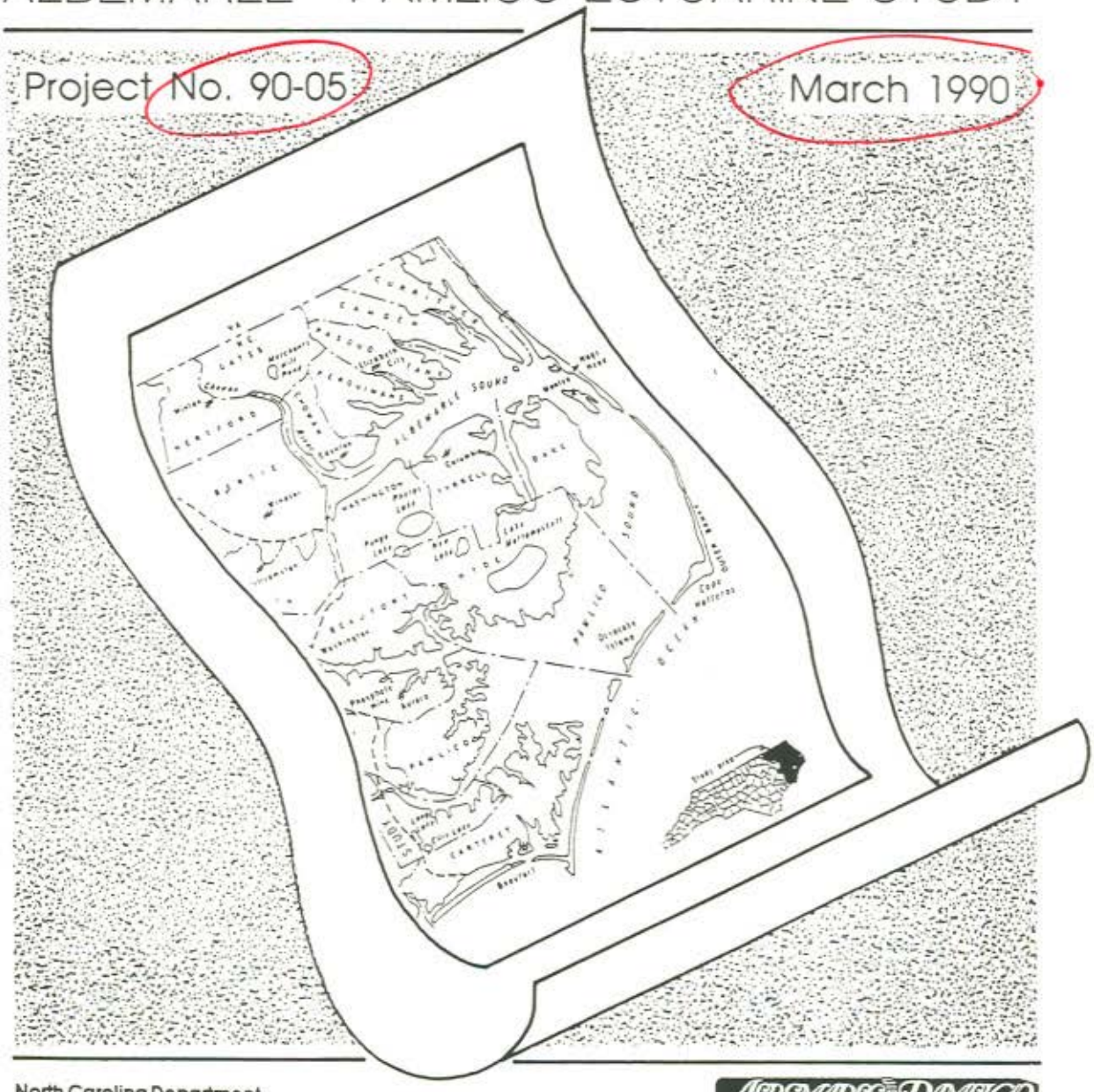
PROGRESS REPORT FOR 1990

ALBEMARLE - PAMLICO ESTUARINE STUDY

Project No. 90-05

March 1990



North Carolina Department
of Environment, Health,
and Natural Resources

Funding Provided by
Environmental Protection Agency
National Estuary Program

ALBEMARLE-PAMLICO

THE ALBEMARLE-PAMLICO ESTUARINE STUDY

PROGRESS REPORT FOR 1990

by

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Program Director

March 1990

A/P Study Project No. 90-05

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INTRODUCTION

The Albemarle-Pamlico Estuarine Study (A/P Study) is jointly funded by the State of North Carolina and the Environmental Protection Agency and is intended to improve the management of valuable resources in the major estuaries of northeastern North Carolina. It combines technical information acquisition and public participation in the development of potential management alternatives to ensure the long-term productivity of these estuarine waters. This is the third progress report on activities covering the period April 1989 through March 1990.

The A/P Study area encompasses approximately 30,880 square miles of drainage area including northeastern North Carolina and southeastern Virginia (Figure 1). This includes five rivers (Chowan, Roanoke, Alligator, Pamlico and Neuse Rivers) and four sounds (Currituck, Albemarle, Pamlico and Core Sounds). Some of the most productive nursery areas in the world are found within the Albemarle-Pamlico estuarine system. The system has the second largest surface water area in the United States and some 92 percent of the fish caught in North Carolina come from these waters. Albemarle and Pamlico Sounds are the key regional resource base for commercial fishing, tourism, recreation, and resort development in North Carolina.

Although these estuarine areas do not display the severe problems evident in some other areas, similar warning signals are present. General declines in finfish fisheries have occurred since 1980. Outbreaks of fish diseases like red sore disease and ulcerative mycosis, blue crab diseases and large-scale fish kills have occurred throughout the region. Massive blooms of blue-green algae typically occur each year in some tributaries of the sounds. Also, the disappearance of rooted aquatic plants from the central part of the Pamlico River appears to be similar to disappearances in other more troubled estuaries.

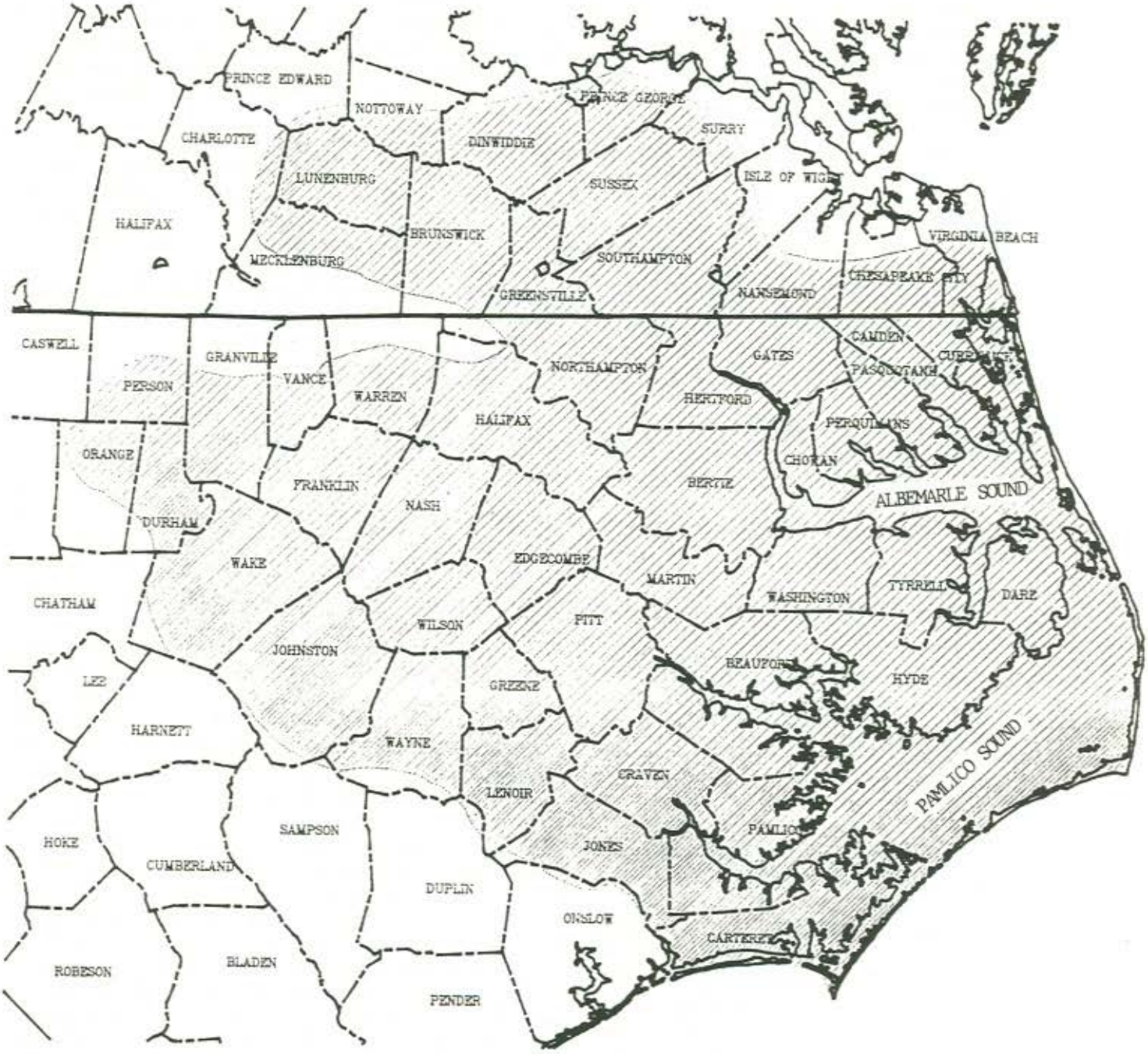
The A/P Study is funding information gathering and demonstration project efforts intended to allow better understanding of the estuarine system and management of these vital resources. Scientists are examining environmental problems to identify relationships with human activities in the watersheds draining into the sounds. Other funded investigations examine the processes contributing to the problems and demonstration projects that utilize best management practices that will help define the management strategies.

