarious Habitats

11. Bald Eagle Inventory

12. Survey for Rare Upland Species

13. Alligator Inventory

MISCELLANEOUS, BUT IMPORTANT POINTS FROM MEETING:

- If sea turtle study is funded, WRC would not be the sub-contractor.

- Priority areas for the Natural Areas Survey are as follows: (1) NE Sector; (2) S. Sector; and (3) Inner Sector.

- NE sections of State - have a paucity of endangered plant information yet that area is experiencing development pressures.

- Research proposals for inventories for sea turtles, RCW, bald eagles and piping plover do not include funds to digitize information into the LRIS system.

- Intertidal/Coastal Swale Inventory - Seven species to be concerned about: 3 Federal candidate species; 1 State-listed; and 3 State candidate species. FWS is funding $8200 this FY for "Sea beach" status survey. There has been a 60 percent reduction in rare species found in these zones in the Chesapeake Bay. In many instances, NC may be the last stronghold for some of these species.

- Mussel survey ranked very high largely because the group felt mussels were a good indicator of water quality. Mussel survey needed in 3 river systems, prioritized as follows: Year 1 - Pamlico River; Year 2 - Neuse River; and, Year 3 - Roanoke River. This is a 3-year study, and all phases needed for success. Year 3 includes development of a management plan.

- Alligator survey lower priority especially since it has been taken off the Federal endangered species list.

Additional thoughts by the group on the wetland proposals submitted by FWS and other miscellaneous issues.

- The FWS should find its own funds to reprint the Albemarle Sound Estuarine Profile, which is a compilation of known information.

- Concept of an Estuarine Profile for Blackwater Streams. Since many exist outside the study area, another funding source might be more appropriate.

- Inventory of Maritime Forests is being done in NC by either UNC or Duke. DCM is letting the contract (Rich Shaw).

F. Working groups on toxic substances and fecal contamination

Dr. John Costlow has agreed to coordinate these working groups, and is proceeding to convene them.

G. Natural Areas and Endangered Species Workgroup

Ms. Gantt chaired a working group on this topic which met December 1, 1987. Their recommendations appear as Figure 6.

H. Heavy metal and organic rich mud pollutants in the Pamlico River estuarine system
(Stan Riggs, East Carolina University)

This project concentrates on pollutants of fine-grained sediments. It will:

map the major point and nonpoint source discharges, along with their known chemical characteristics and discharge rates;

determine concentration and distribution of heavy metal, uranium, thorium, and phosphorus pollutants absorbed onto organic-rich mud within in order to:

a) establish present pollutant levels around a series of know point and non-point sources;

b) identify specific trouble spots within the estuarine system;

c) define a basinwide framework for determining migration paths of pollutants through time; and

d) determine the pre-man or "natural background" levels of pollutants, and establish the changing impact through time resulting from agriculture, urbanization, and industrialization of the drainage basin;

determine the inter-relationships between sediment/water column interactions and resultant chronic effects of heavy metal and organic-rich pollutants upon the estuarine system; and

establish a baseline framework for sediment and associated pollutants:

a) integrate data bases from existing federal, state, and private monitoring programs;

b) develop baseline information for modifying existing long-term monitoring programs; and

c) develop baseline information for the development and implementation of regulatory and management decisions concerning wastewater and sediment discharges and associated estuarine water quality.

The project starts in the Pamlico and then moves to the Neuse and beyond. It was approved initially for funding to begin as soon as possible (i.e., about December, 1987). The Technical Committee approved startup funds of $6,000 in December, which have now been expended. Urgent action is needed to transmit further funds.

I. Potential for persistence of the red-tide dinoflagellate, Ptychodiscus bevis
(Mary Tyler, et al., Versar, Inc.)

The November bloom of the toxic microalga, Ptychodiscus brevis, caused extensive closures of North Carolina shellfish waters until it began dispersing in January, 1988. The probability of persistence of enough cells or resting stages to cause repeat blooms when warmer weather returns prompted this rapid response study. The Technical Committee on December 15, 1987, approved up to $25,000 to address this issue.

Status: Water and sediment samples were taken from the most severely affected areas in Core Sound, Bogue Sound, and near Cape Lookout for processing. Results are expected shortly.

J. Factors responsible for blooms of Ptychodiscus brevis and the design of an effective monitoring program
(Proposed by Dr. Pat Tester, National Marine Fisheries Service)

Federal law requires a monitoring program once red tide has occurred in an area. DEM, DMF, Shellfish Sanitation and NMFS believe remote sensing can be used in this process. An excellent proposal is in hand to address this need, and time is short.

C. Fisheries Dynamics: Stock Assessment and Disease

1. Scoping study on data requirements for fisheries stock assessment in North Carolina
(Linda Mercer and Mike Street, NC Division of Marine Fisheries)

This project was designed to determine the future programs necessary to evaluate fisheries standing stocks. Specific goals include:

define the fishery data needed to achieve management goals;

identify and evaluate existing data; and

recommend appropriate adjustments in existing data collection activities and additional data which should be evaluated.

Status: This project was not officially funded until October, 1987, and personnel problems have prevented active initiation. Mr. Street is finishing the NC Master Plan for Marine Fisheries, with which this project integrates. He will be working on APES as soon as the Master Plan is complete. He sees no problem with completing work on schedule.

2. The value of recreational fishing in Albemarle and Pamlico Estuaries
(V. Kerry Smith and Raymond Palmquist, North Carolina State University)

This project was designed to produce a model applicable to management situations. Specifically, the study will:

review and evaluate past efforts to model the demand for marine recreational fishing;

evaluate the feasibility of transferring existing results to the Albemarle and Pamlico Sounds;

conceptual modeling of the demand for marine recreational fishing;

preliminary demand analysis with North Carolina Survey; and

compare demand estimates of this study with those transferred from other areas.

Status: All activities are on schedule. Recent work in the area has been summarized; a workshop was held in Morehead City recently with recreational fishermen

and managers; valuation of data is being assembled; and conceptual models for demand are being developed.

3. Testing and evaluating different excluder devices in the Pamlico Sound Shrimp Fishery
(Ken Pearce, Mariner's Marine, Inc.)

Mortality in juveniles of non-target species is very high in this particular fishery, yet alternative technologies have never been tried inshore in North Carolina. The management goals of this project are to:

improve and enhance the efficiency of the Pamlico shrimp trawl fishery by reduction of crew effort, energy savings, and efficiency of operation;

enhance the image of the fishery; and

enhance the fishery which the juvenile fish stocks support when they mature.

Status: This project was funded "up-front" with planning year funds, paid back from 1987 funds. As such, the field work is complete and the data analysis is underway. Draft reports are due shortly.

4. Other Activities

A. Fish Disease Workshop

Water Resources Research Institute conducted an extremely good workshop on this topic featuring numbers of national experts. The proceedings volume is being printed and should be available shortly. (A summary is attached as Appendix G.)

B. Recruitment/Nursery Area Working Group

Dr. John Costlow has agreed to coordinate these activities. Planning is underway.

C. Striped Bass Working Group

An excellent two-day session on striped bass declines was held on February 4/5, 1988, in Morehead City. Draft recommendations are attached as Appendix B. A striped bass task force met March 8/9 at East Carolina University to address optimal flow regimes in the Roanoke River. Action is needed quickly on:

1) striper spawning monitoring this April (~$16,000) and

2) obtaining Dr. Bill Hassler's data (~$12,000).

D. Ulcerative Mycosis

The North Carolina Legislature appropriated $75,000 to NC Division of Marine Fisheries to conduct ulcerative mycosis investigations. This work is currently underway. Ideally, APES will take over needed work for this coming fiscal year.

D. THE HUMAN ENVIRONMENT

1. Baseline demographic trends
(Paul Tschetter, East Carolina University)

This project was funded to develop a systemwide demographic database, including permanent and temporary populations, to be completed at LRIS.

Status: Work is on schedule. Appropriate data has been identified, collected, and entered into SAS data sets at East Carolina University. Reports are expected as outlined in the cooperative agreement (i.e., draft by June, final by August, 1988).

2. Current resource management programs
(Rob Nichols, Research Triangle Institute)

This work is required by the Clean Water Bill, to evaluate the performance of existing resource management programs authorized by federal law. The project was approved for December, 1987, funding, but funds are just now available. Supplemental 1987 EPA funds are earmarked for this project as soon as matching funds can be arranged.

3. Existing Management Programs
(Dave Brower, University of North Carolina)

This contract resulted in the Management Program chapter of the source document and also APES 86-01.

PUBLIC INVOLVEMENT

The public involvement portion of the APES program may well be the most important in the long term, since education and personal involvement are critical to build the consensus needed to reach the stated objectives. The majority of this effort depends upon building public and local government confidence in the APES program.

The APES public involvement program has several key features: the Citizens' Advisory Committees (CACs) (as described previously), a local government liaison network, a newsletter, projects funded to citizen groups and universities, and media relations.

Local Government Liaison Network

This feature of the APES program is long overdue, especially given the keystone role of the local government in land-use control. Strong interest has been expressed by all local governments contacted, but especially by Chowan County (Mr. Cliff Copeland) and several municipalities in Southeastern Virginia (e.g., Virginia Beach, Mr. Jack Whitney, Southeastern Virginia Planning District Commission, Mr. Jack Carlock). The idea is to provide a straightforward mechanism for communication (comment and criticism) from local governments to APES, and for dissemination of information from APES to local governments. Similarly, local governments should be able to benefit significantly by simply knowing of actions planned or anticipated by neighbors.

Public Involvement Coordinator Joan Giordano has committed to identify appropriate points of contact in all 33 counties in North Carolina and those in Virginia as well as municipalities, and to prepare updates at least four times per year. The target for initial contact is early summer.

Newsletter

The APES newsletter is also being published by APES staff. Ms. Giordano has solicited articles from resource managers, citizens and officials; has overseen production of a masthead logo, and anticipates first issue in a matter of weeks. The initial budget of $15,000 is expected to cover about four quarterly issues with a circulation of about 10,000. Regular features will include a technical corner, a column on traditional lifestyles and history, as well as reports on program progress on all fronts. For information or to contribute, contact Ms. Giordano at 919/946-6481.

Media Relations

Medial relations are currently excellent, with lots of time dedicated to building such connections. Major articles have run in the New York Times, Philadelphia Inquirer, Winston-Salem Journal, Raleigh News & Observer, Charlotte Observer, Virginian-Pilot, Washington Daily News, Greenville Daily Reflector, Elizabeth City Daily Advance, and the Wilmington Star, among others. In periodicals, coverage has included Business Week, Business North Carolina (another story anticipated next issue), the Environmental Reporter, the EPA Journal, and American Land Forum. Wildlife in North Carolina has done

a story on the Pamlico River and anticipates one on APES shortly. Numerous radio pieces have run, as well as commercial television. A lengthy piece by public television is in the planning stages.

Funded Projects

1. Public Meeting, February 14, 1987
(Jim Kennedy, NC Coastal Federation)

A highly successful public meeting was held on a beautiful Saturday in Beaufort County, NC, at Beaufort County Community College. About 600 people attended (brochure attached as Appendix C).

2. Public Meeting and Designation Event, November 14, 1987
(John Carson and Maury Powers, Elizabeth City State University)

Over 200 people attended a public forum held in Elizabeth City on November 14, 1987, to discuss public concerns and hear Mr. Larry Jensen, EPA Assistant Administrator for Water present APES as the first National Estuary Program project officially designated under the 1987 Clean Water Bill amendments (brochure attached).

3. Citizen's Monitoring Network Scoping Study
(Dave McNaught and Grace Lekson, Pamlico-Tar River Foundation)

This project may initiate the most important long-term result of APES: bringing trained citizens to the program in large numbers in a truly productive capacity.

Status: All activities on schedule. Extreme interest has been shown all over the study area, from Currituck to Chowan to Carteret. A training workshop is scheduled for March 26. See Appendix D for a further description.

4. State of the Estuary Booklet
(Francis Lynn and Melv Okun, University of North Carolina)

This booklet is badly needed, in popular form with attractive presentation to build knowledge of the importance of estuarine problems.

Status: The role of this instrument has changed drastically from what was originally proposed. Because only production money was included in the budget, some modest additional funds ($2,000-$3,000) are needed to have it written. Ms. Okun is negotiating with respected journalist and author Frank Tursi about such an undertaking.

5. Public service announcements
(Francis Lynn and Melva Okun, University of North Carolina)

Ten short radio pieces and four longer pieces for radio are to be developed, as well as four short video pieces for television.

Status: Radio pieces are well underway: interviews were taped at the Elizabeth City meeting and elsewhere. Video filming trips are planned in mid-April, after having been scrubbed for weather reasons last fall.

6. Media tour
(Jim Kennedy, NC Coastal Federation with Duke Marine Lab)

A two/three day media tour of coastal issues and unique features of estuaries is provided here.

Status: The event is scheduled for April 26-29. An agenda is attached as Figure 7.

7. Workshops on management programs and citizen guidebook
(Jim Kennedy, NC Coastal Federation; Lundie Spence and Kathy Hart, Sea Grant)

The need for public involvement in the management of coastal resources is clear.

Status: The draft guidebook was completed in January and has been extensively reviewed by resource managers, professional editors, and lawyers. Copies were distributed to Policy Committee members on March 16, 1988. The book will be produced by Sea Grant and distributed to Citizens' Advisory Committees, Technical Committee members, and serve as the materials for workshops held in coastal areas during late spring and summer. Each workshop will consist of two days and an opportunity for a field trip. Resource managers will serve as "resource" people for the workshop.

8. Videotape and slide show
(Gary Smith, East Carolina University)

The goals of this project are:

to create a videotape production of between 30 and 60 minutes which will document the natural resources, environmental issues, pollution problems, regulatory agencies, and public attitudes of the Albemarle-Pamlico Estuarine area;

to produce a dual-projected, dissolve, color slide show of approximately 30 minutes to encompass the above problems, issues, agencies, and attitudes; and

to produce short video and slide presentations on specific management areas listed in the first goal to be used primarily as introductory informational material.

