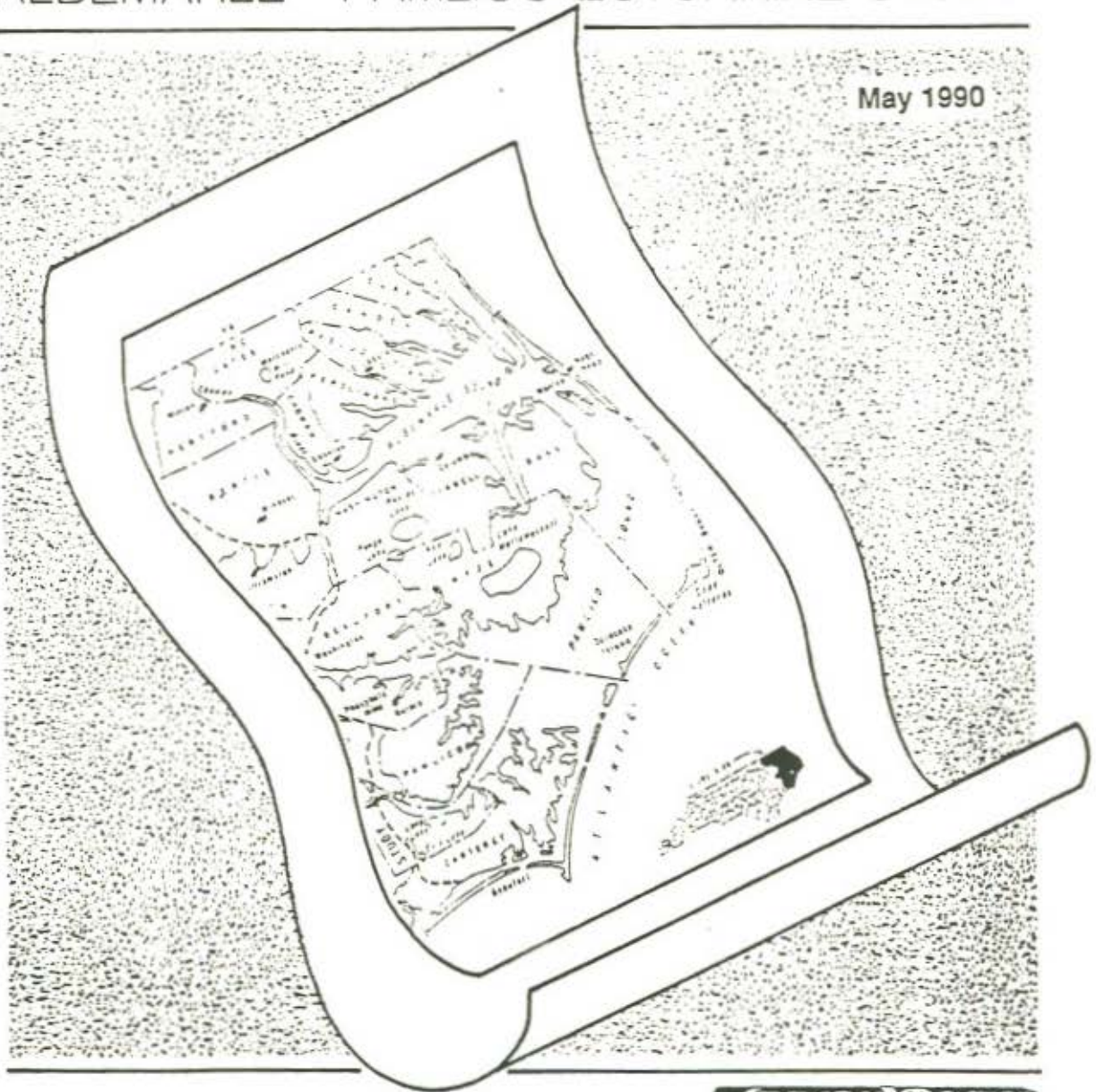


90-30

Annual Work Plan

ALBEMARLE - PAMLICO ESTUARINE STUDY

May 1990



Funding Provided By
North Carolina Department of Natural Resources and Community Development
Environmental Protection Agency
National Estuary Program



THE ALBEMARLE-PAMLICO ESTUARINE STUDY

ANNUAL WORK PLAN
FY 1990

by

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Program Director

May 1990

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.

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.