In addition to information gathering and demonstration project efforts, the A/P Study is supporting the establishment of a geographic information management system (information that is graphically displayed), so that policy and management decisions can be based on the best available information. A baseline water quality monitoring program is also being carried out to gauge the long-term effectiveness of the management strategies that are implemented. Equally important is the investment of program funds used to encourage many public participation efforts. This vital program component is to provide information about the Study, receive citizen input, and gain the needed support to implement the management plan.

The Albemarle-Pamlico Estuarine Study, like other National Estuary Program sponsored efforts, represents a unique opportunity for a partnership of scientists, resource managers, elected officials, and citizens. By working together we can protect our natural heritage and ensure the long-term productivity of these estuaries and the established human uses they support.

FIGURE 1

ALBEMARLE - PAMLICO ESTUARINE STUDY AREA



Scale 1:1,900,000
April, 1989

North Carolina
Land Resources Information Service

BOUNDARY AND HYDROGRAPHY DATA ACQUIRED FROM USGS DIGITAL LINE GRAPHS, 1:2,000,000-SCALE.

PROGRAM MILESTONES AND GOAL

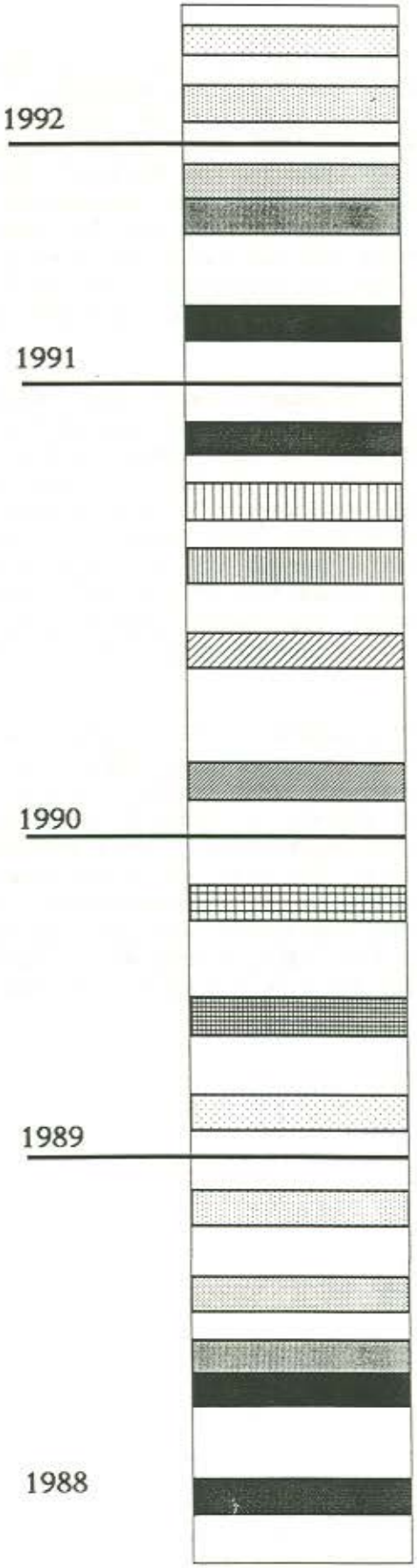
The Albemarle-Pamlico Estuarine Study (A/P Study) has 20 milestones to achieve in order to complete the Comprehensive Conservation Management Plan (CCMP) by November 1992. These milestones were laid out as part of the Designation Agreement between the State of North Carolina and the Environmental Protection Agency in October 1987, for participation in the National Estuary Program. Seven purposes as defined in the 1987 Clean Water Act amendments will be fulfilled. The Study plans to meet all of these milestones and is generally on schedule at the present time (Figure 2). There are two key milestones around which all the others revolve; these milestones are the Status and Trends Report (STR) and the Comprehensive Conservation Management Plan (CCMP). The STR is the foundation upon which the CCMP will be built.

A preliminary STR was completed in December 1989 and entitled "Albemarle-Pamlico Estuarine System - Preliminary Analysis of the Status and Trends." This 341 page report generated a narrative of the Status and Trends, included an analysis of probable causes of the four key issues (critical area, water quality, fisheries dynamics, and human environment), and tested the conclusions against technical experts, organizations, and leaders of public opinion. This exercise was approached through a series of work sessions in which the experts available provided their ideas about the status and trends of issues facing the estuary. Currently, comments are being received by the program office along with other modifications to be incorporated into the final STR by the end of 1990.

The A/P Study goal is to enable resource managers to better preserve the productivity of the estuarine area by expanding relevant knowledge about the impact of human uses upon its physical, biological, and social systems. To accomplish this goal consensus building must be started in Phase I (development of the CCMP) by researchers, resource managers, legislators, local government leaders, and the general public in order to enter the most important phase of the Study implementation. This second phase is the actual implementation of the CCMP. Consensus must be reached on the problems, the goals, and the corrective actions. If consensus is not accomplished when the CCMP is complete, there may not be a strong enough commitment to undertake corrective actions, thus Phase II may not be realized.

FIGURE 2

ALBEMARLE-PAMLICO ESTUARINE STUDY MILESTONES



Final CCMP (Nov.)

Institution/Financial Commitment (Aug.)

Draft CCMP (Jan.)
Federal Inconsistencies
Alternatives (Jan.)

Compliance Schedule
of Action Plan (Nov.)

Final Status/Trends Report (Oct.)

Federal Consistencies Report (Sept.)

Monitoring Long-Term
Management Effectiveness (July)

CCMP Outline Defined
(Management Strategies
& Cost Evaluation) (June)

Schedule Data
Management Activities (Feb.)

Status/Trends Scoping
(Probable Causes) (Dec.)
(Loading/Fate)

Inventory of Relevant
Federal Programs (Sept.)

Data Base Priorities (Feb.)

Priority Environmental
Concerns (Dec.)

Key Data Resources (June)

Federal Agencies
Contribution (April)
Design Baseline
Monitoring Programs (March)

Existing Monitoring Programs (Jan.)

INFORMATION ACQUISITION

The technical information acquisition portion of this Study amounts to approximately 60 percent of the annual funded effort and is identified in the Study's Five-Year Work Plan. Many information gaps still remain in what is known about the estuarine system. By addressing questions concerning the four key categories of the Study -- resource critical area, water quality, fisheries and human environment -- a more complete picture of the internal workings of the estuarine system emerges and allows resource managers to make wiser decisions as to the best management strategies to implement. The A/P Study's priority environmental concerns which are decline in fisheries productivity, fish disease/toxicants, anoxia-related fish kills, changes in distribution patterns of aquatic sessile organisms, impairment of nursery area function, eutrophication, habitat loss, and shellfish closure all fall within the scope of the four key technical categories of the Work Plan.