Status: This project as originally approved in summer, but fell victim to a 5% cut by EPA. The Technical Committee approved replacing the funds in December, 1987, and the contract has been executed. However, Dr. Smith has experienced serious health problems and was delayed from initiating the project. Its future is uncertain.

Costs of individual projects are listed in Appendix E.

Figure 7

SCHEDULE FOR MEDIA TOUR

Tuesday, April 26:

10:00 AM to 4:00 PM	Open House at the Office of the Coastal Federation
6:00 PM	Reception at Duke Marine Lab
7:30 PM	Banquet at Duke Marine Lab

Wednesday, April 27:

7:00 AM	Breakfast at Duke Marine Lab Dining Hall
8:00 AM	Board Bus At Duke
9:30 AM	Cedar Island Ferry Departs
12:00 Noon	Alton Ballance, Hyde County Commissioner, and residents of Ocracoke Discuss Growth Issues Facing Their Community
3:00 PM	Hatteras Island Growth Issues
4:30 PM	Wind Surfing Demonstration, Avon
6:00 PM	Check In At Ramada Inn, Kill Devil Hills
7:30 PM	NC Aquarium: Dinner and Round Table Discussion on the Future of Northeastern North Carolina

Thursday, April 28:

8:00 PM	Board Bus At Ramada Inn
9:00 AM	Primary Nursery Area Trawl Demonstration and Presentation, NC Division of Marine Fisheries
11:00 AM	Lunch in Englehard
12:30 PM	Wetlands, Water Quality and Wildlife, US Fish and Wildlife Service, Mattamuskett Wildlife Refuge
2:30 PM	Agricultural Best Management Practices, NC Department of Agriculture, enroute tour with frequent stops between Swan Quarter and Washington
5:00 PM	Holiday Inn, Washington
6:30 PM	Dinner
7:30 PM	Fish Diseases: NC Division of Marine Fisheries
	Citizen Monitoring of Water Quality: Pamlico-Tar River Foundation
	Citizen Participation in Environmental Regulatory Programs: NC Coastal Federation

Friday, April 29:

8:00 PM	Board Bus At Holiday Inn
8:45 AM	Tour of Crab House
9:30 AM	Tour of Texasgulf Chemicals Company
11:30 AM	Lunch, Courtesy of Texasgulf Chemicals
12:30 PM	Forestry Demonstration, Weyerhaeuser Company
3:30 PM	Return to Duke and Debriefing Session

INFORMATION MANAGEMENT

Information management is an integral portion of the APES program, to allow public policy decisions on coastal issues to be based on information instead of intuition. The APES information management concept is deceptively simple yet innovative: the linking of existing data management systems into a consolidated network. The implementation of this network will be a tedious and costly undertaking, yet it builds on the excellent geographic information system already operational at the Land Resources Information System in NRCD. A challenging feature will be the integration of information across state lines (Chowan, Pasquotank and Back Bay drainages in Virginia). Major features are described below.

A. Base Map

The base map for the APES study, linking geography and all possible tabular data, will be the USGS 1:100,000 Digital Line Graphs (DLGs) purchased by Region IV EPA and edgematched by EPA and LRIS. Similar quadrats will be purchased from Virginia portions of the study area, if they cannot be gotten directly from the State of Virginia. The 1:100,000 scale DLGs are expected anytime from EPA. Base map overlays will include soils, land use land cover and a variety of point markers (NPDES permits, water supplies, etc.), and are delineated on the attached 1987-88 data management work plan (Appendix H). Work is already underway.

B. System Upgrade and Integration

LRIS upgrade to support APES requirements is underway as part of a much larger upgrade being conducted by NRCD. A consultant will be hired to develop specifications for the overall database and system design, with oversight by the Technical Committee Information Management Subcommittee. Requests for bids will be issued as soon as practical to begin implementing their package.

C. Staffing

The Information Management Coordinator position established has been on hold pending resolution of Dr. Rader's change of employment, but now will proceed full speed. The successful candidate will probably be located physically in LRIS to facilitate communication.

MONITORING

The Clean Water Bill dictates two specific roles for monitoring:

1) baseline establishment, and

2) evaluation of management effectiveness.

In our program, these functions will be controlled by the new Technical Committee subcommittee on Monitoring, chaired by Mr. Paul Wilms (DEM). APES, DEM, USGS, EPA and DMF staff have produced a crude baseline monitoring plan, to be refined by the APES Technical Committee (Appendix E). The major features included are:

1) continuous monitors sited at high-risk locations;

2) basinwide water quality studies, especially in open water areas;

3) one-time surveys of sediment and fish-tissue toxics;

4) expansion of the existing ambient water quality monitoring network;

5) emergency event capability; and

6) implementation of a citizens monitoring network.

To this list must be added; as required by federal law:

7) red-tide monitoring program.

The most critical aspects of this program are the citizens monitoring and the continuous monitoring networks.

At present ($225,000-$35,000) = $190,000 is available from EPA in supplemental 1987 funds for baseline monitoring expansion. Immediate needs for these funds include:

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1) red-tide monitoring (Tester/NMFS proposal; $22K);

2) heavy metals sediment (Riggs continuation; $34K);

3) citizens monitoring initiative (?, $30K-$50K); and

4) SAV monitoring expansion (Thayer/NMFS, $12K).

The designation agreement milestones coming most quickly deal with monitoring. The report summarizing existing monitoring systems remains incomplete and overdue, as a result of staff transition. The finalized baseline monitoring plan is due by the end of March.

BUDGET

APES funds come from several sources, from overlapping fiscal years (state vs federal vs APES), and present an unusual opportunity in mental gymnastics. The following breakdown of funding sources, real and anticipated expense is simplified accordingly.

A. Planning Year Funds: FY 1986

The cooperative agreement for these funds was signed on July 11, 1986. The amount of the grant was $300,000, matched by NRCD $16,000 in salaries and indirect costs. An additional $50,000 went to EPA Region IV for program administration: the bulk of those funds were used to support minute preparation for committee meetings (first Margaret Dobger then Marguerite Duffy, SCI). The $16,000 inkind match is currently being consolidated from NRCD staff hours, by verification of staff hours, to be submitted to EPA Grants for verification.

The Planning Year Funds are now virtually exhausted. Funds were used to support Program Office functions through the first quarter of the state fiscal year 1987 (i.e., from July, 1986 to October, 1987). Total program office expenses during that time were as follows:

	To 9/30/87	Grant Amount
Personnel	48,157.00	55,092.00
Fringes	9,886.79	11,559.00
Travel	4,962.56	7,500.00
Equipment	2,332.27	2,500.00
Supplies	674.08	1,000.00
Other (Telephone, etc.)	6,593.21	6,349.00
Total	72,605.91	84,000.00

Additional fiscal expenses and commitments include:

Contractual Services

Dave Brower, UNC (Management Programs)*	5,000.00
NC Coastal Federation (Feb. 14 meeting)*	4,587.15
Elizabeth City State Univ. (Nov. 14 meeting)*	8,113.27
WRRI (3 workshops on technical topics)	15,750.00
Versar (red tide persistence work)	24,897.00
Gary Smith, ECU (videotape slide show)	10,000.00
Stan Riggs ECU (startup funds)	6,000.00
Dave Adams, NCSU (wetlands protection)	7,500.00
	$81,847.42

(Ken Pearce's project was funded initially through Planning Year Funds, but the $11,060.16 paid as of 9/30/87 was repaid from FY 87 funds.)

Transfer to Land Resources Information System		
Database design (etc.) (transferred but not fully expended)		40,000.00
Budgeted for database implementation		91,000.00
		$131,000.00
Program Office Computer System		7,366.56
Sum of all items		$292,819.89
Residual funds:	$300,000 - 292,819.89 =	$ 7,180.00

An amendment to the NRCD cooperative agreement is necessary to consolidate these funds.

B. Federal Fiscal Year 1987

Federal funds from EPA in the amount of $685,000 with a 5% grant-by-grant match were available in 1987-88. To this was added a state budgeted amount of $500,000. However, when final legislative action occurred in July, 1987, only $375,000 was appropriated for this state fiscal year on the grounds that only three quarters overlap the federal fiscal year (that is $500,000/4 = $125,000/quarter X three quarters = $375,000). Therefore, the full budget was was funded, as long as no more than three quarters of state funds are expended by June 30, 1988.

The overall budget of the NRCD/EPA cooperative agreement for October 1, 1988 to October 1, 1989 is shown on Figure 8. Please note that the $15,000 "loss" in the grant was taken from the videotape/slide show line item, which was replenished from residual planning year funds. The cooperative agreement covers all administrative and information management services, as well as the NRCD technical projects and $15,000 for newsletter production.

Other cooperative agreements between EPA and the recipient organizations (FWS, NMFS, ECU, UNC, Duke, NCSU, PTRF, NCCF) and between NRCD and USGS cover all other projects. The purely federal agreements are interagency in nature and do not require the match stipulated by the Clean Water Bill. However, all others require 5% local match (25% starting in 1988-89), which is budgeted from state appropriations. It has proven a formidable task to move such money to each organization, and the task is still not complete.

Figure 8

ALBEMARLE-PAMLICO ESTUARINE STUDY

BUDGET BREAKDOWN & JUSTIFICATION

(1) ADMINISTRATION

	FEDERAL	STATE	TOTAL
a. Personnel			
Project Director	$ 25,593	$ 10,821	$ 36,414
Clerk/Steno IV	14,957	6,325	21,282
Public Involvement Coordinator	18,555	7,845	26,400
Data Management Coordinator	19,327	8,173	27,500
Total	$ 78,432	$ 33,164	$111,596
b. Fringe Benefits			
(1) 18.35% of wages & hospitalization	$ 16,306	$ 6,894	$ 23,200
(2) Longevity Bonus for Clerk/Steno IV	351	149	500
Total	$ 16,657	$ 7,043	$ 23,700
c. Travel			
Project Director	$ 5,623	$ 2,377	$ 8,000
Public Involvement Coordinator	3,514	1,486	5,000
Emergency Travel Fund	2,108	892	3,000
Total	$ 11,245	$ 4,755	$ 16,000
d. Equipment (slide projector, screen, 2 desks, 2 chairs, 3 bookcases, 3 file cabinets, books)	$ 2,249	$ 951	$ 3,200
e. Office Supplies	$ 1,406	$ 594	$ 2,000
f. Contractual Services (Batelle, SCI)	$ 14,056	$ 5,944	$ 20,000

	FEDERAL	STATE	TOTAL
h. Other			
Advertising	$ 351	$ 149	$ 500
Telephone	2,812	1,188	4,000
Postage	1,406	594	2,000
Printing	1,757	743	2,500
Photocopying	1,406	594	2,000
Express Freight	211	89	300
Room Rental	351	149	500
Total	$ 8,294	$ 3,506	$ 11,800
Total Costs	$132,339	$ 55,957	$188,296

(2) DATA MANAGEMENT

(This activity is funded for this year purely by state funds. The budget breakdown agrees completely with the approved budget for the program already submitted to Office of Marine and Estuary Protection.)

(3) INFORMATION ACQUISITION

a. Personnel			
Marine Biologist I (30%)	$ 4,462	$ 1,885	$ 6,347
Assistant Director, Division of Marine Fisheries (5%)	1,432	606	2,038
Clerk (5.92%)	547	232	779
Marine Biologist I (100%)	14,708	6,220	20,928
Total	$ 21,149	$ 8,943	$ 30,092
b. Fringe Benefits @ 18.35% of Wages & Hospitalization	$ 4,640	$ 1,962	$ 6,602
c. Travel	$ 489	$ 207	$ 696
f. Contractual Services (Excluder device project to Mariner's Marine, Inc., as per proposal already filed)	$ 46,640	$ 19,721	$ 66,361
h. Other			
Publications	$ 1,336	$ 564	$ 1,900
Telephone	70	30	100
Computer Charges	4,920	2,080	7,000
Local Government Cost Share	7,028	2,972	10,000
Total	$ 13,354	$ 5,646	$ 19,000
i,k. Total Costs	$ 86,272	$ 36,479	$122,751

	FEDERAL	STATE	TOTAL
(4) PUBLIC PARTICIPATION			
f. Contractual Services (videotape/slide show reserve)	$ 11,948	$ 5,052	$ 17,000
h. Other			
Typesetting/artwork/ printing (newsletter)	8,434	3,566	12,000
Postage (newsletter)	2,109	891	3,000
Total	$ 10,543	$ 4,457	$ 15,000
i,k. Total Costs	$ 22,491	$ 9,509	$ 32,000
Totals (1,2,3,4)	$241,102	$289,945	$531,047

JUSTIFICATION

(1) ADMINISTRATION

a. Personnel

The unusual political sensitivity of local government relations and the requirement for indirect supervision justifies the salary level requested for the Public Involvement Coordinator. Similarly, the challenge involved in synthesizing the planned data management system justifies the salary level requested for the Data Management Coordinator.

b. Fringe Benefits

The current clerk/steno for the program has 17 years experience in state government service and therefore is entitled to an annual longevity bonus of $500.

c. Travel

The Project Director travels extensively in the execution of his duties. Virtually every region of the study area will be visited during the course of the year. Roughly:

4 trips: Raleigh - Washington, DC	@ $300	=	$1,200
4 trips: Raleigh - Atlanta, GA	@ $475	=	1,900
3 trips: To National Meetings	@ $800	=	2,400
Instate Travel, 50 trips (100 to 300 miles)	@ $ 50	=	2,500
Total			$8,000

The Public Involvement Coordinator will travel extensively in the execution of his duties: Roughly:

2 trips: To National Meetings	@ $800	=	$1,600
1 trip: To Washington, DC	@ $350	=	350
1 trip: To Atlanta, GA	@ $500	=	500
102 Trips Instate (50 to 150 miles)	@ $ 25	=	2,550
Total			$5,000

The Policy Committee has requested an emergency fund to reimburse non-federal, non-state employees for exceptional travel expenses in the course of the Albemarle-Pamlico Estuarine Study work. Funds requested will cover approximately 30 trips from various coastal points to Washington (NC), Elizabeth City or Raleigh @ $100/trip for a total of $3000.

d. Equipment

The funds requested will provide a slide projector and screen badly needed in the pursuit of public education throughout the coast ($400); two desks, two chairs, three bookcases, and three file cabinets to equip the offices of the two additional employees ($2700); and $100 for purchase of reference books required for program activities.

f. Contractual Services

Invaluable services have been provided by SCI (under contract to Batelle and EPA), including meeting set-up, minute preparation, and a variety of administrative services. The amount requested will maintain a minimal level of such services for the coming year ($20,000).

h. Other

Telephone usage has been very high and will be even higher as new offices are added and additional outreach efforts are initiated ($333/month, including installation of two additional instruments). "Printing" in state parlance includes photocopying conducted by the state printing office ($2500). Room rental is required for administrative committee meetings outside of Raleigh ($500).