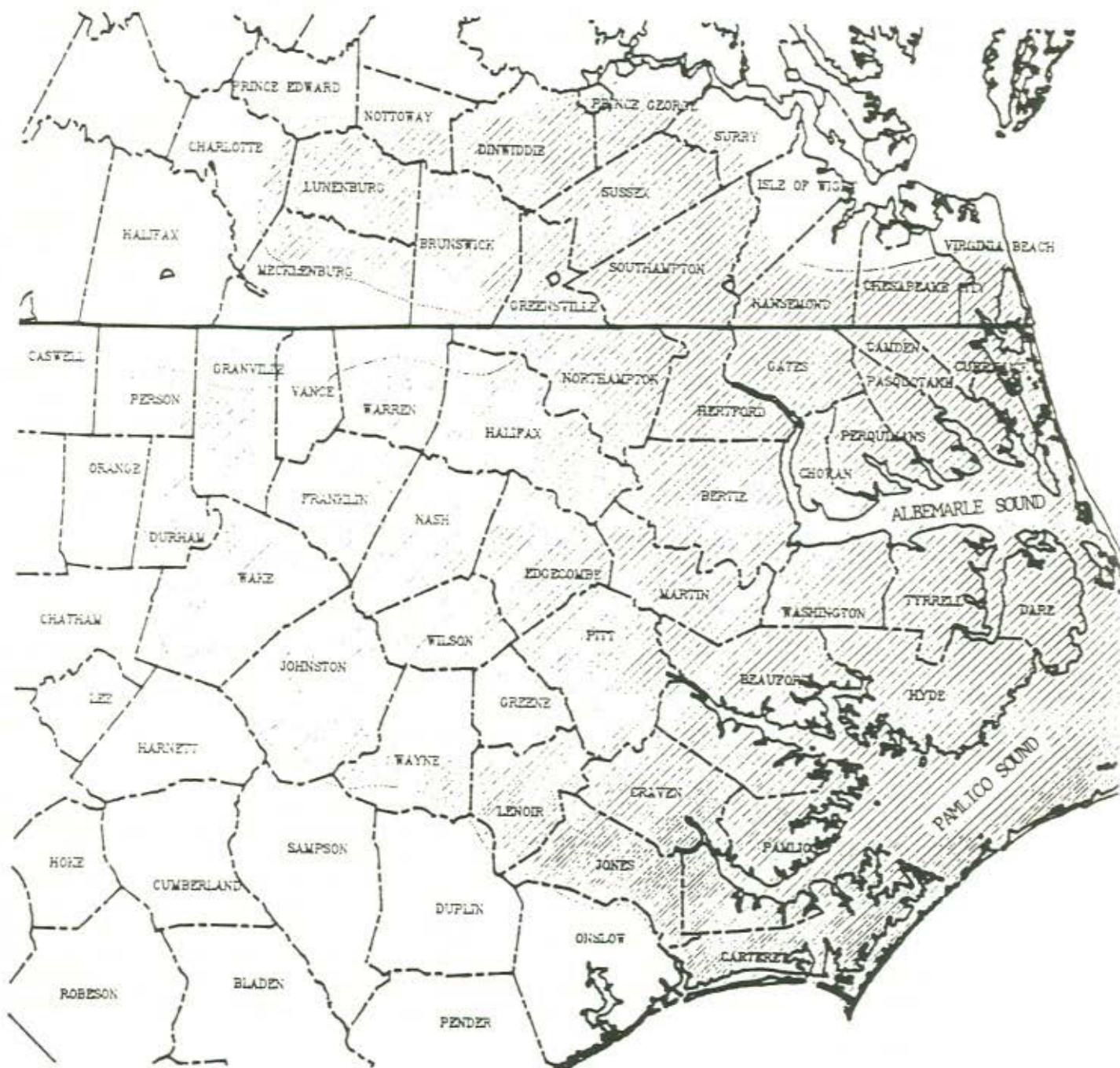
Although these estuarine areas do not display the severe problems evident in some other areas, similar warning signals are present. General declines in finfish fisheries have occurred since 1980. Outbreaks of fish diseases like red sore disease and ulcerative mycosis, blue crab diseases and large-scale 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, 1969

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 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.

There were four milestones to be accomplished during the period from February 1989 to February 1990. The milestones included Data Base Priorities, Inventory of Relevant Federal Programs, Status/Trends Scoping and Probable Cause (Loading/Fate), and Scheduled Data Management Activities (Figure 2). All of these milestones have been completed under separate report covers except for Data Base Priorities and Scheduled Data Management Activities which have been combined into one document.