During FY 1988 there were 20 projects funded compared to 18 projects funded during FY 1989. However, ten of the 18 third-year projects are continuations from the second year and include Project Nos. 301, 305, 311, 314, 315, 317, 318, 333, 335, 344 (Table 1). These FY 1989 projects breakdown into critical area (3), fisheries (4), water quality (6), human environment (3), and two other projects. All A/P Study projects are funded for a one-year period only with annual reviews to determine merits of continuance. Any continuation project must submit a new proposal request during the call for proposal period each year. Continuation projects and new proposals are evaluated as equals, utilizing the established review process criteria of technical merit and relevancy to the Study needs.

Completed and ongoing projects have yielded significant information. Highlights of this information are presented below for each of the four key categories being addressed by the Study.

Critical Resources Areas

An evaluation of nursery area data has determined five distinct habitats based mainly on the parameters of salinity and species mixes. The extent of these regions include riverine/Albemarle Sound influenced, Pamlico Sound, Outer Banks, Core Banks, and mainland Core Sound. Such information could lead to recommendations for broadening Primary Nursery Areas (PNAs) or monitoring their functional and geographic integrity.

Fringe swamps of the A/P Study area are quite different from typical fringe swamps because they often have a gradual grade into interior swamp forest and pocosins without meaningful change in elevation and no transition to uplands. Along the shoreline of the Study area wetlands and upland occupy the following percentages: southern Albemarle Sound is 72% wetlands and 28% upland; Alligator River is 99% wetland and 1% upland; and Croatan/southern Pamlico Sound is 87% wetland and 13% upland. The vegetative structure of the various geographic regions appears to vary with salinity. This type of wetland appears to be quite extensive in the A/P Study area and protection measures should be addressed in the CCMP.

A regional inventory of natural areas, exceptional wetland ecosystems, and endangered/rare species habitats has been completed for the ten counties adjacent to Albemarle Sound including Bertie, Camden, Chowan, Currituck, Gates, Hertford, Martin, Pasquotank, Perquimans, and Washington. There were 300 potential sites that were reduced to 96 sites having biological or physiographical significance at the national,

TABLE 1. FY 1989 INFORMATION ACQUISITION PROJECTS

Topic Area	NO.	Title	Researcher	Institution
Critical Area	301	**Continuation**/Regional Inventory for Critical Natural Areas, Wetland Ecosystems & Endangered Species Habitats	Roe	Parks/DEHNR
Critical Area	335	**Continuation**/Hyde County Soil Survey	Pierce	DEHNR/SCS
Critical Area	343	Mapping and GIS Implementation of land use and land cover categories for the A/P Study Area	Khorram/ Siderelis	NCSU/CGIA-DEHNR
Fisheries	314	**Continuation**/Abundance & Viability of Striped Bass Eggs Spawned in the Roanoke River/NC in 1990	Rulifson	ECU
Fisheries	315	**Continuation**/Food & Feeding of Larval Fishes in the Lower Roanoke River & Western Albemarle Sound	Rulifson	ECU
Fisheries	339	Shell Disease in Blue Crabs, Callinectes sapidus in the A/P Estuary	Noga/Engel	NCSU/NMFS
Fisheries	341	Determining the Relationship Between Water Quality and Ulcerative Mycosis in Atlantic Menhaden	Noga	NCSU
Water Quality	305	**Continuation**/Eutrophication & Nuisance Algal Blooms in the A/P Estuarine System	Paerl	UNC
Water Quality	311	**Continuation**/Citizen Monitoring: A/P Estuary	Perlic	PTRF
Water Quality	317	**Continuation**/Determination of Flow & Flow Patterns in the Pamlico & Neuse River Estuaries	Bales	USGS
Water Quality	318	**Continuation**/Evaluation of Off-Site Changes in Hydrology & Water Quality Resulting from Agricultural BMPs in the A/P Region	Bales	USGS
Water Quality	333	**Continuation**/Reduction of Estuarine Nutrient Loadings: N & P Removal in Coastal Swamps	Kuenzler	UNC
Water Quality	344	**Continuation**/Heavy Metal Pollutants in Organic-Rich Muds of the Albemarle Sound	Riggs	ECU
Human Environment	350	Public Attitudes Toward Water Quality and Management Alternatives in the A/P Estuarine System	Hoban/ Clifford	NCSU
Human Environment	353	A Comprehensive Environmental Management Plan for the Currituck Sound Drainage Area. Part I: Background Investigations	Adams	NCSU

TABLE 1. FY 1989 INFORMATION ACQUISITION PROJECTS
(continuation)

Topic Area	NO.	Title	Researcher	Institution
Human Environment	358	Federal Consistency Review for North Carolina's Estuarine Management Program	Nichols	RTI
Other	___	Status and Trend Scoping Report	Clark	NCSU
Other	___	Open Sound Water Quality Monitoring	Bales	USGS

DEHNR - NC Dept. of Environment, Health, and Natural Resources
UNC - University of North Carolina
ECU - East Carolina University
USGS - U. S. Geological Survey
NCSU - North Carolina State University
RTI - Research Triangle Institute
NMFS - National Marine Fisheries Service
PTRF - Pamlico-Tar River Foundation

state, or regional level. More than two-thirds of the sites identified are wetlands. This study should result in specific recommendations on where preservation and/or conservation actions should be taken -- a key element of the final CCMP.

Fisheries Dynamics

Investigators of the fish disease, Ulcerative Mycosis, can now maintain Atlantic Menhaden indefinitely in experimental systems to conduct this study. Few fish in the experimental systems die from causes other than Ulcerative Mycosis. The disease has been most prevalent in upriver areas of the Pamlico River where the fish acquire the disease in low salinity areas ranging from two to eight parts per thousand (ppt). This is a significant milestone toward determining causal factors of the chronic disease.

Assessment of marine fish stocks determined six management goals for the N.C. Division of Marine Fisheries (DMF). These goals include the following: maintain or increase fisheries productivity; guide wise resource utilization; improve and expedite management decisions; promote conservation of resources and habitat; improve all aspects of interjurisdictional fisheries management; and provide public access to fisheries resources. These goals should allow DMF to define the size of available stocks and determine PNA requirements to maintain fish stocks.

Research into the cause of shell disease in Blue Crabs has found that crab blood (hemolymph) characteristics differ greatly between healthy and diseased crabs. The focus is on hemocyanin which serves as an oxygen carrying protein in the hemolymph. These preliminary results indicate that crabs were "anemic" and under physiological stress. However, factors responsible for lowered hemocyanin concentrations are unknown at this time.

Water Quality

A review of bottom sediment literature for the A/P Study area has found that sediment texture has an overall abundance of fine sand. The two accumulation sites for silt and clay-sized sediments, the fresh-to-brackish estuarine waters associated with riverine sources, and the deep central basin of Pamlico Sound are not connected. These sites have discrete boundaries and are separated by a region of fine sand. This sharp transition suggests there is no well defined sediment dispersal pathway.

In the lower Neuse River nitrogen plays the major role as an algal growth limiting nutrient from July through February. However, phosphorus plays an important second "synergistic" role during the important period when algal growth first commences and proliferates in the oligohaline portion of the tributary from March through June. It is, therefore, important to remember that management of both nutrients is needed because of the close interaction of nitrogen and phosphorus as growth regulators. However, the roles of atmospheric deposition and sediment recycling have not been well defined yet.

Sediments in the Pamlico River Estuarine System in the vicinity of known point source discharges have been found to be enriched with levels of metals up to 14 times as great when compared to other sites in the Pamlico. Surface sediments are enriched up to 10 times greater than the elemental concentrations of sediments from deeper core strata. The study also has identified ten sites in the Pamlico as "areas of concern" based upon their heavy metal concentrations.

Human Environment

A completed investigation of demographic trends in the A/P Study area indicates that the greatest growth pressures should come to Carteret and Dare counties and to a lesser extent in Hyde County. Significant growth is in the form of private recreational housing, motel/hotels, and marinas. The greatest development will take place along the barrier islands of eastern North Carolina. This information helps the Study to set regional priorities for resource protection actions.

Preliminary findings of a public attitudes survey indicate that existing programs and authorities are felt to be adequate; however, there is a lack of resources (manpower), enforcement, and financial incentives to carry out these programs effectively. Also cited was a need for more educational efforts to bring about greater understanding and involvement of estuarine issues. The next phase of the study is to measure public attitudes toward various management alternatives, and thereby determine the public's willingness to pay for the needed management activities.

A draft plan for Carteret County in managing multiple use of state public trust waters has been completed. This plan includes extensive resource mapping and water use classification for the entire county and could be utilized as a model for the Division of Coastal Management.