(3) INFORMATION ACQUISITION

c. Travel

Information acquisition-related travel will including the following expenses:

4 trips: Morehead City - Raleigh	@ 300 miles
2 trips: Morehead City - Wilmington	@ 180 miles
3 trips: Morehead City - Washington	@ 160 miles
2 trips: Morehead City - Elizabeth City	@ 300 miles

3 overnights @ $52

4 breakfasts, 4 dinners @ $13/day

f. Contractual Services

The Policy Committee for the Albemarle-Pamlico Estuarine Study has approved for funding a project proposed by a for-profit corporation, Mariner's Marine, Inc. This proposal was the only response to a specific call for proposals item (99 total proposals received), for which over 500 reviews were conducted. Notice of this call for proposals was carried in five newspapers in North Carolina and Virginia, including two statewide papers in North Carolina and one in Virginia. The pressing nature of the topic required timely action, and the Mariner's Marine proposal was selected for funding by the Policy Committee. The proposal has already been provided to EPA. An oversight committee composed of APES, National Marine Fisheries Service, NC Division of Marine Fisheries, and US EPA personnel has been convened to assure rigorous execution of the contract.

h. Other

Funds requested for "publications" will be used for artwork, layout, and printing for technical reports ($1900). Computer charges will be generated during extensive manipulation of very large data bases, and constitute the largest single charge for one project (total of $7000). The local government cost share represents a contribution to allow a very poor but crucially located county to complete its detailed soil survey. This county contains large areas of valuable fish nursery areas, yet resource management has been conducted in ignorance of this basic parameter. The money will be provided through the Division of Soil and Water Conservation directly to Hyde County ($10,000).

(4) PUBLIC PARTICIPATION

f. Contractual

A reserve of $17,000 has been requested for the preparation of a videotape and slide/tape show by a university contractor. The project was not able to be included in the cooperative agreements requested because of administrative problems on the university end (dealing with release time for the proposed contractor). If that problem is resolved, a simple contract will be executed. Otherwise, additional proposals will be solicited to add to existing proposals from other agencies, and the Citizens' Advisory Committee's will determine which activity to fund.

h. Other

Printing ($12,000) and postage ($3,000) funds will be used to produce a quarterly newsletter for the program.

PART IV. PROGRAM NARRATIVE

5b.

This request for funds represents a continuation of an existing multi-agency state-federal program, operating under a cooperative agreement dated 7-11-86. This request will fulfill major program functions in the topical areas of administration and data management, with minor contributions in the areas of information acquisition and public participation. Most of the program activities in the latter two areas will be accomplished by institutional arrangements and fiscal tools to which either the State of North Carolina or the U.S. Environmental Protection Agency are not parties. These documents are being provided under separate cover as evidence of program completeness, but do not require both State and Federal approval.

Accomplishments to date:

1) Establishment of program administrative boards (Policy Committee, Technical Committee and two Citizens Advisory Committees, with numerous subcommittees)

2) Establishment of Program Office on November 1, 1986.

3) Completion of draft and final workplans and summary reports by April 1, 1987.

4) Receipt of 99 proposals by May 1, 1987, and completion of peer review by over 500 outside reviewers by May 22, 1987.

5) Sponsorship of a public meeting on February 14, 1987, which attracted over 600 participants.

6) Presentation of program information to national forums in April, 1987, and May, 1987.

7) Completion of a comprehensive data management plan by May 22, 1987.

Funding requested here will:

1) Begin implmentation of the information acquisition program

2) Begin implementation of the data management program for the study

3) Fund a satellite office in the coastal region with a staff person dedicated to public involvement.

4) Prepare a comprehensive public involvement plan

5) Initiate a quarterly program newsletter

6) Continue program administration.

MODIFICATIONS TO EXISTING COOPERATIVE AGREEMENT

STATE OF NORTH CAROLINA AND US EPA

PURPOSE: As stated

PERIOD OF PERFORMANCE: (to September 1989)

PROJECT OFFICER: Ted Bisterfeld

S.O.W.:

7. The State (in cooperation with EPA, Policy, and Technical Committees) will establish and operate the Data Management System for the program, as described in the work plan for the Albemarle-Pamlico Estuarine Study.

8. The State (in cooperation with EPA, the Policy and Technical Committees) will administer the program from the established program office, according to the administrative budget attached.

9. The State will execute investigations described in the attached proposals, as listed below:

   - o Hyde County Soil Survey Cost-Share (Sides, DSWC)
   - o PNA analyses (Street, DMF)
   - o Stock assessment (Street & Mercer, DMF)

Schedule Summary:

December 1	- Quarterly report
March 1	- Quarterly report
June 1	- Quarterly report
July 1	- Draft annual report
August 31	- Final annual report

The overall budget breakdown by activity for this fiscal year is:

Administration (includes Public Involvement Coordinator)	$188,296	15.8%
Information Management	188,000	15.7%
Public Involvement	95,000*	7.9%
Information Management	723,681	60.6%
	$1,194,977	100.0%

(*Includes $10,000 from Planning Year Funds)

The total program impact, including match from USGS, NMFS, and FWS is about $1.63 million.

This budget is already out of date in some respects. The Information Management Coordinator has not been hired and the Data Management Coordinator started at a lower salary than the mid-range budgeted, for savings of about $27,000 depending on actually starting dates and salaries.

C. Federal Supplemental Funds, FY 1987

Additional funds are now available from EPA (from the 1/2% construction grants passthrough in the Clean Water Bill) in the amount of $225,000. This money is earmarked for two specific activities:

1) expansion of the baseline monitoring program; and

2) determination of consistency of federal-sponsored environmental management programs.

Rob Nichols of Research Triangle Institute has an approved project to conduct activity #2, as soon as funding mechanisms are completed. Activity #1 should include the following, as soon as possible:

1) amendment to ECU to cover Riggs heavy metal monitoring (~$34K);

2) amendment to NMFS/EPA to cover Pat Testers required red-tide monitoring scoping work (~$25K);

3) citizens monitoring expansion to PTRF (~$15K) to lead into full-blown implementation in 1988-89 at the $100K level;

4) continuous monitors in conjunction with USGS work on flow;

plus other elements of the Baseline Monitoring Plan, when it is adopted.

Local match money will be required at the rate of 25%. Either new appropriations or reprogramming of 1987 state funds would be required.

D. Prospects for 1988

EPA officials tell us that 1988 program funds will exceed expectations. Normal funds will be about $1.2 million from EPA alone. Additional supplemental funds of $300K-$500K are also available if match can be provided at 25%).

The two-year special APES provision is last year's state budget had APES at $500,000 in this year, with provisions for more funds if federal money was being lost due to lack of match. That situation clearly applies. Match to EPA alone would be about:

$ 75K	for supplemental 1987
$400K	for regular 1988
$100K	for supplemental 1988 (assuming $300K)
$125K	deficit from 1987 budget)
$700K	total match required for EPA

I expect one-quarter's worth of the $575K could be "slopped" into 1989-1990, reducing the total to $700K - $145K = $555K.

However, it should be noted that USGS has additional 50/50 cooperative funds available for every dollar in reason that can be brought to bear on this project. While EPA now says it will gladly match USGS funds, the USGS funds must be matched at least through state coffers. We have suggested to USGS that matching funds in the $250K range would be the minimum expected. The bottom line is: $800K in state money could easily be doubled or quadrupled through this program. The other bottom line is: off year funds are usually lean for expansion items.

PUBLICATIONS

The following publications are available (or in preparation) from the Albemarle-Pamlico Estuarine Study:

NO.	Short Title	Author/Editor	Status
86-01	Existing Management Programs	Brower (UNC	Being reprinted
87-01	Source Document	Rader et al. (APES/NRCD)	Available
87-02	Workplan	Rader et al. (APES/NRCD/etc.)	Available
87-03	Proceedings: Modeling Workshop	Stewart/Duffy (WRRI/SCI)	In Preparation
87-04	Proceedings: Remote Sensing Workshop	Stewart (WRRI)	In Preparation
87-05	Proceedings: Fish Disease Workshop	Stewart (WRRI)	Being printed
87-06	APES (CZM 87)	Rader (APES/NRCD)	Available
88-01	Monitoring Networks	APES staff	In Preparation
88-02	Baseline Monitoring Expansion	Rader et al.	Draft Available
88-03	Citizen's Guidebook	Kennedy (NCCF/Sea Grant)	Draft Available 4/88
88-04	Status Report: 3/88	Rader (APES/NRCD)	Available
88-05	(Beaufort County Magazine Article)	Rader (APES/NRCD)	In Production

RECOMMENDATIONS

The change of directors seems a propitious time for introspection and reevaluation. Therefore, as I exist from formal duties as project director, I offer the following suggestions:

Administration

1. The electronic bulletin board being developed by EPA should be joined as soon as possible (i.e., budget for a modem this year).

2. Interns should be funded for this year. At $1,000-$1,5000 for a three month period, immense returns can be obtained. (One excellent candidate suggested the idea.) The Technical Committee Subcommittee on Standard Operating Procedures should develop the procedure as soon as possible for the summer.

3. An Albemarle-Pamlico foundation should be considered to provide a mechanism for private sector funding or coordinated, basinwide funding for public involvement projects (e.g., citizen's monitoring).

4. The SCI/Duffy contract should be completed as soon as possible.

Technical/Information Acquisition and Monitoring

1. Investigator relations is hampered by the cooperative agreement process (i.e., one per institution). Accordingly, quarterly reports are not being filed as needed. A specific form should be prepared by the program office and distributed with a deadline to all Principal Investigators.

2. All proposals received should contain one page executive summaries to be distributed to Policy Committee, Technical Committee, and Citizens' Advisory Committees.

3. Several immediate needs are evident, and funding should proceed as soon as possible. Specifically:

   A. Stan Riggs heavy metal monitoring ($34K, 1987 supplemental funds for monitoring, by amendment of the ECU cooperative agreement).

   B. Pat Tester red-tide monitoring ($25K, 1987 supplemental funds for monitoring, by amendment of the NMFS/EPA interagency agreement).

   C. Roger Rulifson striped bass egg viability monitoring ($16K, 1987 supplemental funds, by amendment to ECU cooperative agreement).

   D. Bill Hassler, historical striped bass data ($12K from 1988 funds).

   E. Rob Nichols, management effectiveness ($35K[?], by new grant to RTI from 1987 supplemental funds).

   F. Gordon Thayer, SAV monitoring expansion ($__, from monitoring 1987 funds.

4. A rapid response program should be produced with specific administrative procedures. (See Budget Section)

5. Reviews of proposals should continue to involve the previously ad hoc Peer Review Committee so as not to lose the unsurpassed academic credibility it contains. CAC's feel strongly that at least one and probably two citizens (one each) should be members of this body. (Dr. Chesson, Mr. Carter, Dr. Larkin, and Mr. Stallings are the logical choices as current Policy Committee or Technical Committee members).

6. The survey of existing monitoring programs should be completed as soon as possible.

7. A separate but contemporaneous process should be established for renewal proposals, based in part on performances in the first year.

8. Workshop/working group recommendations should be included to frame this year's call for proposals.

9. CFP's should be issued by early April if staffing allows.

10. Summaries of results of technical projects should be presented in a public forum on an annual basis, and to the Policy Committee/Technical Committee/Citizens' Advisory Committees at least as often.

11. The required non-technical summaries from each project should be accumulated and published widely.

12. The Workplan for the study should be updated on an annual basis, incorporating both public and technical comments.

Public Involvement

1. The citizen's monitoring network is an immediate "must". I suggest immediate expansion of the existing scoping study to PTRF of about $15-20K from supplemental 1987 funds, with a charge to the Technical Committee monitoring subcommittee to implement a full blown program by June-July (at about the $60K-$100K level per annum). A coordinator is essential: I suggest the position be housed in the NRCD regional office at Washington if space is available. I also suggest that a team of DEM, Division of Water Resources (Streamwatch) and APES personnel be convened to work out the details of the best administration, to complement PTRF recommendations for on-the-water implementation. I believe this item provides the perfect vehicle for public involvement at this stage.

2. An estuarine version of the "Guide to Streamwalking" should be produced as soon as possible, with a general section and an estuary-specific section (perhaps modeled after the Chesapeake Bay tributary sheets, expanded.)

3. The State of the Estuary booklet requires modest additional funding to cover proper configuration ($3,000?). Frank Tursi is a sensible suggestion for the author.

4. A comprehensive public involvement plan should be produced as soon as possible, incorporating the pieces described here, with the specific action of the Citizens' Advisory Committees.

5. The Citizens' Advisory Committees should take the lead on directing public awareness building activities.

6. The Citizens' Advisory Committees should request specific operating funds administered through the public involvement coordinator.

7. Accountability in NRCD field offices can be greatly enhanced using the public involvement coordinator as a point of first contact.

Budget

1. Programmatic match should be encouraged at EPA instead of grant-by-grant.

2. A grant amendment is necessary to consolidate residual planning year funds (about $7,000).

3. A grant amendment could be executed at the same time to reprogram salary moneys not spent (depending on the new director's salary and starting date and the information management coordinator's salary and starting date).

4. Reprogramming of 1987 state appropriations should be investigated to cover supplemental fund cost-share. (The current NRCD/EPA split is 55%/45% as opposed to the 5%/95% or 25%/75% required.) Information management is 100% state at $188,000 for FY 1987-88 (X .75!).