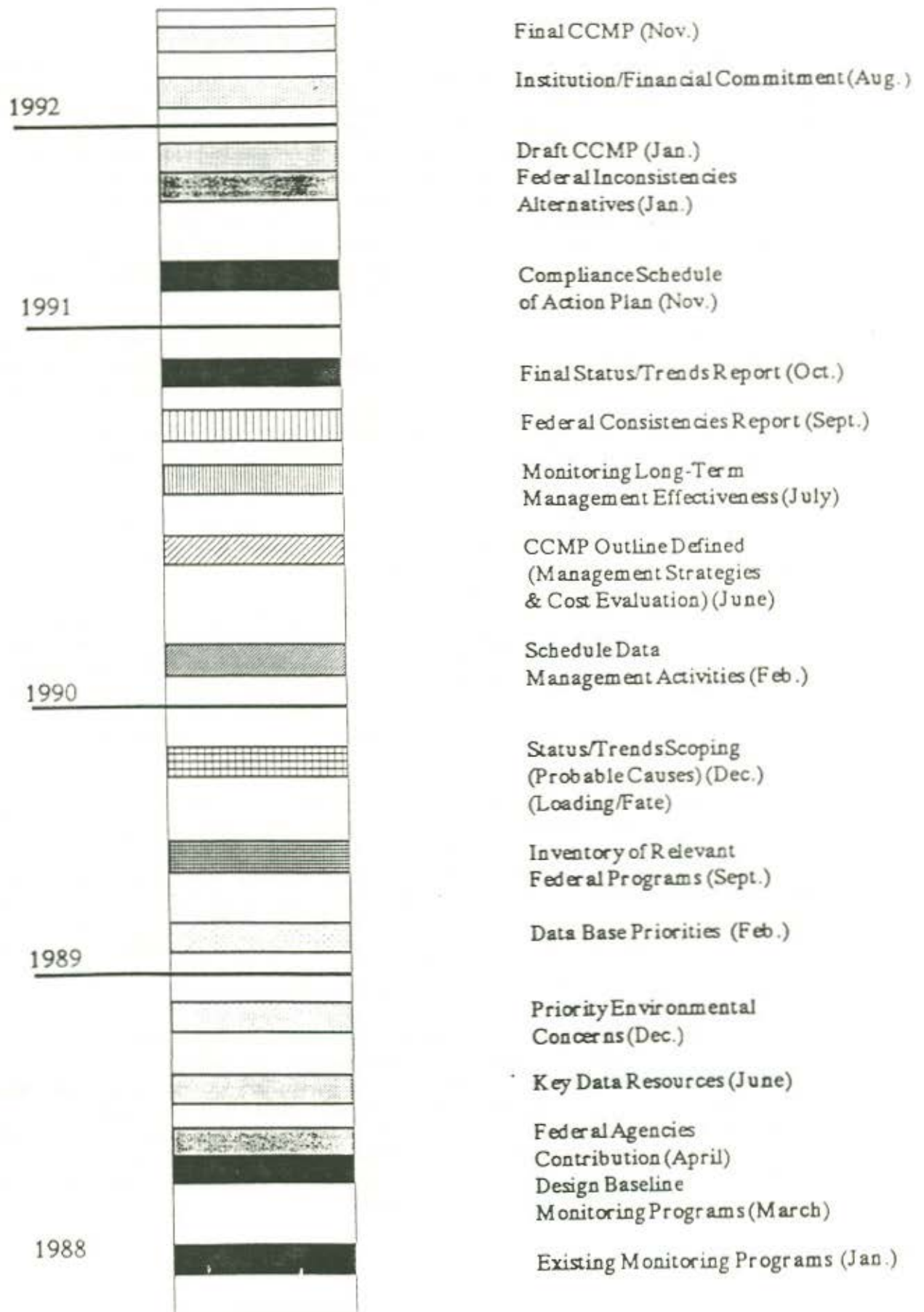
A preliminary STR was completed in December 1989 and entitled "Albemarle-Pamlico Estuarine System - Preliminary Analysis of the Status and Trends." This 341 page characterization report describes the environmental quality of the many estuarine components and it technically analyzes the causes of eight problems identified at the beginning of the A/P Study. During a series of work sessions, expert academicians and resource managers were charged with drawing conclusions from the cumulative knowledge of the estuarine system. These conclusions are now being tested against peer experts, interested citizen organizations and government. Currently, comments are being received by the program office along with other modifications to be incorporated into a final STR by the end of 1990.

Data Base Priorities and Scheduled Data Management Activities have been accomplished through completion of the "Data Management and Analysis System: Data Requirements Document". The data needs were identified by interviewing more than 100 people representing federal, state, and local governments and university researchers. Information was compiled to define the cartographic and tabular data required to support the A/P Study. There were 64 cartographic layers and 60 tabular sets that were ranked and a schedule for each data acquisition was defined. Further details of this milestone can be found in the information management section of this work plan.

A preliminary inventory of Relevant Federal Programs was completed early in the A/P Study through the document "Management Programs and Options for the Albemarle-Pamlico Estuarine Study". This document described the management system through existing federal and state statutes and the associated programs they address. A more complete inventory and evaluation will be undertaken this year through a new project to evaluate key federal programs. Further information on federal programs should be available this fall with the completion of the Federal Consistency Report.

FIGURE 2

ALBEMARLE-PAMLICO ESTUARINE STUDY MILESTONES



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) and improved monitoring of 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, state, or

TABLE 1. FY 1989 INFORMATION ACQUISITION PROJECTS

<u>Topic Area</u>	<u>NO.</u>	<u>Title</u>	<u>Researcher</u>	<u>Institution</u>
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	Khorrani/ 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, <u>Callinectes sapidus</u> 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	PTRE
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)

<u>Topic Area</u>	<u>No.</u>	<u>Title</u>	<u>Researcher</u>	<u>Institution</u>
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

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 taken from low salinity, poorly oxygenated waters were not compensating as they normally would for the physiological stress, but were anemic. 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. This project adds substantially to a limited knowledge about the extent of toxicants in the Estuary.

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.