The examples of research efforts given above are just a sample of ongoing information acquisition efforts. Many of the Study's final reports will be due before the end of 1990. A Publications List gives the availability of these and other A/P Study reports.

PUBLIC INVOLVEMENT

The public participation portion of the A/P Study is probably the most important long-term effort designed to inform and build public/local government support of the program. All public participation projects revolve around the Public Involvement Plan. The Plan's objectives are to provide timely information about the Sounds and progress being made in the A/P Study; to expand educational programs to inform the public about the values and importance of good management; to ensure that the interested public has ample opportunity to participate in the development of the CCMP; and to initiate a process for involving local elected officials in the Study.

There were seven projects funded in 1988 and nine projects in 1989 (Table 2). However, many other projects are undertaken by the A/P Study staff. Several projects have been particularly effective. These include Local Leadership Development Workshops, Public Involvement Program for S.E. Virginia and the Second Annual Meeting. Leadership workshops were held at four locations within the A/P Study area and had participants work in different groups to address areas of concern. Each group was charged with developing management strategies to address specific problems within each area. Attendance at each workshop was between 60 and 80 people and their suggestions were very useful. Public involvement in southeastern Virginia is accomplished by the local planning district. They have been very instrumental in bringing the local governments together to discuss the A/P Study and their role in the overall effort. The experience Virginia has gained through the Chesapeake Bay Program can be a valuable resource to the A/P Study. The second annual A/P Study public meeting, held in November 1989, was quite successful in attracting new people. A different approach in setting up the second meeting was attempted. Participants were taken out into the field to observe firsthand some of the projects the Study is funding. Many people on the tour commented that they now had a better understanding of what the A/P Study is all about.

All public involvement projects fall under the major headings of education/information (printed material, non-print media, and special events), public participation/hands on activities, and local government liaisons. All three areas are being addressed in 1990 with special emphasis on local government liaison. Three highly beneficial publications have been distributed to all 459 public schools within the Study area. "Where the Rivers Meet the Sea" gives an educational, yet personal perspective of the intertwined lives of the estuary and its people. "Guide to Estuaries" is an educational booklet describing the characteristics, role and importance of the estuarine ecosystems, and the types of animals and plants that inhabit them. "Albemarle-Pamlico Estuary 1990 Calendar" is a tool to educate a broad cross-section of regional citizens to the value and management of estuarine resources.

Local government liaison is being addressed this year through three regional outreach projects. These outreach efforts include presentations to local governments within the Study area including southeastern Virginia, Albemarle Sound area, and Pamlico Sound area. The presentations are to inform local governments about the A/P Study; provide them with progress reports; and obtain their comments concerning the Study.

TABLE 2. FY 1989 PUBLIC INVOLVEMENT PROJECTS

Topic Area	NO.	Title	Researcher	Institution
Public Participation	310	**Continuation**/Community Education Outreach II (Pamlico Sound Area)	Stroud	PTRF
Public Participation	312	**Continuation**/Public Education Outreach Program in the Albemarle Sound Area	Abernathy	AEC
Public Participation	322	Raising Public Awareness & Involvement	Foder/Rancer	NCSU
Public Participation	325	**Continuation**/Institutional Enhancement & Public Involvement Program for S.E. Virginia	Carlock	SVPDC
Public Participation	328	Poster Series/Bumper Stickers	Nurnberg	PTRF
Public Participation	329	Assisting A/P Study with Press Tour, Annual Meeting and Recommendation for Management Strategies	Kennedy	NCCF
Public Participation	332	Teacher Training & Curriculum Implementation	Okun	UNC
Public Participation	351	Local Leadership Development Workshops	Hoban	NCSU
Public Participation	352	Public Forum on Management Issues for Protecting the Estuarine Natural Resources	Shaw	DEHNR-DCM
Public Participation	—	Model Nursery Area Exhibit	Staff	A/P Study
Public Participation	—	Newsletter (four issues)	Staff	A/P Study
Public Participation	—	A/P Study Slide Show	CAC/Staff	A/P Study

AEC - Albemarle Environmental Council
PTRF - Pamlico Tar River Foundation
NCSU - North Carolina State University
SVPDC - Southeast Virginia Planning District Commission
NCCF - North Carolina Coastal Federation
UNC - University of North Carolina

INFORMATION MANAGEMENT

The Center for Geographic Information and Analysis (CGIA), formally the Land Resources Information Service (LRIS), is under contract with the A/P Study to carry out the information management portion of the Study. Progress in specific areas of information management will be described in this section.

CGIA has completed a comprehensive data needs assessment for the Albemarle-Pamlico Estuarine Study. The purpose of the data needs assessment was to use a structured methodology to identify the data needs of resource managers and researchers, to document those needs in the form of data base and software specifications, and to supply recommendations for implementation. The data needs assessment team conducted more than 50 interviews with more than 100 people representing federal, state, and local government agencies and university researchers. This set of information was used to identify each cartographic data layer and tabular data set required to support the A/P Study.

A list (Table 3) of the 64 cartographic data layers is presented in rank order based on data acquisition priorities including ease of data acquisition and expected utility. The same process was utilized to develop a rank order list (Table 4) of the 60 tabular data sets. Both sets of information also have a schedule for data acquisition as the final step in the data needs assessment. Some of the key cartographic and tabular data to be acquired in 1990 are hydrology, land use/land cover, point source dischargers, CAMA major development permits, and marinas.

Technical data sets from funded investigations are periodically loaded into the A/P Study data base, including digitizing new information for the ARC/INFO GIS. Soils, submerged aquatic vegetation, and other data sets have been loaded into the system. Tasks are in progress for the compilation of a final Status and Trends document.

TABLE 3. Cartographic Data Layers

	CARTOGRAPHIC DATA LAYER NAME	STATUS	ESTIMATED DATE OF COMPLETION
1.	State Boundary	Complete	Done
2.	A/P Study Area Boundary	In-Progress	Jun 90
3.	County Boundaries	Complete	Done
4.	Subbasins	In-Progress	Jun 90
5.	Quad-County-Subbasin Boundaries	Planned	Jun 90
6.	Hydrography	In-Progress	Mar 90
7.	Land Use and Land Cover	Planned	Jun 90
8.	Point Source Dischargers	In-Progress	Sep 90
9.	Wetlands and Deep Water Habitats	Planned	No definite milestone
10.	Ambient Water Quality Monitoring Sites	Complete	Done
11.	Natural Heritage Inventory	In-Progress	Sep 90
12.	1980 Census Boundaries	Complete	Done
13.	Surface Water Intakes	Complete	Done
14.	Submerged Aquatic Vegetation	Complete as mapped	Done
15.	Superfund Sites	Planned	Jun 90
16.	1990 Census Boundaries	Planned	Jun 92
17.	Coastal Reserves	In-Progress	Mar 90
18.	Fisheries Biological Monitoring Sites	Complete	Done
19.	Oyster Cultch Plant Sites	Complete	Done
20.	Game Lands	Complete	Done
21.	Heavy Metal and Organic-Rich Mud Pollutants Sample Sites	In-Progress	Done (Pamlico) Sep 90 (Neuse) Sep 92 (Albemarle)
22.	Citizen Water Quality Monitoring Sites	Complete	Done
23.	Mussel Distribution	Complete	Done
24.	Bottom Sediment Sample Locations	Complete	Done
25.	Federal Land Ownership	Complete	Done
26.	Nursery Areas	Complete	Done
27.	Shellfish Evaluation Areas	Complete	Done
28.	Oyster Producing Areas	Complete	Done
29.	Outstanding Resource Waters	Planned	Mar 90
30.	1970 Census Boundaries	Complete	Done
31.	Artificial Reefs	Complete	Done
32.	CAMA Major Development Permits	Planned	Jun 90
33.	General Soils	Complete	Done
34.	Transportation	In-Progress	Jun 90

TABLE 3. Cartographic Data Layers (continued)