5. State indirect costs for the new cooperative agreement probably must be added (Andy Kleitseh, per com.). Costs are real and high, and some realistic figure must be included next time.

6. Indirect cost rate policy must be clearly established--as opposed to the hodgepodge we considered this past year. I recommend total cost versus total product, without regard to indirect costs. ECU, for example, has committed to 0% indirect cost on state money and 10% or salaries and wages for federal--a major breakthrough.

7. Heroic efforts to fund projects should be avoided--every single one caused immense procurement, media or investigator relations problems. Alternatively, a rapid response fund should be created with specific administrative procedures. (I believe Narragansett Bay has done this.) $50K might be a reasonable amount.

8. The evidence for the NRCD $16,000 match for the Planning Year Grant is being assembled, and should be visibly filed with EPA grants to keep the auditors happy.

Acknowlegement

This report was only possible with the extraordinary efforts by Ms. Kathy Norris, Albemarle-Pamlico Estuarine Study clerk.

APPENDIX A

ALBEMARLE-PAMLICO ESTUARINE STUDY

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ALBEMARLE-PAMLICO ESTUARINE STUDY

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Ms. Grace Bonner 322-4522
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Mr. Ralph Buxton 441-4124
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* Mr. Derb Carter, Jr. 833-4859
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The Neuse River Foundation
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Mr. Buddy Swain 638-4991
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New Bern, NC 28560

APPENDIX B

DRAFT
RECOMMENDATIONS OF THE STRIPED BASS WORKING GROUP
ALBEMARLE-PAMLICO ESTUARINE STUDY

1. Existing information must be consolidated so that long-term, historical datasets are not lost.

   A. Dr. William Hassler's original data should be consolidated and computerized at APES expense, with clear credit to Dr. Hassler and his colleagues.

   B. Historical collections of scales (and other hard parts) should be identified and made available for comprehensive scale studies.

   C. Historical hourly flow data for the Roanoke Rapids Reservoir should be obtained from the Corps of Engineers and computerized, 1930-present.

2. Long-term datasets should be continued, regardless of who actually conducts the work, using the original data collection sites and protocols. Agency cooperation (and immediate action) is required to avoid missing this field season. Specifically, recreational creel surveys and egg viability surveys in the Roanoke River should be funded collaboratively by APES and Wildlife Resources Commission, and conducted by WRC personnel. Division of Marine Fisheries should continue Albemarle Sound landings surveys.

3. A synoptic, correlative study should be conducted to evaluate the gross order, relative contributions of various factors to striped bass population declines. Specific factors should include: flow modification, water quality factors, food chain effects, population dynamics and harvest.

4. Effects of modification of the flow regimen in the Roanoke River on spawning success and larval development should be conducted. Particularly useful information would include:

   A. Relationship between "peak power generation" and spawning activity;

   B. Relationship between temperature and spawning activity;

   C. Determination of river stage and corresponding flow rates where flood plains are inundated.

   D. Estimation of flows required to "flush" deep holes in the river, especially the delta.

   E. Estimation of flow rates capable of "premature" transport of larvae into Albemarle Sounds.

   F. Estimation of effects of changing flow regimen on phytoplankton and zooplankton population structures.

G. Estimation of optimal flow regimen in the Roanoke River, for striped bass as well as infrastructure and waste disposal purposes (NMFS-led effort underway--see Dr. Chuck Manooch). This effort should address both minimum and maximum flows.

H. Estimation of the effects of all current and proposed water withdrawals and discharges on the flow regimen in the Roanoke River.

5. Water quality effects on egg viability and larval survivability should be undertaken, specifically:

A. Expansion of existing water quality monitoring. Continuous monitors for flow, temperature, conductivity and dissolved oxygen should be installed in critical locations to give detailed real-time information.

B. Continuation of dissolved oxygen depth profiles for the Roanoke River delta and western Albemarle Sound during summer high temperature periods, to document bottom-water anoxia. Deep holes should be included in this.

C. Analysis of historical trends in pesticide and contaminant loadings.

D. Completion of contaminants survey in the region (U.S. FWS underway).

E. Evaluation of plankton sensitivity to water quality changes (by bioassays of zooplankton and possibility phytoplankton).

F. Evaluation of pesticide and other toxicant effects on eggs and larvae (Al toxicity underway by Dr. Roger Rulifson).

G. Analysis of long-term oxygen demand effects of organics from swamps, paper mills and municipal wastewater treatment plants.

6. The significance of food chain modification should be evaluated, especially for larval striped bass, to augment existing work by Dr. Rulifson and work planned by the WRC for 1988 in the Tar-Pamlico and Neuse system, specifically:

A. Analysis of feeding behaviors of larval striped bass in relation to zooplankton diversity, abundance and size structure.

B. Evaluation of zooplankton biomass and productivity, to estimate larval production capacity in the Roanoke River.

C. Estimation of competition with other fish (especially white perch) during the critical larval stages.

D. Analysis of adult feeding relationships.

E. Evaluation of spatial relationships between striped bass larval and preferred prey organisms and effects of modification of flow and other ecological determinants on these spatial patterns.

7. Population modeling (either theoretical or empirical) should be used to evaluate the significance of modified mortality rates at various life history stages due to different factors.

A. Effects of modified age/size structure at time of spawning on egg viability and larval survivability should be estimated. Comparisons between successful Dan River stocks and depleted Roanoke River stocks should be conducted, especially for eggs (nutrition/physiology).

B. Fishery independent tag studies should be undertaken to evaluate stock sizes.

8. Migration and movement patterns of subadult and adult fish should be documented to locate the large fish during predicted temperature/oxygen "squeeze" events and also to evaluate the degree of isolation of the Albemarle/Pamlico stock from the oceanic/East Coast stock. Radio or ultrasonic tags should be attached to large adults on the spawning grounds and followed.

9. Effects of total mortality of striped bass due to commercial and recreational activities should be estimated. Numbers compiled by the Emergency Striped Bass Task Force should be examined to document suspected overfishing relationships.

10. Potential management strategies (including possible moratoria and modifications of gear and season for both the commercial and the recreational fishery) should be examined to estimate economic effects and likely effects on striped bass populations.

A. Improved targeting of white perch in the mixed species Albemarle fishery is desirable.

B. The efficacy of the existing stocking program should be evaluated, including economic, environmental and social consequences.

11. The Albemarle-Pamlico Estuarine Study and the State of North Carolina should ask VEPCO to regulate their discharge regimen this spring to correspond with that recommended by the Task Force on Optimal Flows in the Roanoke River being chaired by Dr. Chuck Manooch. This action should occur <u>immediately</u> because of the proximity of the spawning season.

12. The Albemarle-Pamlico Estuarine Study and the State of North Carolina should work for Outstanding Resource Water classification by the Environmental Management Commission (or other rigorous water quality protection) for the Roanoke River. Priority uses should shift from power generation, water supply and flood control to maintenance of biological productivity.

13. This group should be convened at least annually to review progress, facilitate communication and recommend further funding actions.

Quote for the day, by Dr. John Merriner, echoed by Dr. Cynthia Jones: "No fish, no fish."

This conference is sponsored by:
Albemarle-Pamlico Estuarine Study
N.C. Coastal Federation
Pamlico Tar River Foundation
Regional Development Institute, East Carolina University
UNC Sea Grant College Program

In cooperation with:
N.C. Marine Science Council
Elizabeth City State University
N.C. Eastern Regional Chamber of Commerce
N.C. Association of Soil and Water Conservation Districts
The Mid-East Commission
Neuse River Council of Governments
The Albemarle Commission
School of Allied Health Science, East Carolina University
N.C. Wildlife Federation
N.C. Fisheries Association
Town of Bath
Stumpy Point Civic Club
Friends of Hatteras Island
Albemarle Protection Organization
Beaufort County Community College
Outer Banks Audubon Society
The Fishermen's Fund
Carteret County Crossroads
Carteret Wildlife Club
Neuse River Foundation
The Sierra Club
League of Women Voters
Conservation Council of North Carolina
Carteret County Waterman's Association
Environmental Resources Project

Regional Development Institute, Willis Building
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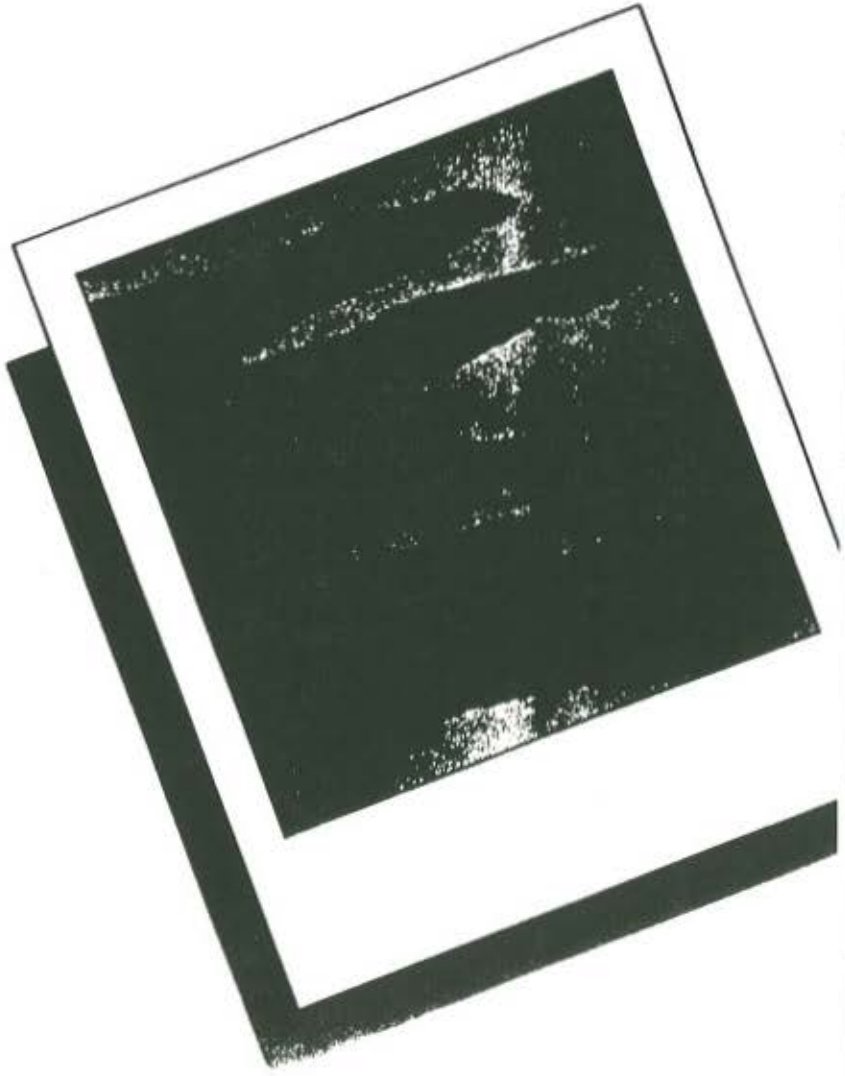
APPENDIX C

THE ALBEMARLE-PAMLICO ESTUARINE INITIATIVE

Managing Our Estuarine Resources

Saturday, February 14
Beaufort County Community College
U.S. 264, Seven miles east of Washington, N.C.



During the next five years, approximately $5 million will be spent by federal and state agencies to find ways to better manage the Albemarle and Pamlico estuaries. This initiative will evaluate the current status of Albemarle and Pamlico sounds and result in the development of strategies to ensure their long-term productivity.

A day-long conference is being held to inform and involve citizens from throughout North Carolina in this new project. This meeting will be the public's first major opportunity to learn about this initiative, to make suggestions about its priorities, and to recommend public-education and involvement programs that should be funded as part of the estuarine management efforts.

Limited funds have been provided by the Appalachian Regional Committee of the Sierra Club to provide mileage reimbursements for citizens who wish to participate in this conference. These funds are only available to citizens who do not have an organization to sponsor their travel. Application for this travel assistance can be made by calling 919/946-7211. When you call, leave your name, address, phone number and estimated mileage to and from the conference on the answering machine.

AGENDA

8:30-9:30 Registration and Coffee

9:30-9:50 The Welcome
James P. Blanton, President, Beaufort County Community College
Michael Orbach, Chairman, N.C. Marine Science Council

9:50-11:15 Overview of Albemarle-Pamlico Project
Moderator: John Costlow, Chairman, N.C. Marine Fisheries Commission
Federal Strategy for Managing Estuaries: Jack Ravan, Regional Administrator, Region IV, U.S. Environmental Protection Agency
North Carolina's Focus on the Albemarle-Pamlico Region:
S. Thomas Rhodes, Secretary, N.C. Department of Natural Resources and Community Development
Estuarine Resource Issues in the Albemarle-Pamlico Region: Doug Rader, Project Coordinator, Albemarle-Pamlico Project

11:15-12:30 Panel on Citizen Participation in Estuarine Programs— Other Experiences
Moderator: Michelle Hiller, U.S. Environmental Protection Agency, Washington, D.C.
Panel: Fran Flanigan, Citizen's Project for the Chesapeake Bay, Baltimore, Md.; Richard Klein, Save Our Streams, Annapolis, Md.; Alan Hankin, Lloyd Center for Environmental Education, Dartmouth, Mass.; Trudy Coxe, Save the Bay, Providence, R.I.

12:30-1:45 Luncheon
Speaker: The Honorable Walter B. Jones, 1st District Congressman and Chairman of the Committee on Merchant Marine and Fisheries
(Lunch will be provided for those who preregister by Feb. 5. Otherwise participants can find a restaurant in nearby Washington.)