FY 1990 Funded Projects

There are sixteen information acquisition projects to be funded in FY 1990. The projects fall under the categories of resource critical area (2), water quality (9), fisheries (2), and human environment (3). Ten of the 16 funded projects are continuation of last year's efforts. Further details of individual projects can be found by reviewing the following text and Table 2.

A. Resource Critical Area

1) PROJECT NO. 401 Regional Inventory of Critical Natural Areas

This is a third year effort by N.C. Natural Heritage Program to document important natural areas, exemplary wetlands and endangered species habitats within the study area. The first and second phase of the investigation was to compile and inventory important natural areas in the 17 counties adjacent to the Albemarle and Pamlico Sounds. The third and final phase will be to extend this effort into 17 counties which compose the upper drainage basins in North Carolina. A regional inventory of critical natural areas will be invaluable in targeting management strategies to protect these vanishing areas.

2) PROJECT NO. 416 Delineation of SAV in Currituck, Albemarle, and Pamlico Sounds

This project is a continuation of a first year effort to map the submerged aquatic vegetation (SAV) distribution along the Outer Banks of North Carolina combining aerial photography and ground reconnaissance. The second year effort will characterize and delineate SAV in Currituck, Albemarle, and Western Pamlico

Sounds. All information will continue to be entered into the Department of EHNR geographical information system (GIS). Since SAVs are tied closely to nursery areas, this survey will be important to determine the location, extent and trends of this valuable resource. Data could also be used to support potential recommendations for designating new primary or secondary nursery areas.

B. Water Quality

1) PROJECT NO. 417 Citizen's Monitoring Network

This is a fourth year funding effort to continue a comprehensive water quality monitoring program that closely ties to the U.S. Geological Survey and Department of EHNR - Division of Environmental Management monitoring efforts. Approximately 66 citizen's monitoring sites have been established throughout the study area. Baseline water quality data includes nutrients, dissolved oxygen, temperature, turbidity, pH, and salinity which are taken weekly from all citizen's sites. This project along with the other two projects comprising the comprehensive monitoring program will determine the effectiveness of management strategies implemented.

2) PROJECT NO. 453 Development of Point and Nonpoint Nutrient Budgets for Major Tributaries

Nutrient budgets for nitrogen and phosphorus will be prepared for major tributary basins. Point source and nonpoint source budgets will be developed based on recent discharger monitoring data, LANDSAT data being classified under a separate A/P Study task, and a literature review of nutrient export. The budgets will provide important technical information necessary for continuing nutrient management for river basins in the A/P Study area.

3) PROJECT NO. 458 Management Plan for Currituck Sound Watershed: Modeling

This project is a continuation of a first year effort to develop a management plan for the Currituck Sound Watershed. The first year effort was to synthesize existing information, assess the present situation, and develop alternative courses of action. The second year effort will be the development of a flow/transport model of the upper Currituck Sound to examine potential stress on the system from extreme events. This continuation project will help define management strategy for this watershed as well as the entire A/P Study area to be included in the CCMP.

4) PROJECT NO. 461 Evaluating Crab Hemocyanin as an Indicator of Stress and Environmental Quality

This is an adjunct effort to a project funded last year to examine the crab shell disease question. The first year effort was to characterize and quantify the immune factors responsible for protection of the crab's shell against the bacteria that causes shell disease. Abnormally low concentrations of hemocyanin in the hemolymph have been measured in the crab blood. The second year effort will be to examine the natural environmental factors, chemical contaminants, and possible parasitic diseases among the crab population and determine if they correlate with the observed low hemocyanin concentrations. This investigation may produce a biological indicator that can be utilized to isolate a problem area so management strategies can be applied.

5) PROJECT NO. 465 Continuous Monitoring of the Open Sounds

This project is one of three components of a comprehensive water quality monitoring program the A/P Study has established. The two other components include a citizen's monitoring project and Department of EHNR-Division of Environmental Management's baseline water quality monitoring project. This specific project is monitoring the parameters of salinity, temperature, and dissolved oxygen at 29 sound and tributary locations. The measurements are being recorded every 15 minutes and will define the temporal/spatial variability of the parameters in the estuarine setting. The monitoring program will create a baseline of water quality information to later determine the effectiveness of management strategy that is implemented from the CCMP.

6) PROJECT NO. 467 Hydrodynamic Modeling of Albemarle Sound

Very little is known about the hydrodynamics of the Albemarle Sound. Joint funding from U.S. Geological Survey, Army Corps of Engineers, N.C. Striped Bass Management Board, and the A/P Study are being utilized to answer this question. The modeling process will consist of the following steps: 1) numerical grid generation; 2) determination of inflows; 3) creation of input data files; 4) model calibration; 5) model validation; and 6) model application. This model will be used to investigate circulation in Albemarle Sound that will better define striped bass reproductive patterns, nutrient budgets, water-flow characteristics, movement of sedimentary particles, and cumulative impact methodology.

7) PROJECT NO. 468 Determine Flow/Flow Pattern for Pamlico and Neuse River Systems

This is a third year effort to develop a hydrodynamic model of the Pamlico and Neuse Rivers. Continuous data collection has taken place for the last two years (both long-term and short-term intensive) with actual model calibration to be conducted this year. The investigation will involve data analysis, interpretation, and modeling to provide information on flows and flow patterns. Results of the project can be utilized to determine nutrient budgets, water flow characteristics, sediment movement, algal bloom conditions, and cumulative impacts on the system.