	CARTOGRAPHIC DATA LAYER NAME	STATUS	ESTIMATED DATE OF COMPLETION
35.	State Park Boundaries	Complete	Done
36.	Stream-Gaging Stations	Planned	Sep 90
37.	Marinas	Planned	Dec 90
38.	Peat Lands	Complete	Done
39.	Anadromous Fish Areas	Complete	Done
40.	Public Water Supplies (Groundwater Intakes)	Planned	Jun 90
41.	Solid Waste Facilities	Planned	Dec 90
42.	Aquifers	Planned	Sep 90
43.	Detailed Soils	In-Progress	No definite milestone
44.	Municipal Boundaries	Complete	Done
45.	Pollution Incidents	Planned	Sep 90
46.	Ambient Air Monitoring Sites	Planned	Dec 90
47.	Air Quality Permits	Planned	Dec 90
48.	Air Emissions Inventory	Planned	Dec 90
49.	Water Quality Sample Project Locations	Planned	Dec 90
50.	Mining Permits	Planned	Mar 91
51.	Lease Blocks	Complete	Done
52.	Geology	Complete	Done
53.	Geodetic Control Points	Planned	Mar 91
54.	Sea Turtle Population Sites	Planned	Mar 91
55.	Ocean Fishing Pier Licenses	Planned	Mar 91
56.	Military Air Space	Complete	Done
57.	Fishing Water Jurisdictions	Complete	Done
58.	Historic and Archaeological Sites, Buildings, and Structures	Planned	Mar 91
59.	Water Quality Monitoring Sites (Groundwater)	Planned	Jun 91
60.	Water Level Monitoring Sites (Groundwater)	Planned	Jun 91
61.	Dam Inventory	Planned	Jun 91
62.	Elevation	Planned	No definite milestone
63.	Watersheds	Planned	No definite milestone
64.	Bathymetry	Planned	No definite milestone

KEY TO TABLE

Complete = full digital data coverage present for A/P area
In-Progress = A/P-wide coverage does not exist
Planned = none of A/P area present in digital form

TABLE 4. Tabular Data Sets

	TABULAR DATA SET NAME	STATUS	ESTIMATED DATE OF COMPLETION
1.	1970 Census Data	In-Progress	Sep 90
2.	1980 Census Data	Planned	Jun 90
3.	1990 Census Data	Planned	Jun 92
4.	Agricultural Output Statistics	Planned	Sep 90
5.	Air Emissions Inventory Data	Planned	Dec 90
6.	Air Quality Permits Data	Planned	Dec 90
7.	Ambient Air Monitoring Data	Planned	Dec 90
8.	Ambient Water Quality Monitoring Data	In-Progress	Mar 90
9.	Anadromous Fish Data	Complete	Done
10.	Big Game Kill Reports Data	Planned	Sep 90
11.	Boat Registrations Data	Planned	Sep 90
12.	Boating Access Areas Data	Planned	Dec 90
13.	Bottom Sediment Sample Data	Complete	Done
14.	Building Permits Data	Planned	Sep 90
15.	CAMA Major Development Permits Data	Planned	Jun 90
16.	Census of Agriculture	Planned	Sep 90
17.	Census of Manufactures/Mineral Industries	Planned	Sep 90
18.	Census of Wholesale and Retail Trade	Planned	Sep 90
19.	Citizen Water Quality Monitoring Data	In-Progress	Mar 90
20.	Commercial Landings Data	Planned	Sep 90
21.	County Business Patterns Data	Planned	Sep 90
22.	Dam Inventory Data	Planned	Jun 91
23.	Detailed Soils Data	In-Progress	No definite milestone
24.	Fish Processing Operations Data	Planned	Sep 90
25.	Fisheries Biological Monitoring Data	Complete	Done
26.	Furbearer Harvest Data	Planned	Sep 90
27.	General Soils Data	Complete	Done
28.	Hazardous Waste Facilities Data	Planned	Sep 90
29.	Heavy Metal and Organic-Rich Mud Pollutants Data	In-Progress	Done (Pamlico) Sep 90 (Neuse) Sep 92 (Albemarle)
30.	Historic and Archaeological Data	Planned	Mar 91
31.	Marinas Data	Planned	Dec 90
32.	Mechanical Harvest of Clams Permits Data	Planned	Sep 90
33.	Mining Permits Data	Planned	Mar 91
34.	Municipal Data	Complete	Done
35.	Mussel Distribution Data	Planned	Mar 90
36.	Natural Heritage Inventory Data	In-Progress	Sep 90

TABLE 4. Tabular Data Sets (continued)

	TABULAR DATA SET NAME	STATUS	ESTIMATED DATE OF COMPLETION
37.	Ocean Fishing Pier Licenses Data	Planned	Mar 91
38.	Operating Unit Survey Data	Planned	Sep 90
39.	Outdoor Recreation Facility Inventory Data	Planned	Sep 90
40.	Oyster Cultch Plant Data	Complete	Done
41.	Oyster, Scallop, and Clam Licenses Data	Planned	Sep 90
42.	Pollution Incidents Data	Planned	Sep 90
43.	Population Estimates/Projections Data	Planned	Sep 90
44.	Pound Net Registrations Data	Planned	Sep 90
45.	Public Water Supplies Data (Groundwater Intakes)	Planned	Jun 90
46.	Recreational Fishery Statistics	Planned	Sep 90
47.	Sea Turtle Population Data	Planned	Mar 91
48.	Seafood Dealer Licenses Data	Planned	Sep 90
49.	Solid Waste Facilities Data	Planned	Dec 90
50.	State Parks Data	Complete	Done
51.	Stream-Gaging Data	Planned	Sep 90
52.	Striped Bass Reproduction Monitoring Data	Planned	Sep 90
53.	Superfund Data	Planned	Jun 90
54.	Surface Water Intakes Data	Complete	Done
55.	Tourism Expenditures and Employment Data	Planned	Sep 90
56.	Vessel Licenses/Permits Data	Planned	Sep 90
57.	Water Level Monitoring Data (Groundwater)	Planned	Jun 91
58.	Water Quality Data Analysis	Planned	Sep90
59.	Water Quality Monitoring Data (Groundwater)	Planned	Jun 91
60.	Water Quality Sample Project Data	Planned	Dec 90

KEY TO TABLE

Complete = full digital data coverage present for A/P area
In-Progress = A/P-wide coverage does not exist
Planned = none of A/P area present in digital form

MONITORING

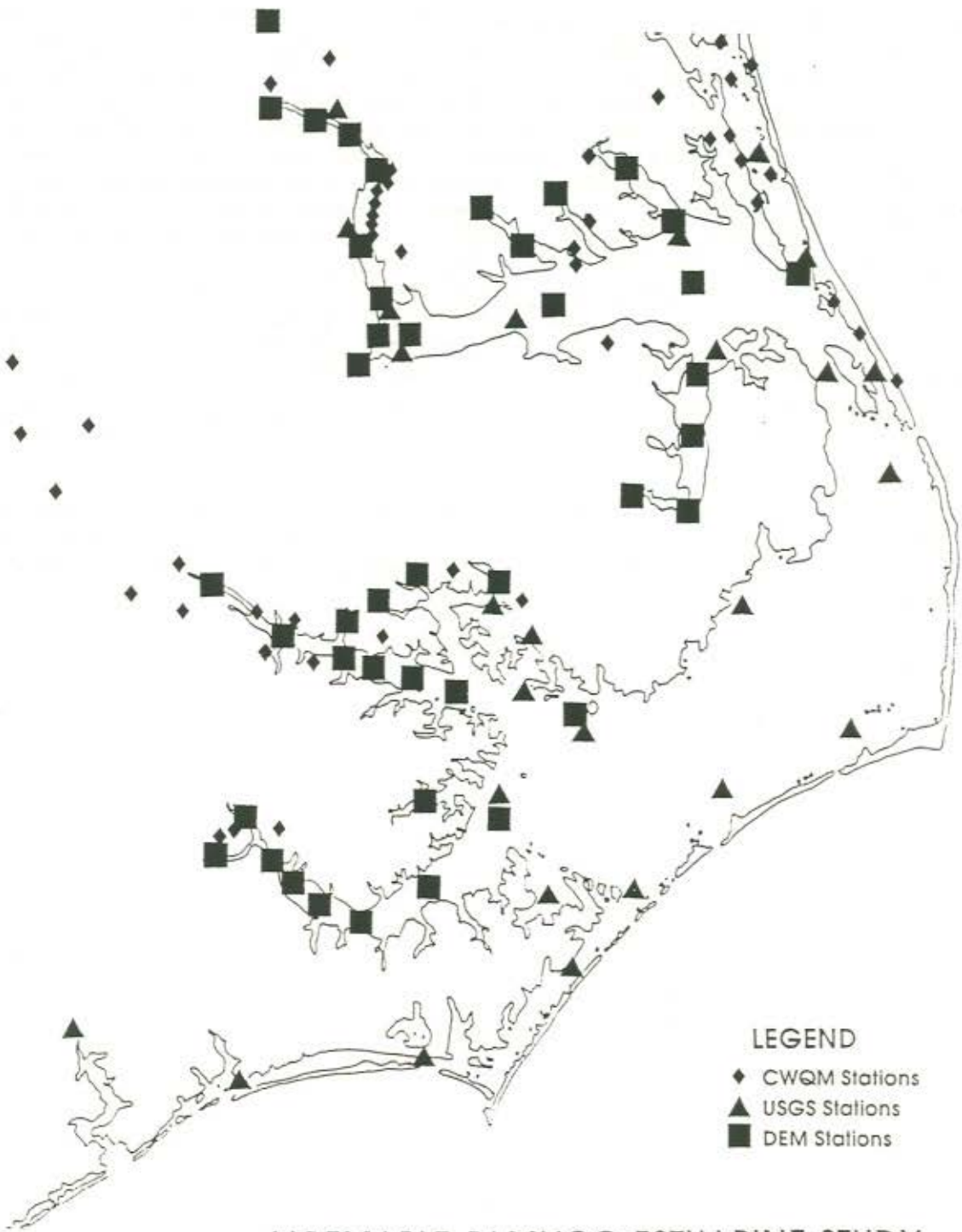
The Albemarle-Pamlico Estuarine Study's monitoring plan was completed in March 1988, and implemented in October 1988, to expand the state's baseline monitoring within the Study area. The goal of this augmentation is to evaluate long-term trends and assess the effectiveness of improved management actions. This plan was revised in June 1989, and now includes seven components to achieve the two stated goals.