1:45-3:45 Estuarine Management Workshops
What do we need to know? (Information needs)
How do we use what we know? (Policy development)
How do we get involved? (Citizen participation)

3:45-4:15 Results and Recommendations of Estuarine Management Workshops

4:15 Adjourn

REGISTRATION FORM

Name _____

Address _____

City _____

State _____ Zip code _____

Affiliation(s) _____

Phone Number _____

Registration must be complete by Feb. 5 to receive a free lunch and any materials that will be distributed to participants. Travel reimbursement may be arranged by calling 919/946-7211. Return the registration form to:

Albemarle-Pamlico Conference
Regional Development Institute
East Carolina University
Greenville, N.C. 27834-4353

ALBEMARLE/PAMLICO SIGNING

State/EPA Cooperative Agreement for National Estuary Program Designation Under the Water Quality Act of 1987

We recognize the need for a Management Conference on the Albemarle/Pamlico Sounds to [illegible] the environmental problems in the system, to address the many complexities and sources of pollutants, and to develop a comprehensive conservation and management plan for action. We further recognize that the States and EPA share the responsibility for managing the [illegible] and resources of coastal waters in the system.

In signing this agreement, we are committing to produce and to be bound by which will: assess trends in water quality, natural resources and uses; determine the causes of change through data collection, change detection and problem diagnosis; regulate point and non-point loadings and other threats as deemed necessary; assist a comprehensive conservation and management plan which includes recommendations for priority actions; develop plans to coordinate implementation of a comprehensive plan with federal, state and local agencies; provide monitoring to assess the effectiveness of the implementation actions; and review federal financial assistance programs and federal development projects for consistency.

We also agree that the statutory requirements for Management Conference agreements have been met and that we will participate in the Conference. Further, we commit that the statutory requirements for submitting funds will be met to complete the characterization of present problems and develop the comprehensive conservation and management plan.

J. Thomas Rhodes
Secretary
North Carolina Department of
Natural Resources and Community Development

Lee A. DeHihns III
Acting Regional Administrator
Environmental Protection Agency
Region IV

[illegible] 1987

Albemarle-Pamlico Estuarine Study Policy Committee

Mr. S. Thomas Rhodes*
Mr. Dan Ashe
Dr. John Costlow
Dr. Ford Cross
Mr. Lee A. DeHihns, III*
Dr. Dirk Frankenburg
Ms. L. K. Gantt
Mr. Dan Asai

Albemarle Pamlico Estuarine Study Staff

Douglas Rader, Ph.D. — *Project Director*
Jed Beitzel — *EPA Region IV Coordinator*
Mark Ahlstrom — *EPA Headquarters Coordinator*

* Co-Chairmen

Ceremony to Designate the Albemarle-Pamlico Estuarine Study under the Environmental Protection Agency's National Estuary Program

Elizabeth City, North Carolina

November 11, 1987

EPA

"The Albemarle-Pamlico Estuarine Study has been marked by an unusual level of bipartisan support. All levels of government (local, state and Federal) have been involved in the planning process. It is clear that our estuarine zone must receive our combined and steadfast commitment to ensure its long-term biological productivity and continue to support a rich variety of traditional lifestyles."

James G. Martin, Governor
North Carolina

With these words, Governor Martin officially renews North Carolina's commitment to protect and manage Albemarle-Pamlico Sounds under the Environmental Protection Agency's National Estuary Program.

The Water Quality Act of 1987 recognizes that many activities threaten the health of our nation's estuaries. Under the National Estuary Program, the EPA Administrator convenes conferences to develop and implement a Comprehensive Conservation and Management Plan that balances competing uses while restoring the ecological integrity of the estuary.

Environmental Protection Agency officials also recognize the importance of cooperation as a business solution. Lawrence J. Jensen, EPA Assistant Administrator for Water has said:

"You and I in our roles as homeowners, farmers, businessmen, regulators, and citizens must make the difference. Through our mutual efforts, programs will work, pollution will be controlled, and our estuaries will be restored and revived."

The designation of the Albemarle-Pamlico Estuarine Study under the National Estuary Program marks a new beginning for local, state and Federal partners to plan and to take action on protecting the heritage of Albemarle-Pamlico Sounds. Work remains to be done. As Congressman Walter B. Jones, U.S. Representative from North Carolina and Chairman of the U.S. House of Representatives Committee on Merchant Marine and Fisheries, stated:

"We recognize shared governmental responsibilities. What is required now is effort and commitment. we must be willing to **work**, to **learn** and to **teach**. Surely it is worth the effort."

Agenda

8:30 - 9:30	Registration, Coffee and Poster Sessions
9:30 - 9:35	Welcome Jimmy Jenkins, Chancellor, Elizabeth City State University Member, Citizens' Advisory Committee
9:35 - 9:50	Federal Role in the Estuarine Study Lee Debbins, Regional Administrator, Region IV, U.S. Environmental Protection Agency
9:50 - 10:00	Overview of the Estuarine Study and Program Introduction Douglas Rader, Project Coordinator, Albemarle-Pamlico Estuarine Study
10:00 - 12:15	Panel Discussions on Natural Resource Management Issues Introduction to Panels by Herb Carter, Pamlico Citizens' Advisory Committee
10:00 - 10:15	Aquatic Life and Fisheries Resources Issues Moderator John Costlow, Albemarle - Pamlico Estuarine Study Policy Committee, Duke University Panelists Terry Pratt, Albemarle Citizens' Advisory Committee Fred Bonner, Pamlico Citizens' Advisory Committee Harrell Johnson, Division of Marine Fisheries Bud Cross, National Marine Fisheries Service
10:45 - 10:50	Break and Change Panels
10:50 - 11:30	Water Quality Issues Moderator Al Howard, Albemarle Citizens' Advisory Committee Panelists Bill McGeorge, Albemarle Citizens' Advisory Committee Raun Carpenter, Pamlico Citizens' Advisory Committee George Everett, Division of Environmental Management Sam Cox, U.S. Soil Conservation Service
11:30 - 11:35	Break and Change Panels
11:35 - 12:15	Habitat Loss and Shoreline Development Moderator Doug Nelson, Pamlico Citizens' Advisory Committee Panelist John Stallings, Albemarle Citizens' Advisory Committee Tom Quay, Pamlico Citizens' Advisory Committee Dave Owens, Division of Coastal Management Charlie Hollis, Corps of Engineers
12:15 - 12:30	Update on Albemarle Citizens' Advisory Committee and Review of the Afternoon Program Parker Chesson, President, College of the Albemarle and Chairman, Albemarle Citizens' Advisory Committee
12:30 - 1:45	Luncheon and NEP Designation Ceremony Speakers The Honorable James G. Martin, Governor of North Carolina Lawrence J. Jensen, Assistant Administrator, Office of Water, U.S. Environmental Protection Agency
1:45 - 3:15	Working Sessions Six working sessions with a moderator and four resource persons. Identification of problems from morning sessions. What do we know about them now, and where do we go from here?
3:15 - 3:45	Wrap-up General Meeting Reports from working sessions Moderator Parker Chesson

Appendix D

December 15 - Grace-BCMAG

Citizen participation in water quality monitoring of the Albemarle/Pamlico estuarine region is well underway. This is a significant opportunity for concerned citizens to become involved in and contribute meaningfully to the protection of our water quality. It also means a long term, and economical source of realiable baseline data that will be useful to the scientific and regulatory communities in assessing management alternatives. And, perhaps most importantly, it means a network of informed "watchdogs" who can provide an effective first-alert system for spotting emerging problems.

Our first task in developing the project for the Pamlico was to survey existing programs around the country and then establish the parameters and methods for our watershed. We studied programs that are currently operating in Delaware, Rhode Island, Maryland, Virginia, Massachusetts, Michigan, Minnesota, Illinois, Vermont and New Hampshire and Nova Scotia, Canada.

One of the first established and most extensive of the estuarine programs is the Citizens Program for the Chesapeake Bay, Inc. (CPCB). The CPCB was started in July of 1985 as part of a Chesapeake Bay Program public participation grant from the Federal Environmental Protection Agency. The initial pilot program was designed to determine if citizens could collect scientifically valid data from nearshore stations and whether these data be used to help document changes in the main tributary. They also set out to determine the most reliable sampling procedures, reporting formats and data management systems for a volunteer program. The CPCB hoped to be able to provide the feasibility of a permanent bay-wide citizen monitoring network as part of long-term management strategies. The program has been successful on every count and now serves as an example for many fledgling programs throughout the coastal area.

Today about fifty Chesapeake volunteers monitor fifty nearshore stations along two major tributaries of the Chesapeake: the James River in Virginia and the Patuxent River in Maryland. Each monitor measures five water quality parameters at his site weekly, throughout the year.

By necessity, the methods used by the Chesapeake volunteers are much less sophisticated than those used in government and research monitoring programs. However, the values obtained by CPCB volunteers, in most cases, are comparable to those obtained by government monitors at adjacent sites. The reliability and scientific validity of the data is due, in part, to an extensive quality assurance plan designed and implemented by Kathy Ellett, CPCB project coordinator.

Ms. Ellett says their data is most useful in helping to track developing trends in the bay tributaries. Also, in at least one instance, the Maryland Department of Natural Resources is using data collected by volunteers to augment or supplement the more limited agency monitoring activities. By using volunteers they are able to

expand the monitoring to include more stations, more frequently, on a year-round basis.

Another well established estuarine lay monitoring program has been carried out by volunteers in Rhode Island. The Salt Pond Watchers got their start as a project of the University of Rhode Island Sea Grant program, in September 1985. Since that time over thirty volunteers have been measuring water quality parameters every two weeks, from May through September, in seven coastal salt water lagoons. They record water depth and temperature, weather, and field observations. They also sample for dissolved oxygen, nutrient concentrations (nitrates and phosphates), chlorophyll (an indicator of algae concentrations), and fecal coliform bacteria (an indicator of fecal contamination). The nutrients, chlorophyll, and coliform samples are sent to laboratories for analysis by professional technicians.

The Salt Pond Watchers have met with tremendous success and their work has been well received by area management agencies. Through their monitoring of coliform bacteria they were able to show that bacterial contamination of several of the ponds exceeded safe shellfishing levels during the summer and fall and, in some instances, even exceeded safety
standards for water contact sports.

Rhode Island's Department
of Environmental Management (DEM) was able to use the more extensive field data provided by the pond watchers in establishing policy for possible shellfishing closures. DEM also requested the help of the pond watchers in conducting a shoreline survey to identify wastewater discharges. Also, their Coastal Resources Management Council (CRMC) plans to use pond watcners data in the evaluation of permit and planning decisions.

These programs are some of the larger, well established ones responsible for monitoring in estuarine systems. However, there is work being done in N.C. as well. The North Carolina Division of Environmental Management's Stream Watch program has been fostering interest in water conservation for years. The program encourages local citizen groups to adopt a stream, river, or lake and to take responsibility for protecting and promoting it.

Stream Watch has provided funds to some organizations for stream monitoring projects. One such project is a group of property owners on the Chowan River. Members of the Arrowhead Property Owners Association near Edenton, NC have been monitoring along the Chowan and one of its
tributary creeks since 1982. They collect data once a week from May through September, testing for temperature, pH, salinity, dissolved oxygen and phosphate, nitrate and ammonium concentrations. The monitors also try to keep track of the algae bloom conditions in the Chowan by reporting an Algal Index for each site. The data obtained is reported to and filed by DEM at the Washington regional office.

Many other groups have shown interest in participating in lay

monitoring programs throughout the area. The Neuse River Foundation in New Bern wants to start a lay monitoring program to cover sections of the Neuse and Trent Rivers. Also, a group of concerned citizens at Fairfield Harbor (on the Neuse) have begun plans for a Stream Watch affiliation there. Vann Latham, a retired mathematics teacher, has recently applied for a Stream Watch grant for monitoring along the Pungo River.

It is indeed evident from the long list of successful lay monitoring programs already in existence that citizen volunteers can contribute meaningfully to any water quality management program.

The Albemarle/Pamlico Estuarine Study has already funded PTRF for the development of a citizens program on the Pamlico. An experienced water quality technician at East Carolina University and at North Carolina Phosphate Corporation, I have been hired to supervise the PTRF project.

PTRF staff has conducted an exhaustive review of existing lay monitoring programs. We have made contact with the coordinators of these programs and have sought their advice on the procedure for setting up a lay monitoring program. We have met with several government agency water quality professionals seeking their input in developing a monitoring scheme that will mesh well with existing agency monitoring efforts.

Dr. Doug Rader, project coordinator for the APES, is an excellent source of both information and inspiration. Dr. Rader believes that the citizen participation programs have great potential. He foresees an interlinking network of small citizens groups throughout the study area that will eventually form the backbone of a vast first-alert system for our watershed. He stresses that the volunteers should not only be well trained to perform technical measurements, but should learn to recognize warning signs for potential problems. They should be able to respond to critical situations by knowing what, if any, immediate action to take and who to contact in these cases.

Dr. Rader also notes that in order for the efforts of citizens monitoring groups to be well received, three important criteria must be met. They are: (1) The volunteers must receive good, thorough technical training. There must be standard procedures for every test and all volunteers must know and practice them; (2) There should be a good program for quality control. This is to insure that the data collected is consistent, viable scientific data; and (3) There must be an approved system for calibration of the methods used.

In order to be sure that our program meets these criteria the PTRF staff has enlisted the help of a support committee of scientists. The committee members are: Dr. Stan Riggs, Department of Geology, ECU, chairman; Dr. Vince Bellis and Dr. Graham Davis, Department of Biology, ECU; Dr. Don Stanley, Institute of Coastal and Marine Resources, ECU; Dr. Barney Kane, School of Allied Health Sciences, ECU; and Dr. Bob Crounse and Dr. Jacky McGinty, ECU school of

Medicine.

The science committee met initially in August 1987.
It was agreed that obtaining data on some basic parameters such as dissolved oxygen, salinity, temperature and pH on a frequent basis could help to isolate the interactions of these variables that preceed fish kills. They also suggested that fecal coliform data could be useful. They felt that such data would fill a gap in the existing data base.

Having completed scoping the available resources and existing citizen programs, PTRF staff has decided upon parameters, methods, and number of stations.

The science committee discussed several options for the location of sampling stations. Dr. Donald Stanley, a long-time Pamlico River researcher, felt that tributary creeks had been neglected by earlier and current monitoring schemes. The committee concurred that a major focus of the PTRF would be the tributaries. Sampling protocol and potentials for future expansion of monitoring were also reviewed by the committee.