8) PROJECT NO. 472 Inventory of Available Toxicant Information

Resource managers will have a consolidated inventory of toxics data for various media, including water column, fish and shellfish tissue, sediment, and effluents. A geographic mapping effort will also be conducted to indicate existing or potential toxics problem areas resulting from the analysis of existing toxics information. The completed toxics inventory will be useful in assessing future monitoring needs, defining areas of concern, and in developing management strategy to address these problem areas.

9) PROJECT NO. 473 Baseline Water Quality Monitoring

This effort is one component of the A/P Study's comprehensive water quality monitoring program. Other efforts include U.S. Geological Survey's continuous monitoring sites and the Citizen's Monitoring Network. The N.C. Division of Environmental Management has expanded its statewide ambient water quality program to more intensely monitor areas of highest concern within the A/P Study

area. There are 21 individual parameters recorded including physical, chemical, and biological data that are collected monthly. Results of the baseline water quality network can be later compared with earlier information to determine the effectiveness of the implemented management strategies.

C. Fisheries

1) PROJECT NO. 434 Examination of Blue Crab Fishery in Pamlico Sound

Research will address the possible effects to the benthic habitat and biota that crab trawling is having in the Pamlico and Pungo Rivers. Fishery-dependent data from crab pots and trawl fisheries will be collected and analyzed to develop management strategies for these fisheries. Management objectives will include the optimum yield for blue crabs and sustained yield for finfish as it relates to finfish bycatch in the crab trawl fisheries.

2) PROJECT NO. 454 Water Quality and Ulcerative Mycosis Relationship Utilizing Menhaden

Ulcerative Mycosis (UM) is the most important finfish disease problem in the A/P Study area. This second year research will determine the relationship between the development of UM in fishery populations and selected water quality conditions, including dissolved oxygen, salinity, pH, nitrite, and ammonia. These parameters are generally considered to be the most important factors affecting fish health. Results of this work should indicate which water quality factors appear to be important in development of the disease.

D. Human Environment

1) PROJECT NO. 415 Public Attitudes Toward Different Management Strategies

This project is a second year effort to gain insight into public attitudes about resource management problems and possible management strategies. The first phase was to develop an in-person and telephone interview survey instrument as a means to quantify public attitudes on resource problems. Second phase will be to analyze public attitudes regarding the effectiveness of particular management strategies and the public's receptiveness to alternative policies and programs. Benefits of the effort will be better identified educational needs and another mechanism for greater public involvement in decision making for the CCMP.

2) PROJECT NO. 430 Evaluation of Environmental Management Strategies

The investigation will evaluate both success/failure of management strategies nationwide and identify elements that are applicable to the A/P Study. Efforts will be to focus on successful management elements that can be utilized in the estuarine environment. Then a report will be produced that documents specific management strategies and recommend how these elements can be incorporated into the CCMP.

3) PROJECT NO. 452 Evaluation of Federal Programs

Federal programs or activities that affect the A/P Study area, either through financial assistance, development projects or military operations will be examined by this project. Overall process includes the following steps: identify relevant federal programs and facilities, define impacts or areas of concern, evaluate program consideration of environmental quality effects, and produce final report. This project will expand the recently published evaluation of North Carolina management programs to include existing Federal policies, programs, and activities important to the A/P Study area.

TABLE 2

THE ALBEMARLE-PAMLICO ESTUARINE STUDY
 Technical Acquisition-Project Status 1990

No.	Project Name	Mgmt. Conf. Purpose #	Delivered/ Projected	Products		Source Funds	Responsible Organization	Percent Non-Federal Share
				Date of Delivery	Total Cost			
401	Regional Inventory of Critical Natural Areas	1,4	Study Report	12/30/91	66,250	EPA/State Appropriations	EHNR-Division of Parks & Recreation	13
416	Delineation of SAV in Currituck, Albemarle, and Pamlico Sounds	1	Study Report/Inventory Maps	09/30/91	92,656	EPA/NOAA	NOAA-Beaufort Laboratory	0
417	Citizen's Monitoring	1,6	Annual Report	09/30/91	40,000	EPA	EPA	0
453	Point and Nonpoint Nutrient Budgets	2,3	Study Report/Digital Files	10/14/91	69,775	EPA/State Appropriation	Research Triangle Institute	7
458	Mgmt. Plan for Currituck Sound Watershed: Modeling	1,4	Study Report	09/14/91	42,462	State Appropriations	N.C. State University	100
461	Evaluation of Crab Hemocyanin as a Indicator of Stress	2,6	Study Report	09/30/91	21,000	EPA/NOAA	NOAA-Beaufort Laboratory	0
465	Continuous Monitoring of the Open Sounds	1,6	Annual Report	06/30/91	202,600	USGS/State Appropriations	U.S. Geological Survey	50
467	Hydrodynamic Modeling of Albemarle Sound	3,6	Study Report	09/30/92	295,000 (1 yr.) COE/FWS	USGS/State Appropriation	U.S. Geological Survey	20
468	Determine Flow/Flow Pattern for Pamlico	3,6	Study Report	09/30/92	182,600	USGS/State Appropriation	U.S. Geological Survey	50
451	Inventory of Available Toxicant Information	1,2	Study Report	10/14/91	41,442	EPA/State Appropriation	Research Triangle Institute	30