These components include: 1) implementation of a trained citizens' water quality monitoring (CWQM) program; 2) emergency response capabilities to chronicle episodic events; 3) continuous monitoring of 37 open water sites maintained by the U. S. Geological Survey (USGS); 4) expansion in time and space of the existing Division of Environmental Management (DEM) ambient water quality sites in A/P Study area from 74 monitoring sites to 99 sites; 5) survey of fish tissue toxicants and sediment toxicants; 6) conduct a one-time synoptic water quality study basinwide; and 7) measure sediment oxygen demand (SOD) in critical areas. Component Nos. 1, 3, and 4 will all remain in place to establish baseline information and determine long-term effectiveness of management strategies implemented. Figure 3 indicates the location of monitored sites. Component No. 2 has formalized by the creation of a Pamlico Emergency Response Team (PERT) in June 1988, to address the increasing environmental problems of the Pamlico River. The N. C. Division of Environmental Management (DEM) and the Division of Marine Fisheries (DMF) staff in the DEHNR Washington Regional Office have worked together to respond to episodic events. The remaining components (Nos. 5, 6, and 7) field work has been completed and final reports on these subjects are due by the end of 1990.

Another important purpose of the continuous and ambient samplings are to provide input to water quality modeling for allocation of wasteload limits and hydrodynamic analysis. The actual modeling efforts will not take place until the FY 1990-91 funding package is approved.

FIGURE 3

MONITORING



ALBEMARLE-PAMLICO ESTUARINE STUDY
Water Quality Monitoring Stations

PRIORITY ACTION PLANS

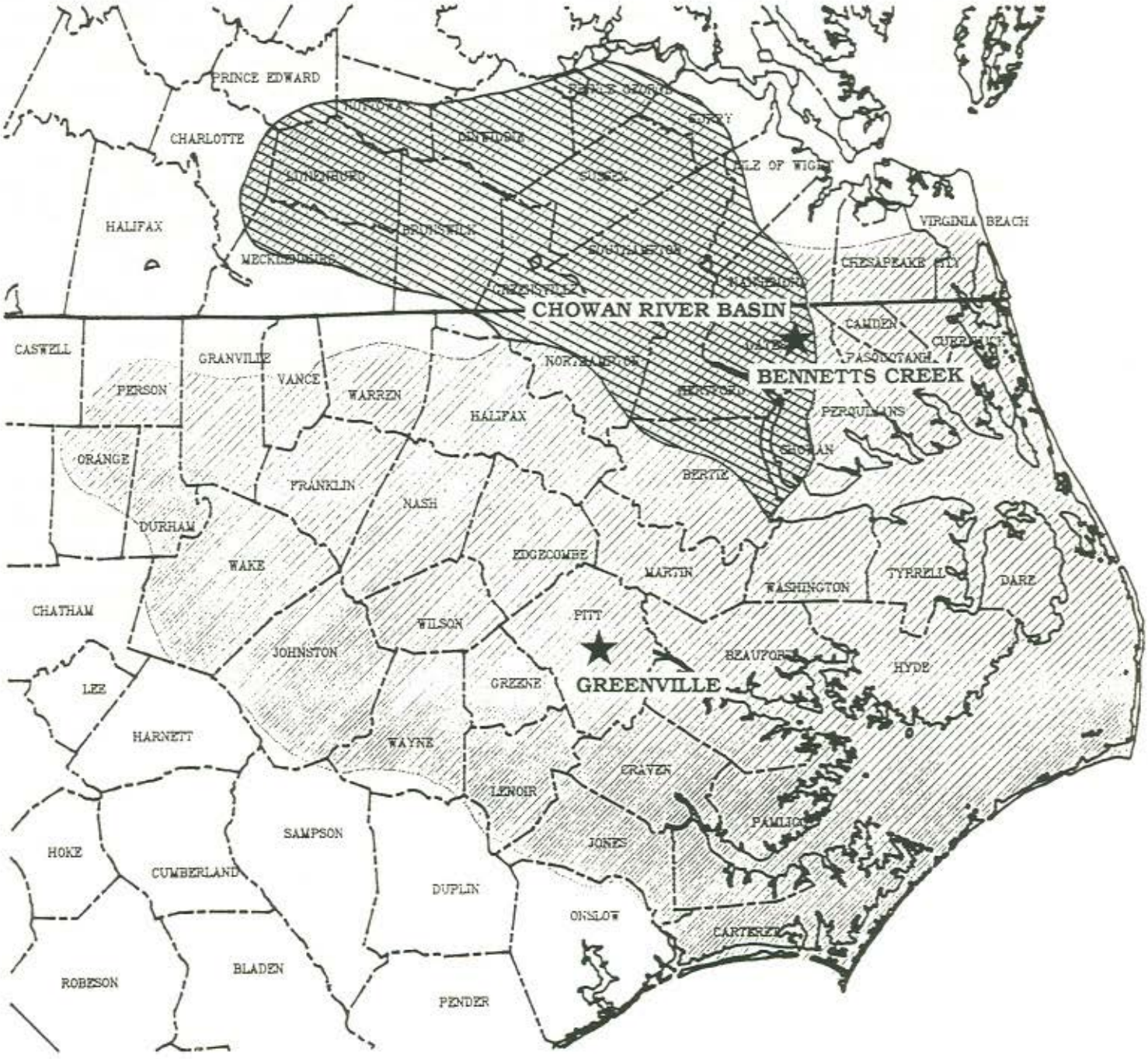
Priority action funds have been provided to the A/P Study in FY 1988 and in FY 1989 by EPA as supplemental funding based on individual project merit as existed among all projects competitively submitted by the other 11 National Estuary Programs. These funds are provided to estuarine programs to demonstrate management strategies that have 1) the potential to be effective measures for the entire Study area, 2) possible national application, and 3) can be incorporated into the Comprehensive Conservation Management Plan (CCMP). All priority action projects have an A/P Study requirement that the grant recipient provide 25 percent matching funds toward the project.

Funds provided in FY 1988 are being utilized to implement agricultural best management practices (BMPs) for animal waste in the Bennett's Creek watershed, a tributary of Chowan River in Gates County. This watershed has acute waste management problems resulting primarily from animal feed lots. The second and third projects are efforts by the Virginia and North Carolina Divisions' of Soil and Water Conservation to establish best management practices within different watersheds of the Chowan River Basin which extends into both states (Figure 4). Agricultural waste management problems have been identified by both states' environmental agencies. Virginia will be evaluating land applied waste lagoon effluent as a supplemental fertilizer source, while North Carolina will be investigating land application of waste lagoon effluent coupled with intensive cattle grazing under different soil conditions.

Funds provided in FY 1989 are being utilized to build a urban stormwater detention basin. This facility will receive runoff from 200 acres of downtown Greenville (Figure 4) and will reduce the amount of nutrients, heavy metals, and sediment that reach the Tar River. This area is quite typical, both geographically and culturally, to a number of other small cities within the Study area. This type of BMP for developed areas should have widespread applicability.