Water temperature, ph, salinity, dissolved oxygen and turbidity (measured by secchi disk determination of limit of visibility) are the parameters selected for our program.
Each of these parameters are important. Temperature is an influential variable in many aspects of water chemistry and biology; it affects the stability of compounds, the rates of chemical reactions, density, inversions and circulations of the water.

Ph is a measure of the relative acidity or alkalinity of water. Measured with a simple color-comparator kit, fluctuations in ph can have significant consequences for the living resources in an estuary. Salinity, which has been declining in recent years in the Pamlico estuary, will vary in the Pamlico from 0 parts per thousand of water to 17 ppt near Pamlico point. The gradient created by the mixing of fresh river water and salt water from the Sound is a determinant in the distribution and well-being of most of the estuary's living resources.

Dissolved oxygen (DO) is another important variable that our volunteers will measure. DO levels below 3-5 ppm will not allow many species of fish or plant life to survive. Low DO levels are thought to have been a key factor in the various diseases, kills and other symptoms of stress in the Pamlico in recent years. Our monitors will use a micro-Wimkler titration kit to measure DO.

The final parameter that we will study is the limit of visibility. AQ secchi disk test is a good measure of turbidity in the water. Turbidity is increased due to the suspended sediments; large amounts of suspended matter can interfere with the penetration of light in the water column. Sufficient light penetration is essential for the adequate photosynthesis by aquatic plants. If turbidity is excessive and light is insufficient, the subaquatic vegetation may disappear and a vital source of food, nursery habitat and shelter is lost to

estuarine wildlife.

PTRF volunteers will also be doing some fecal coliform sampling on a monthly basis. Steve Jones , of Environmental I Laboratory (Greenville) has donated this service to PTRF for 10 stations once a month for one year. The presence of high fecal coliforms is an indication of contamination from human and animal wastes. Failing septic tanks, inadequately treated sewage, animal-waste lagoons can all be responsible for such contamination. This is one parameter that has not been very widely monitored in the Pamlico to date.

We are also beginning to expand up the Tar River into the fresh water. In this portion of the system the parameters will be slightly different; here we will also measure nutrients, nitrates and phosphates. It was the consensus of our science committee that measuring nutrients in the Pamlico was extranneous. There is already over $75 thousand spent annually to measure these elements in the estuary but not in the upper Tar. Secondly, the measuring devices which might be within our budget limitations were wholly inadequate for salt water areas. In the estuary nutrient levels are so small that only very sophisticated measuring techniques will isolate the fluctuations. On the converse, nutrient levels are expected to be higher in the Tar River and therefore less expensive measuring kits would suffice.

On March 26,1988, a training workshop for volunteers will be held. The volunteers will be equipped with materials and kits to measure each of the aforementioned variables. They were trained in the procedures that each must follow carefully. Data collection will begin by the volunteers in early April.

After the volunteers are experienced and the program is well underway, quality assurance will continue to be a major consideration. The PTRF staff plans to follow closely the fine example set by Kathy Ellett and the Citizens Program for the Chesapeake Bay in this regard. Without a good quality assurance plan the program will surely suffer. It is the volunteer, though, who is largely responsible for making the plan work.

PTRF staff has every reason to believe that our own local volunteers will do the same fine job that has been done elsewhere. Dr. McNaught has already gotten an enthusiastic response from many PTRF members who are excited about the prospects of the new program. According to McNaught, " Several individuals from various locations along the Pamlico and throughout the estuary, have been anxiously awaiting the opportunity to contribute to this program. The individuals with whom I have

spoken understand what participation will entail and seem to have the necessary desire to do the job."

It is obvious that a pilot lay monitoring program must be a fairly limited undertaking in terms of both geography and the type of data collected.
Once sampling is underway, the possibilities are endless. We will certainly try to expand the program both geographically and in terms of the parameters sampled as soon as
project coordinators have made any necessary adjustments.

Appendix E

FIRST YEAR TECHNICAL PROJECTS

ALBEMARLE-PAMLICO ESTUARINE STUDY

The following projects have been approved by the Policy Committee for first-year funding, depending upon final legislative appropriations.

	SUBJECT	PRINCIPAL/ INVESTIGATORS	INSTITUTIONS
$52K	1. Environmental determinants of oyster bed success	Sutherland, Ortega & Peterson	Duke University Marine Laboratory & UNC Institute for Marine Sciences
$11K	2. Data requirements for fisheries stock assessment	Mercer & Street	NC Division of Marine Fisheries
$50K	3. Value of recreational fishing	Smith & Palmquist	North Carolina State University
/K	4. Analysis of nursery area data	Street	NC Division of Marine Fisheries
$28K	5. Ecological function of fringe swamps	Brinson	East Carolina University
$47K	6. Potential for eutrophication & nuisance algal blooms	Paerl	University of North Carolina
$44K	7. Nutrient reduction by coastal swamps	Kuenzler	University of North Carolina
$39K	8. Baseline demographic trends (permanent & seasonal populations)	Tschetter	East Carolina University
$65K	9. Analysis of existing hydrologic & water quality data	Bales	US Geological Survey
$115K	10. Offsite effects of Best Management Practices	Bales	US Geological Survey
$143K	11. Flows & flow patterns in the Neuse & Pamlico River systems	Bales	US Geological Survey

	SUBJECT	PRINCIPAL/ INVESTIGATORS	INSTITUTIONS
$66K	12. Excluder devices in the inshore shrimp fishery	Pearce	Mariner's Marine
$32K	13. Obstructions to migration of anadromous fish	Collier	US Fish & Wildlife Service
$38K	14. Distribution of submersed aquatic plants	Davis	East Carolina University
$73K	15. Aerial survey of submersed aquatic plants	Thayer	US National Marine Fisheries Service
$31K	16. Water column & bottom sediment dynamics	Wells	UNC Institute for Marine Sciences
$10K	17. Hyde County Soil Survey Cost Share	Philen	NC Division of Soil & Water Conservation

Also, the following projects have been recommended for December funding:

$7K+	18. Wetland protection strategies	Adams	North Carolina State University
$40K	19. Heavy metals in bottom sediments	Riggs	East Carolina University
$35K	20. Current resource management programs	Nichols	Research Triangle Institute

In addition, the Peer Review Committee has requested the following actions:

Workshops on 1) hydrologic & water quality modeling
2) remote sensing (land use/land cover; etc.)
3) fish diseases.

Workgroups 1) striped bass declines
2) natural area/wetland inventories & endangered species
3) recruitment processes & their effects on nursery function
4) toxicants and pesticides.

Proposal solicitation/revision on 1) management of fecal contamination
2) management of nursery area impacts

FIRST YEAR PUBLIC INVOLVEMENT PROJECTS

ALBEMARLE-PAMLICO ESTUARINE STUDY

The following projects have been approved by the Policy Committee for first-year funding, depending upon final legislative appropriations.

		SUBJECT	PRINCIPAL/ INVESTIGATORS	INSTITUTIONS
$14K	1.	Citizen's monitoring network	McNaught	Pamlico-Tar River Foundation
$7K	2.	State of estuaries booklet	Okum	UNC Institute for Environmental Studies
$10K	3.	Public service announcements	Okum	UNC Institute for Environmental Studies
$32K	4.	Media tour	Kennedy	NC Coastal Federation
	5.	Workshops on management issues & guidebooks	Kennedy	NC Coastal Federation
	6.	Videotape/slide show	(NRCD reserve until contractor selected)	
$17K	7.	Newsletter	Public Involvement Coordinator	Albemarle-Pamlico Estuarine Study
$9K	8.	Public meeting	Carson & Powers	Elizabeth City State University

Total Cost: $100,136

Appendix F

BASELINE MONITORING PROGRAM

ALBEMARLE-PAMLICO ESTUARINE STUDY

As part of the negotiated designation agreement between the U. S. Environmental Protection Agency and the Albemarle-Pamlico Estuarine Study, a milestone of March, 1988, was identified for a final baseline monitoring plan to be completed. This program is anticipated to be ready to be implemented beginning in April, 1988. The following plan resulted from the combined expertise of appropriate state and federal agency staff (US EPA, USGS, US NOAA, NC APES, NC DEM, and NC DMF), and represents probably the most comprehensive baseline program ever implemented in the Southeastern U. S. The component parts are carefully tailored in response to EPA guidance to

- construct a comprehensive baseline dataset to characterize the water quality, sediment and biological resources of the Albemarle-Pamlico system, basinwide;
- evaluate the spatial and temporal heterogeneity inherent in parameters of concern in this system, to allow adequate evaluation of temporal trends in historical and APES-generated datasets;
- evaluate and characterize episodic events of great concern (fish kills, anoxia, etc.) which currently escape systematic review;
- provide ground-truth and calibration to remotely sensed water quality datasets expected to be used to validate land use/land cover-driven watershed models and to understand large-scale hydrologic phenomena; and
- be used to develop by November, 1992, a continuing monitoring program which is intended to evaluate the long-term status of this important estuarine system.

This baseline monitoring program is being designed at the specific request of EPA, in response to the Office of Marine and Estuarine Protection's interpretation of Clean Water Bill requirements. We, therefore, request additional supplemental funds to help activate this program at this time. Considerable cost-sharing by program collaborators (especially USGS) has been included to maximize the return from this effort.

PROGRAM COMPONENTS

The comprehensive baseline monitoring plan presented here has six principal components:

- continuous monitors for specific parameters sited at locations of known importance or risk;
- synoptic water quality studies basinwide, with emphasis on open water areas previously poorly known;

- o one-time surveys of sediment and fish tissue toxicants;
- o expansion in time and space of the existing ambient water quality monitoring network, especially into open water areas;
- o emergency response capability to chronicle episodic events;
- o initial implementation of a trained citizen's monitoring program.

Each of these components is critical to the adequate characterization of the dynamic parameters of greatest concern in this system.

Continuous Monitors

Albemarle-Pamlico Estuarine Study has already funded initial flow evaluations in the Pamlico and Neuse River tributaries, being conducted collaboratively with USGS. This work includes twelve continuous tide gauging stations and twelve additional water quality stations (see attached map). These water quality stations originally were intended to measure only temperative and conductivity at various depths, to allow salinity evaluations. However, these stations provide a useful opportunity to add additional instrumentation at relatively low cost and monitor water quality as well.

The rationale behind a system of continuous water quality monitors is linked to the nature of the significant problems in this system. The major parameters of concern at this time are nutrient concentration, dissolved oxygen concentration, algal pigment concentration (chlorophyll a), suspended sediment concentration and salinity. Many of these, but particularly nutrient concentration, dissolved oxygen concentration varies 100%+ over the course of minutes and sometimes tens of meters. All existing systematic monitoring programs completely miss this level of variation, is both time and space. In fact, the diurnal minimum for dissolved oxygen occurs in the early morning when water quality samples are generally sleeping. Similarly, vertical stratification changes are completely missed by single depth or even top and bottom sampling -- changes in the depth of the anoxia zone can go completely undetected (e.g. the Chesapeake anoxia work).

Furthermore, a real-time capability is needed in this system to allow cueing of emergency response and synoptic studies. Punch-tape reading backlogs easily, and long delays in data availability can be avoided by the use of data collection platforms (DCPs) on a portion of the stations. DCPs have the further advantage that data is continually available from the receiving computer in Columbia, S.C., already processed, to any researcher or program person with an interest.

The minimum number of continuous monitoring units needed for such a network in this complex system is forty. This number is composed of 12 existing stations in the Pamlico and Neuse Rivers (USGS), 3 additional in the Pamlico (northshore and farther east of existing station), 2 additional in the Neuse (Street's Ferry Bridge and eastward of existing stations), 12 stations in the Chowan, Albemarle Sound, Alligator River and Currituck Sound), one each in Croatan and Roanoke Sounds, 6 in outer Pamlico Sound and Core Sound, and three in the Pungo River.

Each station will be equipped with two four-channel units, to measure dissolved oxygen at four depths, temperature at two depths and conductivity at two depths. Half of the stations will be equipped with DCPs; the remainder will be read by punch tape at USGS. Because of the extreme vulnerability of the equipment to the elements and vandalism, we will rent all of it from USGS. Rental fees of approximately $80/unit and $80/DCP include all maintenance and replacement costs.

Each of the existing USGS stations will require only an additional unit with four channels to accommodate dissolved oxygen measurements.

The total cost of this equipment rental is as follows:

12 stations with one added unit @ $80/month	= $ 960/month
28 stations with two added units @ $160/month	= $4480/month
20 stations with DCPs @ $80/month	= $1600/month
	$7040/month

$7040/month X 12 months = $84,480/year

The USGS costshare for installation, replacement service, manual reading of half of the stations, data processing, etc. will run approximately $6000 for installation and maintenance for 28 additional stations plus $2000/station for 12 previously funded stations for a total of $192,000.

A problem exists with current technology for long-term success of oxygen electrodes in estuarine situations. Fouling becomes a serious problem, and biased readings can result. Work conducted by Dr. Rick Luettech at the University of North Carolina Institute of Marine Sciences and Dr. Joe Ramus and Dr. Bruce Kenny at Duke University Marine Laboratory demonstrates that reliable data can be attained. In fact, Drs. Ramus and Kenny have developed a new oxygen electrode which is virtually disposable. We believe this represents a major breakthrough in continuous monitoring, and expect to take advantage of their excellent work. A netting and calibrational exercise must be conducted however before standard electrodes can be replaced on the continuous monitors. Drs. Ramus and Kenny have proposed to conduct this work, to devise appropriate dissolved oxygen community metabolism models and to deliver those products as a functional dissolved oxygen system with replaceable electrodes for about $50,000, capable of reporting community oxygen metabolism and its correlates. (The technology development process is complete to date, and no patent rights would accrue to the program.)

The total cost of the development and implementation of the expanded continuous monitoring system then is $326,000, of which the EPA share is $134,400.

Synoptic Water Quality Studies

The amount of water quality data available from the Albemarle-Pamlico system is large, yet relatively little is available from the open water parts of the system. Virtually nothing is known about spatial heterogeneity in water quality parameters throughout the basin. The staff working group strongly recommends conducting at least one synoptic study of all portions of the

system to characterize baseline variability. Forty continuous sampling points is grossly inadequate to address spatial variability. Without adequate information on spatial variability, no time series data (historical or APES generated) can be properly analyzed or understood.