TABLE 2

THE ALBEMARLE-PAMLICO ESTUARINE STUDY
 Technical Acquisition-Project Status 1990

No.	Project Name	Mgmt. Conf. Purpose #	Delivered/Projected	Products		Source Funds	Responsible Organization	Percent Non-Federal Share
				Date of Delivery	Total Cost			
473	Baseline Water Quality Monitoring	1,6	Annual Report	09/30/91	43,946	EPA/State Appropriation	EHNR-Division Environ. Mgmt.	2
434	Examination of Blue Crab Fishery	2,4	Study Report	08/30/91	45,410	EPA/State Appropriation	EHNR-Division Marine Fisheries	34
454	Water Quality and Ulcerative Mycosis Relationship Utilizing Menhaden	2	Study Report	12/31/91	53,771	State Appropriation	N.C. State University	100
415	Public Attitudes Toward Different Management Strategies	4,5	Study Report	12/31/91	79,695	State Appropriation	N.C. State University	100
430	Evaluate Environ. Mgmt. Strategies	4,5	Study Report	08/14/91	40,206	EPA/State Appropriations	Center for Policy Negotiation	7
452	Evaluation of Federal Programs	4,7	Study Report	10/14/91	34,139	EPA/State Appropriations	Research Triangle Institute	30
	CCMP Draft	4	Study Report	12/31/91	46,000	EPA/State Appropriation	A/P Management Conference	2

Management Conference Purpose

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
3. Develop relationships between pollutant loads and estuarine uses and quality
4. Develop a comprehensive conservation and management plan (CCMP)
5. Develop a plan to coordinate implementation of the CCMP
6. Monitor the effectiveness of CCMP actions
7. Develop a federal consistency plan

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 3). 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 3. FY 1989 PUBLIC INVOLVEMENT PROJECTS

<u>Topic Area</u>	<u>NO.</u>	<u>Title</u>	<u>Researcher</u>	<u>Institution</u>
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

There are 11 public participation projects to be funded in FY 1990. Three of the 11 funded projects are continuation to last year's efforts in the area of regional public education outreach. Further details of individual projects can be found by reviewing the following text and Table 4.

1) PROJECT NO. 403 Water Quality Awards Program

A water quality awards program will provide a mechanism to further involve citizens and to recognize the involvement of constituent groups who have practiced conservation and water quality protection in the A/P Study Area. There will be an awards banquet to recognize the winners along with invitations to county officials, agency representatives, and legislators to help increase the Study's visibility and support.

2) PROJECT NO. 407 Assist with Annual Meeting, 10 Fact Sheets and Revise the Citizen's Guide

This project will assist the A/P Study in three areas including 1990 annual public meeting, update "A Citizen's Guide to Coastal Water Resource Management", and prepare 10 fact sheets regarding the most significant studies funded by the Study. The basic idea behind the project is to translate scientific information developed by the Study into forms that are usable by the general public.

3) PROJECT NO. 408 Radio Outreach Program

Develop an effective radio outreach series of 25 programs to be aired over a one year period as part of an existing statewide syndicated radio program. The related program series would include interviews with A/P Study researchers, other resources managers, and local government officials. This radio outreach will position the A/P Study's purpose and goals as critical issues and needs which the public and private sectors will be made aware on a day-to-day basis.

4) PROJECT NO. 409 Public Education Outreach in Albemarle Sound Area

Provide presentations to public officials, citizens' groups, and schools concerning specific information about the activities and goals of the A/P Study. The presentations and a series of newsnotes will be concentrated in 9 Albemarle counties and 10 municipalities. This heightened awareness in the Albemarle Sound region will lead to consensus building in the development of a CCMP.

5) PROJECT NO. 411 Five Fact Sheets for Albemarle Sound Area

Five fact sheets on the Chowan, Pasquotank, Perquimans, and Roanoke Rivers and Albemarle Sound will raise public awareness about the necessity for a balanced approach to utilizing these waters. The importance of these waters to local citizens will be emphasized as being a fabric of their lives and how necessary wise policies are if the quality of life is to be preserved.

6) PROJECT NO. 412 "Precious Waters" Display

The project is to design and construct a comprehensive exhibit on the Albemarle-Pamlico Sound systems at the North Carolina Aquarium in Pine Knoll Shores. Focus of the exhibit will be on the environmental problems, economic impacts, and cultural changes of the Albemarle-Pamlico region. This project will be viewed by over 1.5 million visitors during the 3-year display period and will promote awareness and understanding of these coastal issues.