FIGURE 4

PRIORITY ACTION PROJECTS



Scale 1:1,900,000
April, 1989

ADMINISTRATIVE BOARDS AND STAFF

The Albemarle-Pamlico Estuarine Study is made up of four administrative boards which have 93 members. These boards include the Policy Committee, Technical Committee, Albemarle Citizens' Advisory Committee, and the Pamlico Citizens' Advisory Committee. Figure 5 indicates the individual committees and their interaction. The Policy Committee's main responsibilities are to establish general policies and goals for the program; approve all substantial expenditures of funds under the project; structure, appoint, and replace members of the Technical and Citizens' Advisory Committees; approve and appoint program staff; approve the workplan for the Study; evaluate progress of the Study toward established goals; and provide broad-based support for the program in policy and political matters. The Technical Committee's major duties are to provide technical support to program staff; review draft documents and make recommendations to the Policy Committee on document technical merit; help design and evaluate effective information management and public participation programs; and review draft proposals and make recommendations on projects to be funded to the Policy Committee. The general charge to the two Citizens' Advisory Committees is to provide a mechanism for structured citizens' input into the Albemarle-Pamlico Estuarine Study from their respective regions and assist in the dissemination of information relevant to or developed by the A/P Study in their respective regions. Tables 5-8 consist of the individual members of each committee.

The A/P Study Program Staff consists of four full-time individuals and one part-time individual from the North Carolina Department of Environment, Health, and Natural Resources (DEHNR) and one individual from the Environmental Protection Agency (EPA) Region IV Office. Duties of the program staff are to prepare all programs documents; coordinate the entire proposal call and review process; administer all technical/public participation projects and their grant awards; support all administrative board meetings; and administer all day-to-day program functions. Members of the Program Staff and their titles are listed below.

A/P STUDY PROGRAM STAFF

NAME	TITLE	ORGANIZATION
Robert Holman	Program Director	DEHNR
Ted Bisterfeld	Project Officer	EPA
Joan Giordano	Public Participation Coordinator	DEHNR
Kathy Norris	Administrative Assistant	DEHNR
Karon Donnelly	Secretary	DEHNR
Eva Walker	Secretary (part-time)	DEHNR

FIGURE 5

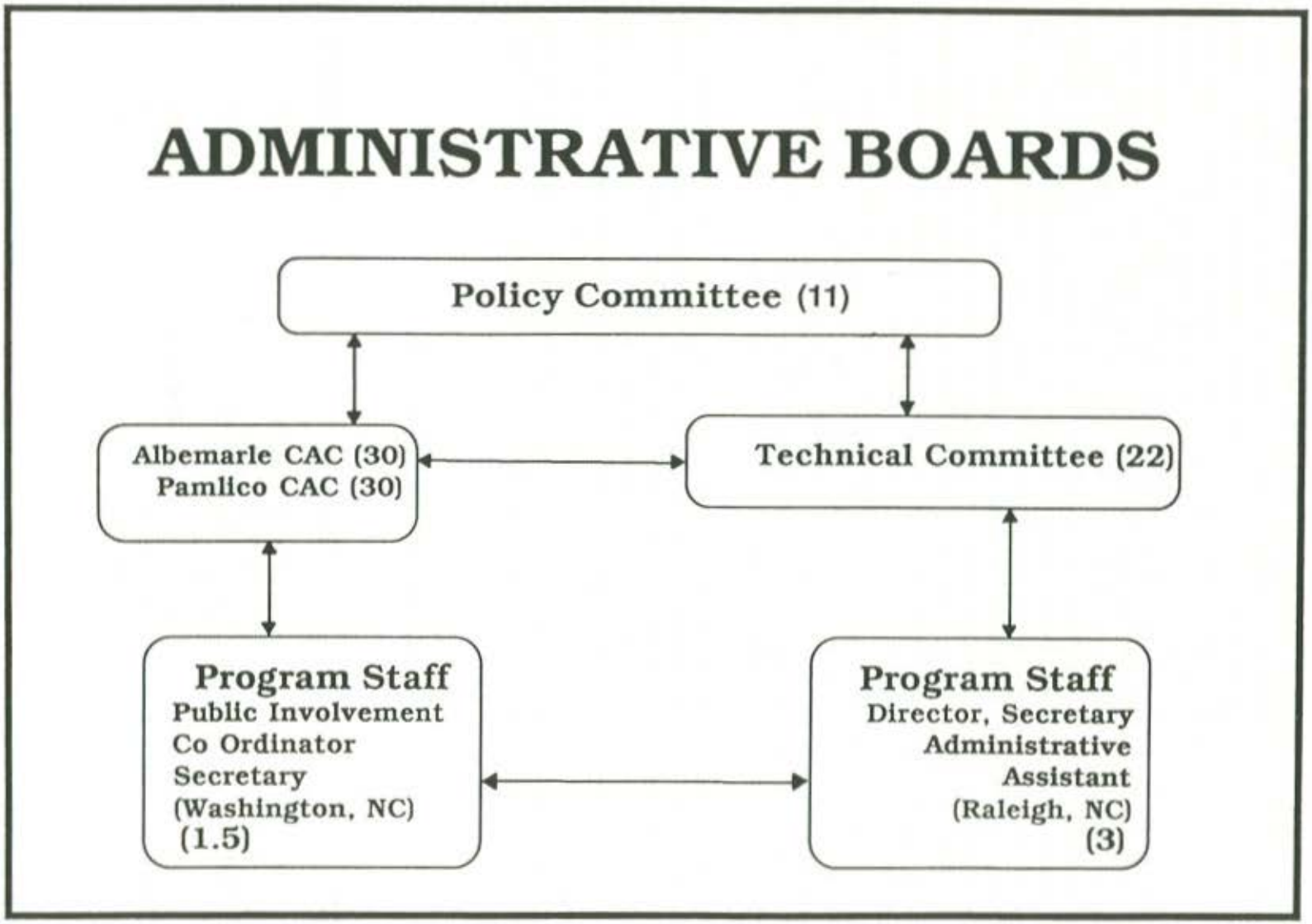

ADMINISTRATIVE BOARDS
Policy Committee (11)
Albemarle CAC (30)
Pamlico CAC (30)
Technical Committee (22)
Program Staff
Public Involvement
Co Ordinator
Secretary
(Washington, NC)
(1.5)
Program Staff
Director, Secretary
Administrative
Assistant
(Raleigh, NC)
(3)

TABLE 5

ALBEMARLE-PAMLICO ESTUARINE STUDY
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TABLE 6

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TABLE 7

ALBEMARLE-PAMLICO ESTUARINE STUDY
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L. Polk Williams
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J. A. Wright
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*There are currently six vacancies on this committee

TABLE 8
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Grace Evans
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Oriental, NC 28571

Roy Fogle
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Neuse River COG POB 1717
New Bern, NC 28560

Sharon Gibbs
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John Greene
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Ralph Jarvis
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Greenville, NC 27834

Dick Leach
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John Van Duyn
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Stanford White
PCAC
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Nags Head, NC 27959

* Currently one vacancy on this Committee

BUDGET

The A/P Study budget is funded each year primarily from funds provided by the Environmental Protection Agency's (EPA) Office of Marine and Estuarine Protection to the Department of Environment, Health, and Natural Resources and other institutions within the State of North Carolina through cooperative agreement grants. There is a required 25 percent non-federal share requirement to the Study. DEHNR provides most of the 25 percent share with the state appropriation except in the case of early implementation projects in which the grant recipient provides the 25 percent share. Additional funds are provided by various federal and state agencies that directly participate in the program. Funds obtained from the two main sources are listed below for the last four years.

Year	North Carolina	EPA
1986	$ 16,000	$ 300,000
1987	500,000	685,000
1988	500,000	1,625,000
1989	500,000	1,350,000

The base budget for 1989 (Table 9) totaled $1,700,000; however, there was a supplemental award by EPA of $150,000 for priority action projects.

The projected budget for 1990 (Table 10) is $1,700,000; however, there may be one supplemental award for priority action projects. Projects submitted by the 12 National Estuary Programs to EPA will be judged on a competitive basis if funds are available. The amount of any supplemental funds provided by EPA for 1990 is unknown at the present time.

PUBLICATIONS

The publications list (Table 11) includes completed information acquisition reports, public participation activities, and program documents. Most of these documents are available except for a few information acquisition reports that are presently out of print. Many final reports from second year projects will be due in the next few months. Please contact the program or public participation offices to obtain a current publications list or abstracts of investigations in progress.