A secondary benefit is the calibration of remotely sensed water quality data, both NOAA AVHRR satellite images (to be obtained from NOAA's Rick Stumpf for approximately $5000 for 1987 images, pending Technical Committee approval) and Landsat TM images which have been proposed to NASA for funding (approximately $540,000 over two and a half years). The NASA work will address land use/land cover from a Geographic Information System perspective, and will calculate watershed and subwatershed loadings of sediment and correlated constituents based on the Universal Soil Loss Equation. It will also allow 30m resolution for certain water quality parameters (temperature, suspended sediment, algal pigments and probably salinity), but must be calibrated by real-time "ground" data. The proposed synoptic study will be scheduled to coincide with the satellite pass in order to accomplish both goals. We expect to use continuous monitor data to cue the synoptic study, to guarantee that representative seasonal conditions exist.

Consultation with the Division of Environmental Management personnel who conducted similar limited studies on the Chowan/Albemarle and on the Neuse suggest that the cost for a one-day, systemwide synoptic water quality survey will run approximately $80,000. More than one survey should be scheduled, to demonstrate that the chosen sampling time is not in someway unique, to account for seasonal variability and to provide a safety factor should conditions preclude effective satellite imaging. However, to keep this request to target levels only one study is proposed: other study funds will be used to repeat the process later, as such funds become available.

Total cost, therefore, is $80,000.

Fish Tissue and Sediment Surveys

Sediment contaminant concentration is very poorly known. Preliminary evidence suggests that "hotspots" exist, yet their locations are poorly defined. Furthermore, experienced staff members believe that strong differences in physical composition of the sediment (even across relatively short distances like the north and south shores of the Pamlico River) may be partly or mostly responsible for differences in frequency of anoxia events in those areas. Subsequent work on sediment oxygen demand will probably prove necessary -- siting of proposed discharges could be dramatically affected.

Occasional intensive surveys of fish tissue and sediment contaminants have been conducted in the past, yet no systemwide baseline evaluation has ever been conducted. DEM staff feels very strongly that fish tissues and sediments best reflect this total loadings of toxic substances, integrating variable water concentrations over both time and space. In addition, the potential exists for recreating an unknown past by vertically partitioning sediment cores, especially where industrial markers are present (e.g. Texasgulf and the Pamlico). Preliminary data from upstream in tributaries shows some surprisingly high concentrations of pesticides: a survey is distinctly needed to fill in this blank spot in our knowledge of this system.

This work will couple nicely to current work being conducted in liaison with APES by FWS on a baseline contaminants study of the Albemarle-Pamlico Peninsula and the counties north of Albemarle Sound (fish, reptiles, birds). Biological monitoring staff consulted believe fish tissue work can be done for about $2000/site. Careful scrutiny of water quality station locations and previous tissue programs suggest that 20 sampling locations will be adequate for first-order characterizational work. The total cost of tissue studies, then, is about 20 X $2000/site = $40,000.

Expanded Ambient Water Quality Network

The existing ambient water quality monitoring network maintained by DEM is exceedingly sparse in some areas of the study region, especially the open water. In most cases former ambient stations exist, but the State of North Carolina has been unable to afford to keep them up. The working groups determined that a significant advantage could be gained by reestablishing a portion of the former stations to allow more complete characterization on conditions in the Sounds on an ongoing basis. The existence of historical data from particular stations is a criterion in the selection of stations for reactivation, as is evenness and completeness of coverage. Previous transect-arranged sampling in Albemarle Sound and the Neuse River has been exceedingly valuable. New stations will probably be transect arranged, in the rivers of highest concern, to correspond with continuous monitoring stations. This arrangement would maximize data utility. The recommended expansion is 60 additional sites, mostly concentrated in the Pamlico River, Neuse River and Albemarle Sound. (Approximately five sites would be run on each of four transects in each of the three basins). A two member water quality monitoring team could run those transects and have the samples analyzed for approximately $180,000 per year.

The total cost of an expanded ambient monitoring network is, therefore, $180,000.

Experience with previous sediment sampling in the region suggests that forty sites will be adequate to construct a first-order map of sediment contaminant concentration. Work currently under way by Dr. John Wells at University of North Carolina on physical sediment dynamics will be combined with knowledge of point source locations and nonpoint source concentrations to select specific site. Not all sites will correspond with water quality stations, but proximately to water quality stations will serve as a site selection criterion.

The cost per station for this work is estimated at $1,000. The total cost is 40 X $1000 = $40,000.

Emergency Response and Episodic Event Monitoring

A severe problem exists in the capabilities of NRCD regional staff to respond to episodic events (fish kills, algae blooms, "dead water", spills, etc.) Oftentimes considerable time elapses before any response can be made to citizens' complaints or reports of such events. For that reason (as well as change through time in reporting, recording and responding procedures), virtually all our data on incidences of fish kills and other episodic events is suggestive only. A clear process must be established to monitor and

document these events. Field staff are already badly overloaded, so additional staff is necessary.

We proposed to create a position specifically for emergency response/episodic event monitoring. Not only will this position allow efficient documentation of those events, but it will also expand accountability to the public (as well as provide a replacement for the monitoring team when one member is not present). We estimate the support of such a position would run approximately $50,000 including salary, fringe benefits, travel, telephone, and materials.

Citizens' Monitoring Network

An additional important function of this person will be to coordinate our proposed citizens' monitoring network. Currently, the Pamlico-Tar River Foundation is conducting a scoping study on such networks. We will be ready to implement this program by early spring. We believe the success of the Chesapeake Bay Program Citizens' Monitoring Network speaks for itself: not only can trained citizens using standardized protocols calibrated to state standard techniques (quality assured) provide useful data, they also provide an excellent "streamwatch" capability to fuel the episodic monitoring program described above. The estimated cost of training and equipping about 200 citizen's monitoring groups is about 200 X $200 + $10,000 for other materials = $50,000.

Total Costs

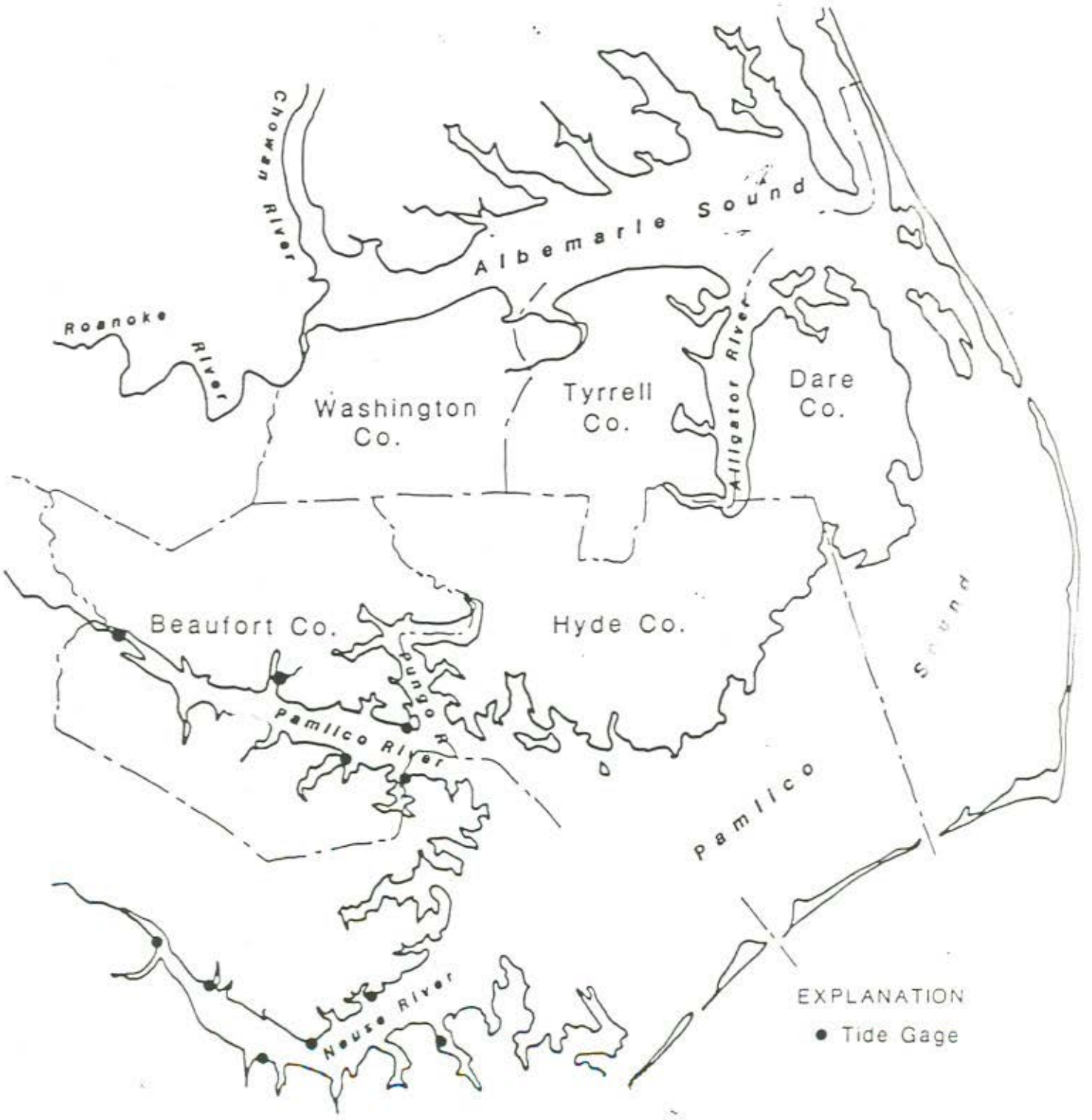
Total funds requested from EPA are shown below:

continuous monitoring network	$ 84,480
dissolved oxygen monitoring development	$ 50,000 *
synoptic water quality study	$ 80,000
fish tissue and sediment surveys	$ 80,000
expanded ambient water quality network	$180,000
episodic event monitoring	$ 50,000 *
citizen's monitoring network initiation	$ 50,000 *
Total Request	$574,480
* candidates for APES program funding	- 150,000
	$424,480
Total program value would be	$574,480
	192,000
	$766,480