7) PROJECT NO. 413 Feasibility Study for a Estuarine Resource Center Inland

There is a need for an Estuarine Resource Center that is inland and apart from the three existing state aquariums on the coast of North Carolina. This project is a feasibility study to determine the support and location for a permanent facility that interprets the natural systems of our inland coast and that serves as a repository for relevant educational materials.

8) PROJECT NO. 431 Public Education Outreach in Southeastern Virginia

Southeastern Virginia Planning District Commission will be continuing an outreach effort from last year to build a cooperative bridge with environmental managers, local governments, and citizens in S.E. Virginia. These efforts include the elements of public participation/involvement, information exchange/clearinghouse, and technical studies. This project like the other two regional outreach efforts are geared to providing individuals of the area with the A/P Study activities and goals. It also serves as a mechanism to receive input to the Study.

9) PROJECT NO. 439 Commercial TV Video

The working title of this public service television campaign is "Yes, in Your Backyard". An activist message will be brought into the homes of every North Carolinian concerning the impact of water quality to the Albemarle-Pamlico Estuarine System. Preliminary target groups will include home owners, recreational boaters, fishermen, farmers, children, residential developers, and small businesses. The series will supply citizens with specific information about individual actions they can take in their own backyard to benefit our fragile estuarine system.

10) PROJECT NO. 444 Model Education Curriculum

The model education curriculum project is an effort by the Elizabeth City-Pasquotank County Schools in eastern North Carolina to develop a curriculum for kindergarten through sixth grade students on estuarine and environmental health. This basic approach to environmental education is very much needed in all schools. It will teach the value of natural preservation and how the actions of man affect living habitat.

11) PROJECT NO. 474 Public Education Outreach in the Pamlico Sound Area

This is a continuation project from last year to educate the public and students within the Pamlico Sound area. Additional benefits this year will be the production of several educational tools to help supplement and further the A/P Study's goals. Key components will include an estuarine poster, a series of newspaper articles, and a newsletter for school teachers.

TABLE 4

THE ALBEMARLE-PAMLICO ESTUARINE STUDY
Public Participation-Project Status 1990

<u>No.</u> <u>Project Name</u>	<u>Mgmt. Conf.</u> <u>Purpose #</u>	<u>Products</u> <u>Delivered/</u> <u>Projected</u>	<u>Date of</u> <u>Delivery</u>	<u>Total</u> <u>Cost</u>	<u>Source</u> <u>Funds</u>	<u>Responsible Organization</u>	<u>Percent</u> <u>Non-Federal</u> <u>Share</u>
403 Water Quality Awards	4	*Evaluation Report *Awards Banquet *Video at Banquet	08/31/91	10,250	EPA/State Appropriation	Albemarle Resource Conservation Council	11
407 Assisting with Annual Meeting, 10 Fact Sheets, and reprint of Citizen's Guide	4	*Annual Public Meeting 10 Fact Sheets *Revised Citizen Guide	08/31/91	35,000	EPA/State Appropriation	N.C. Coastal Federation	2
408 Radio Outreach Program	4	8 Radio Program	08/14/91	11,679	EPA/State Appropriation	Business Forums	2
409 Public Education Outreach in Albemarle Sound Area	4	*Program Presentations *Newspaper Articles *Newsletter distribution	08/14/91	18,010	EPA/State Appropriation	Albemarle Environmental Association	30
411 Five Fact Sheets for Albemarle Sound Area	4	5 Fact Sheets	08/14/91	4,910	EPA/State Appropriation	Albemarle Environmental Association	30
412 "Precious Waters" Display	4	Fixed Visual Display at Atlantic Beach Aquarium	10/01/91	58,500	EPA/State Appropriation	N.C. Aquarium Society	60
413 Feasibility Study for a Estuarine Resource Center	4	Study Report	09/30/91	24,000	EPA/State Appropriation	Pamlico Tar River Foundation	75

TABLE 4

THE ALBEMARLE-PAMLICO ESTUARINE STUDY
Public Participation-Project Status 1990

<u>No.</u> <u>Project Name</u>	<u>Mgmt. Conf.</u> <u>Purpose #</u>	<u>Products</u> <u>Delivered/</u> <u>Projected</u>	<u>Date of</u> <u>Delivery</u>	<u>Total</u> <u>Cost</u>	<u>Source</u> <u>Funds</u>	<u>Responsible Organization</u>	<u>Percent</u> <u>Non-Federal</u> <u>Share</u>
431 Public Education Outreach in S.E. Virginia	4	*Summary Report *Basin Fact Sheets *Newsletter Articles	08/14/91	25,000	EPA/State Appropriation	S.E. Virginia Planning Comm.	7
439 Public TV Video	4	*8 Spot Video Series *Tip Sheet	08/14/91	30,930	EPA/State Appropriation	Willard Productions	2
444 Model Education Curriculum	4	*Curriculum Guide *Newspaper Articles	08/14/91	56,430	EPA/State Appropriation	Elizabeth City/Pasquatank Co. School System	7
474 Public Education Outreach in Pamlico Sound Area	4	*Program Presentations *Educational Poster *School Newsletter *Newsletter Articles	09/30/92	34,500	EPA/State Appropriation	Pamlico-Tar River Foundation	30

Management Conference Purpose

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
3. Develop relationships between pollutant loads and estuarine uses and quality
4. Develop a comprehensive conservation and management plan (CCMP)
5. Develop a plan to coordinate implementation of the CCMP
6. Monitor the effectiveness of CCMP actions
7. Develop a federal consistency plan

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 5) 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 6) 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.