EVENT SCHEDULE

The Albemarle-Pamlico Estuarine Study establishes the administrative committees' annual meeting schedule one year in advance to promote better attendance, coordination, and communication among the four committees (Table 12). The 1990 schedule revolves around the funding year selection process and EPA's deadline for submission of a proposed budget package.

TABLE 9
ALBEMARLE-PAMLICO ESTUARINE STUDY
Budget: FY 1989
Review and General Breakdown

I. Existing Funding Sources

$1,200,000	EPA FY 1989 [Clean Water Act Section 205(1)/320(G) Funds]
500,000	State of North Carolina Appropriated Funds
$1,700,000	Total (Base Budget)

II. Supplemental Funding Sources

$ 150,000	EPA FY 1989 Priority Action Plan Funding [Clean Water Act Section 205(1)]
$ 150,000	Total

III. Base Budget Breakdown

Item	Cost	Percent	Guideline
A. Administration	$ 287,317	16.9	(15)
B. Information Management	165,000	9.7	(15)
C. Public Participation	234,527	13.8	(10-20)
D. Technical Info. Acquisition	1,013,156	59.6	(60)
Total	$1,700,000	100.0	

TABLE 10
ALBEMARLE-PAMLICO ESTUARINE STUDY
Proposed Budget: FY 1990
Review and General Breakdown

I. Existing Funding Sources

$1,200,000	EPA FY 1990 [Clean Water Act Section 205(1)/320(G) Funds]
500,000	State of North Carolina Appropriated Funds
$1,7000,000	Total

II. Possible Supplemental Funding Sources

$ 50,000	EPA FY 1990 Possible Priority Action Plan [Clean Water Act Section 205(1)]
$ 50,000	Total

III. Base Budget Breakdown

Item	Cost	Percent	Guideline
A. Administration	$ 221,921	13.1	(15)
B. Information Management	186,000	10.9	(15)
C. Public Participation	275,000	16.2	(10-20)
D. Technical Info. Acquisition	865,987	50.9	(60)
E. Priority Action Plan	151,092	8.9	---
Total	$1,700,000	100.0	

TABLE 11. ALBEMARLE-PAMLICO ESTUARINE STUDY PUBLICATIONS LIST
March 1990

No.	Abbreviated Title	Author/Editor	Status
86-01(I)	Existing Management Programs	Brower (UNC)	Available
87-01(P)	Source Document	Rader et al. (A/P Study)	Available
87-02(P)	Work Plan I	Rader et al. (A/P Study)	Available
87-03(I)	Proceedings: Modeling Workshop	Stewart/Duffy (WRRI/SCI)	Out of Print
87-04(I)	Proceedings: Remote Sensing Workshop	Stewart (WRRI)	Out of Print
87-05(I)	Proceedings: Fish Disease Workshop	Stewart (WRRI)	Out of Print
87-06(P)	Citizens' Monitoring Pilot	Lekson (PTRF)	Available
88-01/02(P)	Baseline Monitoring Network	Rader/Holman et al. (A/P Study)	Available
88-03(P)	Citizens' Guidebook	Kennedy (NC Coastal Federation)	Out of Print
88-04(P)	Status Report: March 1988	Rader (A/P Study)	Out of Print
88-05(P)	Beaufort County Magazine	Rader (A/P Study)	Available
88-06(I)	Water Quality/Hydrology Bibliography	Bales (USGS)	Out of Print
88-07(I)	Turtle Excluder Device	Pearce/Street (Mariners' Marine/DMF)	Available
88-08(P)	Project Abstracts for the Period 1987-89	Holman, et al. (A/P Study)	Available
88-09(I)	Red Tide Persistence	Tyler (Versar)	Available

(I) Information Acquisition Documents
(P) Public Participation/Program Documents

TABLE 11. ALBEMARLE-PAMLICO ESTUARINE STUDY PUBLICATIONS LIST
March 1990
(continuation)

No.	Abbreviated Title	Author/Editor	Status
88-10(I)	Submerged Aquatic Vegetation (Eastern)	Ferguson (NOAA)	Out of Print
88-11(P)*	Can Albemarle and Pamlico Be Saved?	Taylor (Wildlife of NC)	Available
88-12(I)	Obstructions to Anadromous Fish Migration	Collier/Odom (US F&WS)	Available
88-13(I)	Value of Recreational Fishing in A/P Estuaries	K. Smith (NCSU)	Available
88-14(I)	Analysis of Fringe Wetlands in A/P Sounds	Brinson (ECU)	Out of Print
89-01(P)	Progress Report for 1989	Holman (A/P Study)	Available
89-02(I)	Fish Stock Assessment	Phalen (DMF)	Available
89-03(I)	Baseline Demographic Trends	Tschetter (ECU)	Out of Print
89-04(P)	Public Involvement Plan	Giordano (A/P Study)	Available
89-05(I)	Scoping of Water-Column and Bottom Sediments	Wells (UNC)	Available
89-06(I)	Heavy Metal/Mud Pollutants in Pamlico River Estuary	Riggs (ECU)	Available
89-07(P)	State and Federal Interrelated Programs To The A/P Study	Holman, et al. (A/P Study)	Available
89-08(P)	Project Abstracts For The Period 1989-1990	Holman, et al. (A/P Study)	Out of Print
89-09(I)	Evaluation of Nursery Area Data	Noble (DMF)	Final Draft Stage
89-10(I)	Submersed Aquatic Vegetation	Davis (ECU)	Available
89-11(I)	Water Quality Trends	Harned (USGS)	Final Draft Stage
89-12(P)	The State of The Estuary Booklet	Okun (UNC)	Available $3.00

TABLE 11. ALBEMARLE-PAMLICO ESTUARINE STUDY PUBLICATIONS LIST
March, 1990
(continuation)

No.	Abbreviated Title	Author/Editor	Status
89-13A(I)	Albemarle Pamlico Estuarine System: Preliminary Technical Analysis of the Status and Trends (Technical Document)	Copeland, et al. (Sea Grant)	Available (limited number)
89-13B(I)	Albemarle-Pamlico Estuarine System: Preliminary Technical Analysis of the Status and Trends (Public Document)	Copeland, et al. (Sea Grant)	Out of Print
00-00(P)	A Guide to Estuaries	Gale (PTRF)	Available $1/Multi-copies
90-01(I)	Inventory of Natural Areas	Roe	Final Draft Stage
90-02(I)	Evaluation of Environmental Management and Resource Protection Programs in the A/P Region	Nichols (RTI)	Final Draft Stage
90-03(I)	Abundance and Viability of Striped Bass Eggs Spawned in the Roanoke River, N.C. in 1988	Rulifson (ECU)	Final Draft Stage
90-04(P)	Coastal Satellite Scene	KRS/National Geographic	Available ($10/copy)
90-05(P)	Progress Report for 1990	Holman (A/P Study)	Available

*Not an A/P Study Document but material is related to the Study.

(I) Information Acquisition Documents
(P) Public Participation/Program Documents

TABLE 12

ALBEMARLE-PAMLICO ESTUARINE STUDY SCHEDULE-1990

Date	Event
January 12, 1990	Review Call For Proposals (submittal due date)
January 29/31,1990	CAC Meetings to Evaluate Specific Proposals
February 20, 1990	Technical Committee Meeting to Consider Subcommittees' Proposal Recommendations
March 6, 1990	Roundtable Meeting of All Committees
March 7, 1990	Policy Meeting to Consider Technical Committee's Proposals and Annual Budget Recommendations
March 21 & 28, 1990	Return Selected Proposals to Authors for Revisions
April 13, 1990	Revised Proposals to Director/Subcommittees
April 23-27, 1990	CAC Meetings
April 30, 1990	Final Cooperative Agreement Packages
May 9,1990	Technical Committee Meeting
June 12-13, 1990	Policy Committee Meeting
August 6-10,1990	CAC Meetings
August 21,1990	Technical Committee Meeting
August 29,1990	Roundtable Meeting of All Committees
August 30, 1990	Policy Committee Meeting
September 1,1990	Projected EPA Award of Funding
September 13, 1990	Annual Researchers Review Workshop
September 18, 1990	Technical Review Subcommittee Meeting
October 5, 1990	Annual Public Meeting
October 29/Nov 2, 1990	CAC Meetings
November 13, 1990	Technical Committee Meeting
November 27, 1990	Policy Committee Meeting
November 28, 1990	Call For Proposals Sent Out