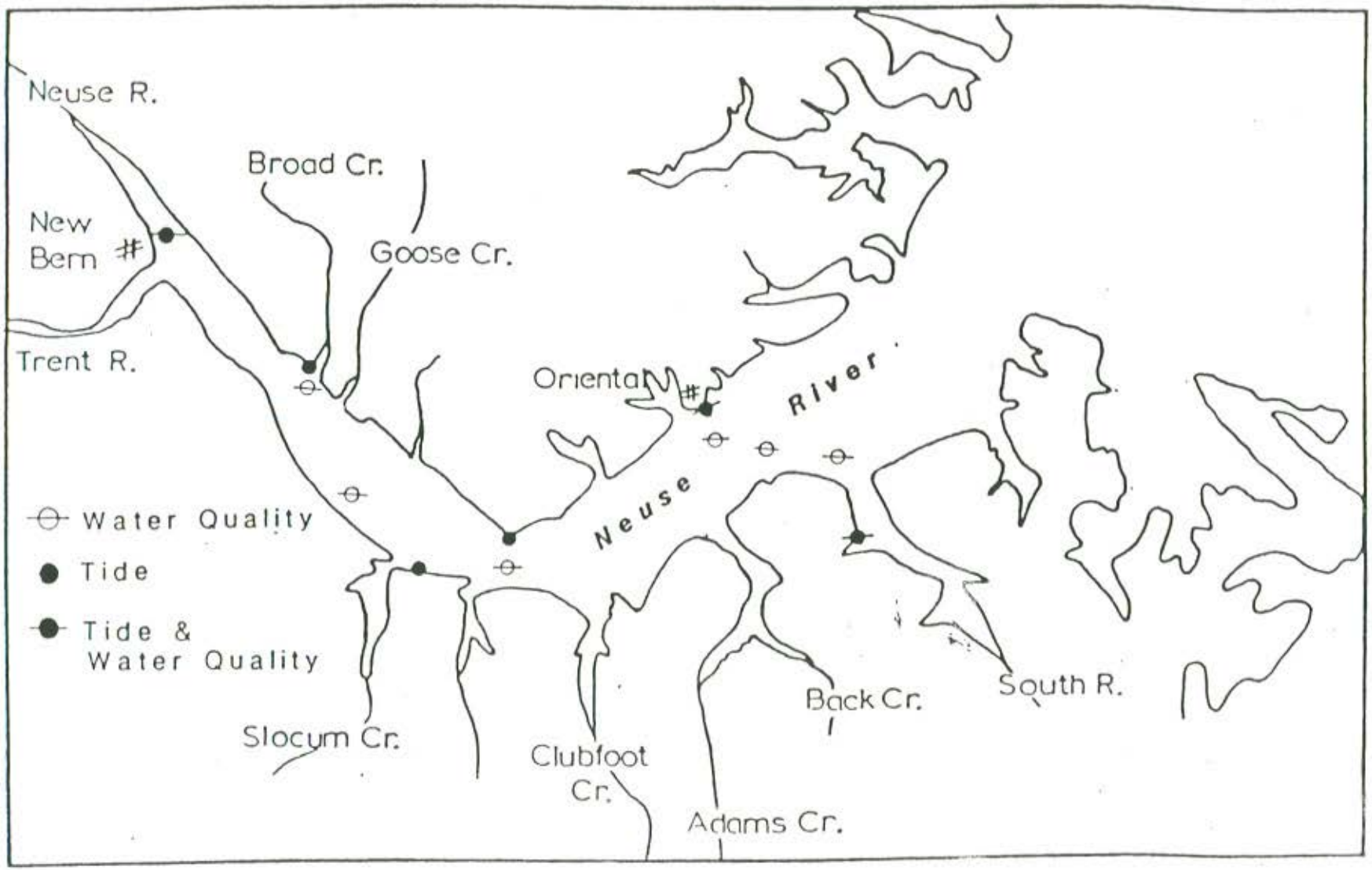
Albemarle-Pamlico Peninsula

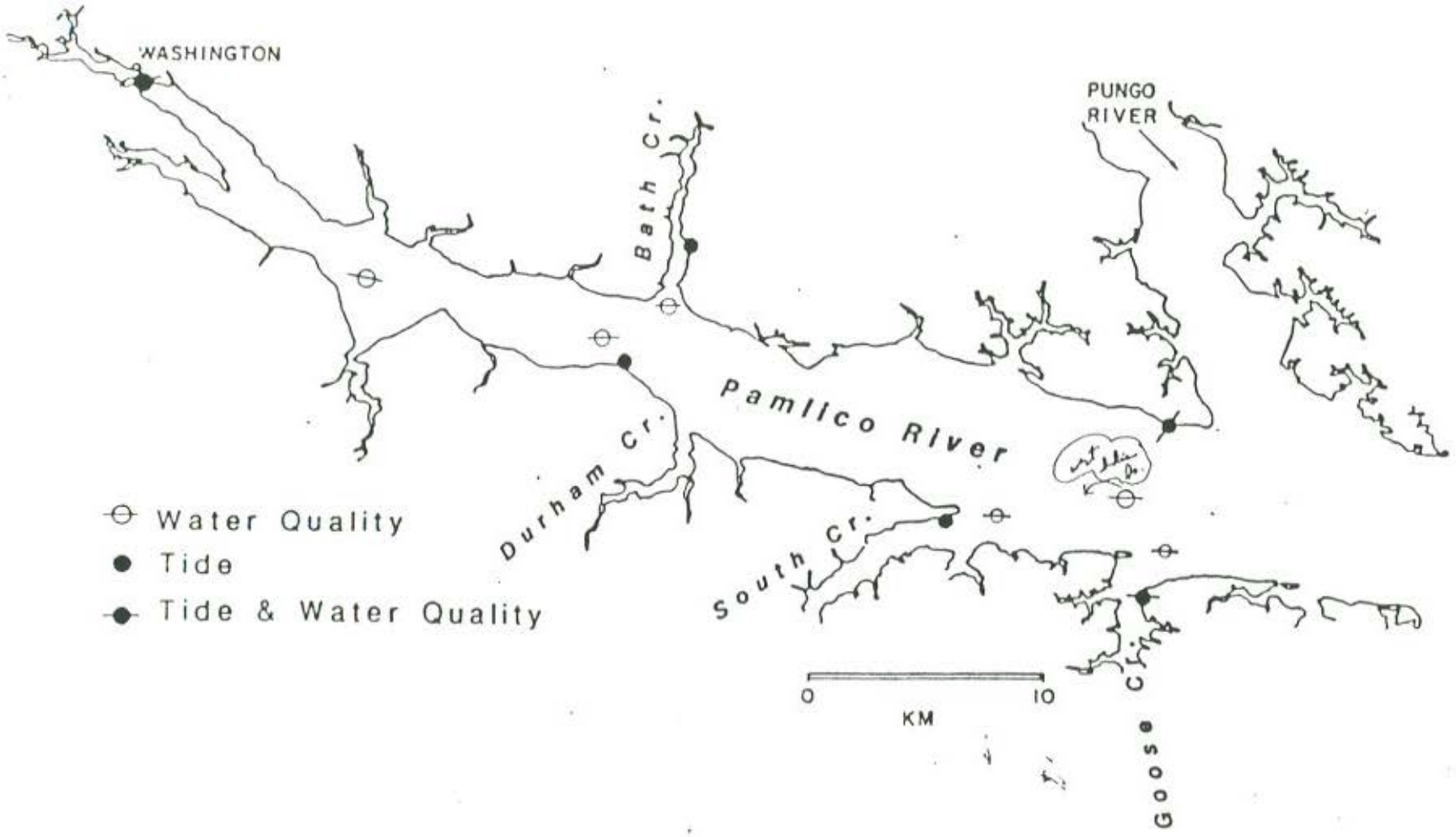
Pamlico and Neuse River Tide Gage Locations

Agricultural-Drainage Study Sites



Neuse River Estuary Tide and Water Quality Stations





Pamlico River Estuary Tide and Water Quality Stations

APPENDIX G

ALBEMARLE-PAMLICO ESTUARINE STUDY

WORKSHOP ON FISH AND CRAB DISEASES

EXECUTIVE SUMMARY

On September 22, 1987, a group of national and regional experts on diseases of fish and crabs was convened to recommend a practical strategy for addressing disease problems as part of the Albemarle-Pamlico Estuarine Study. A full day's session followed (see attached agenda).

Highlights of the information presented included:

J. Hawkins (DMF) - Ulcerative mycosis (UM) first detected in North Carolina in 1981-1982; high prevalence 1982-1984 (especially spring and fall); mostly menhaden, but also flounders, silver perch, shad, striped bass and others; strongly focused in Pamlico River, but some in Albemarle and Core Sounds; 1984 was bad year, but no associated pollutants could be identified (salinities very low); since 1984 some infections in Chesapeake and St. John's River (FLA); abundant fish kills this year, with lots of infection (NCSU survey work ceased after April when money ran out); blue crab shell disease described.

J. Mulligan (DEM) - Described current procedures for addressing fish kills; statewide numbers of kills: 1984 (39), 1985 (57), 1986 (45), 1987 to July (35); Pamlico River had by far the most 10/45 in 1986, 14/35 in 1987; on average more fish die in Pamlico River than the rest of the state; only 3 kills attributed to specific pollutants; better response time needed; better monitoring needed; recently, lots of crabs dead in pots (hard to handle from a jurisdiction standpoint - public resources?); toxic dinoflagellates?

E. Noga (NCSU) - Impacts on 1) maximum sustained yield, 2) aesthetics, 3) human health, and 4) system health indicator(?); other diseases too (eel bacteria, "red sore" = 9 different diseases, etc.); UM caused by water molds (Aphanomyces and Saphrogenia, not normally invasive); injections of cultured molds gave little results unless accompanied by injections of corticosteroids (stress factors); even so, got no real gross ulcers (only histopathologically similar ulcers); best approach: 1) identify high risk areas, 2) look at reduced resistance to infection caused by stress.

J. Levine (NCSU) - Monthly monitoring survey results; 15% of all menhaden collected have been infected; peaks in Oct-Dec and April-June 1986; highest incidences in 2-8 ppt region; mostly affects menhaden (70-160 mm), up to 93% incidence; also other epidemic disease problems; mostly where natural immune competence of hosts is compromised; need to identify anthropogenic causes and possible management solutions.

J. Stober (Athens Lab, USEPA) - Fish diseases are a burning issues in NC, FLA, VA (Gulf, GA, SC not really interested); Puget Sound experience: municipal and industrial wastes (1950s - 1960s), toxic sediments (1970s - 1980s); now tumors in flatfish; after 10 years of research have good correlations, but cannot induce the tumors!; NC problem seems even less tractable - no short-term answer; public awareness building of primary importance: nonpoint pollution controls and lifestyle changes.

In response to a request for specific recommendations to the Policy Committee of the Albemarle-Pamlico Estuarine Study, the following suggestions were made:

1) Identify physical areas of highest risk of infection and then attempt to establish causal relationships through experimental manipulations.

2) Produce an effective, management-related monitoring scheme.

3) Make a clear case for a legislative mandate to regulate wildlife effects, especially cumulative impacts of piecemeal development; demonstrate that the resource loss is of sufficient magnitude to justify regulatory efforts.

4) Build the case for ecosystem effects of juvenile menhaden losses.

5) Prove a link to water quality changes.

6) Build an education program to foster public awareness of the environmental and economic costs of chronic deterioration of water quality.

7) Don't wait for proof positive of causal relationships which may never come; recommend public policy changes to address probable causal relationships between water quality and signs of stress.

In short:

1) The Pamlico Sound and its tributaries are the major nursery grounds for the entire east coast menhaden fishery (with the Pacific menhaden, the most valuable fishery in the US).

2) Seasonal peaks of UM infection among juvenile menhaden in the Pamlico River reach 90+% and average 15% of all menhaden sampled by university researchers.

3) Most infected fish appear to die, although some apparently recovered fish have been captured in more saline reaches of the system.

4) The large variability in time and space make detection of even large population changes extraordinarily difficult.

5) Chronic losses of a minimal extent (1/2%/year) could easily cut the menhaden fishery by half in 30 years.

6) The disease vectors appear to be common water molds, normally not invasive.

7) Nonstressed fish do not become infected when exposed to the pathogens; artificially "stressed" fish do.

8) The specific critical element of stress is unknown and presumed to relate to water quality (anoxic, sediment, fresh water, toxicants, etc.).

9) Infection levels peaked in spring and fall of 1984 and 1985 and probably spring 1987; the levels this year were high but uncertain because funds were not available to researchers to continue their monitoring efforts.

10) Florida collections show similar incidence rates, but fish are adults; Chesapeake Bay collections also display ulcerations.

Concerning crab diseases:

1) The disease of blue crabs active this summer in the Pamlico River seems to be bacterial in nature and be grossly similar to "burnt crab" or "brown spot" disease recorded previously in other locations.

2) The incidence peaked at about 15% of all adult females, and was highest between Durham Creek and South Creek on the south shore of the Pamlico River; fisherman reported individual catches as high as 40-50%.

3) Causal relationships are unknown, although caged unaffected crabs rapidly became affected in that stretch of the river (DMF experiments).

(See attached DMF press release.)

Finally, the expected Fall 1987 peak of UM incidence is beginning. A large fish kill occurred September 28 in the Pungo River, with very high infection rates among killed fish. The Pamlico River is clearly the major problem area in the Albemarle-Pamlico system for stress on fish and crabs.

DNR:kn
10/9/87

APPENDIX H

Albemarle-Pamlico Estuarine Study
Data Management Work Plan
1987-1988

The following activities comprise the Albemarle-Pamlico Estuarine Study data management work plan for 1987-1988:

I. Computer System Upgrade

The Land Resources Information Service (LRIS) will upgrade the computer system to support the data management requirements of the Albemarle-Pamlico Estuarine Study.

II. Data Entry of Geographic Features

The following datasets will be incorporated into the geographic information system for use in the APE Study.

A. Hydrography

A geographic hydrography dataset will be designed and developed through a cooperative effort by LRIS, the NRCD Division of Environmental Management (DEM), and EPA. Hydrography data (streams, water bodies, and shoreline) from the 1:100,000 scale (100K) Digital Line Graphs (DLG's) produced by U.S. Geological Survey will serve as the base.

EPA will provide LRIS with the 100K digital data, acquired from USGS, for North Carolina. The 100K digital data for the Virginia portion of the study area will be purchased by LRIS from USGS.

LRIS will load, process, and reformat the data into ARC/INFO files that correspond to the USGS 7.5 minute quadrangle windows.

DEM will mark and code each stream segment with a unique stream index number. The index number will relate to DEM's stream classification data. Each stream segment will also be coded with a reach number to correspond to the reach numbers in EPA's Storet. The codes will be added to the geographic files and used as a basis for relating the tabular hydrologic data with geographic features.

B. Point Locations

LRIS will acquire and load into the geographic information system point location data for water quality monitoring sites, point source discharge locations, stream gaging stations, water intake locations, land fills, Superfund sites, and other point locations.

C. General Soil Associations

LRIS will acquire copies of the recently completed 1:250,000 scale General Soil Associations maps for both North Carolina and Virginia from the USDA Soil Conservation Service (SCS). LRIS will digitize the soil lines, integrate the data with 100K hydrography, and process the data to ARC/INFO coverages. Tabular data on soil attributes will also be acquired from SCS and incorporated into the data base.

D. Fisheries Data

LRIS will process the existing fisheries data to ARC/INFO coverages. The data include 7.5 minute quadrangle shoreline, primary nursery areas, secondary nursery areas, biological monitoring station locations, submerged aquatic vegetation, etc.

E. APES Project Area Boundary

LRIS will develop a boundary file for the study area and small scale map files of the project area including the Virginia portion of the study area.

F. Watersheds

The process of delineating watershed boundaries on 7.5 minute quads for future digitization will be initiated.

G. Land Use and Land Cover

LRIS will process the existing digital land use and land cover data for the study area to ARC/INFO coverages. Future activities toward developing land use and land cover data for the study area will await notification from NASA regarding the proposal submitted for partial funding.

III. Database/System Design

A consultant will be hired to develop specifications for the overall database and system design. LRIS is presently awaiting a proposal from Environmental Systems Research Institute (ESRI) for developing these specifications. The design will address:

Identification and definition of data items to be incorporated into the APES data base from existing datasets, including Storet, Watstor, DEM's Permit Compliance System, DEM's Stream Classification files, and Division of Marine Fisheries database.

Technical design of the database, including the literature catalog, tabular data, and geographic data.

Specifications for the "front-end" software that will be developed to access the APES data bases.

IV. Purchase Supplies

Maps for digitizing and proofing the geographic data will be purchased.

CUSTOMER'S ORIGINALS

GUIDELINES FOR BEST PRINTING RESULTS

1. **Always fill out Print Request Forms properly.**

   For books and documents with several pages, please do a sequence sheet to speed up printing process. The Printer is on production. When he has to stop and do a print sequence sheet, he is losing production. (A sample print sequence sheet is on reverse side.)

2. **Protect your originals from getting bent corners and wrinkles** -- especially if there are a lot of originals for one job, such as books, etc.

3. A shop copy of your originals is used to print your orders. This is done in order to protect your originals from being eaten by the machine when your copies are made. When the shop copy is made, it becomes the second generation of your original. When the material is printed, it becomes the third generation. Each generation loses copy quality. **For better quality and especially on big jobs, if possible, please send two (2) sets of originals (especially when there are computer graphics.)**

4. **Try to send good originals (straight, centered, free of spots, and on white paper). Your originals should be copy ready.** If the Printer has to clean your originals up with wite out or square up (center) the originals, he is losing production and it also is taking longer for you to get your job back.

YOUR COOPERATION WILL BE GREATLY APPRECIATED. THANK YOU!!!