One important data layer that will be completed this year will be a current land use/land cover map of the entire study area. Each county planner is being contacted to review the map product for accuracy. Comparison of this current land use/land cover map with an early one produced by U.S. Geological Survey (LUDA Series) will provide the Study with land use trends over a 15-year period. This data layer will also provide a means of estimating more directly the nutrient loading from nonpoint sources.

TABLE 5. 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 5. 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 6. 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 6 . 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	Sep 90
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

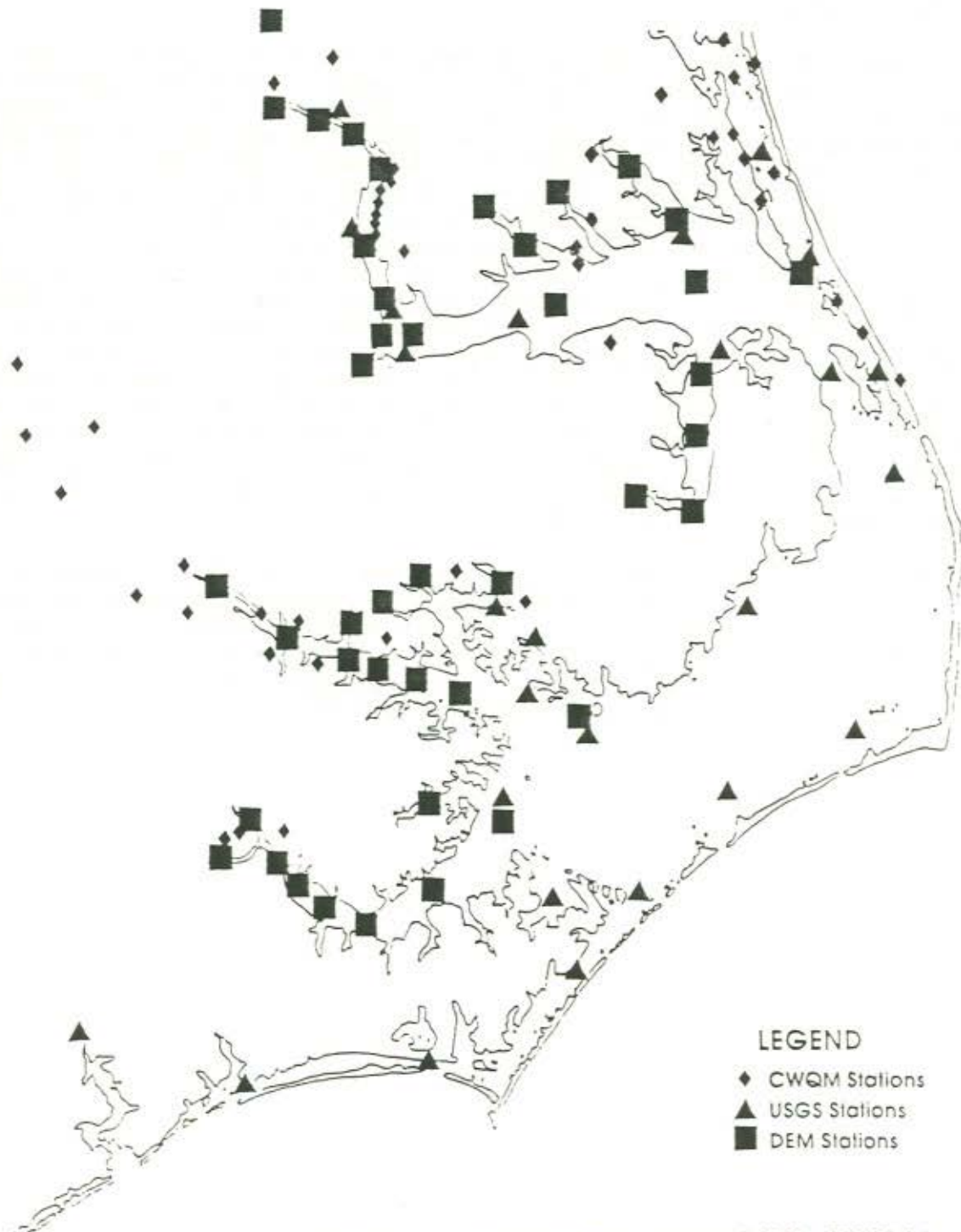
The Albemarle-Pamlico Estuarine Study's monitoring plan was completed in March 1988, and implemented in October 1988, to expand the state's baseline monitoring within the Study area. The goal of this augmentation is to evaluate long-term trends and assess the effectiveness of improved management actions. 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 improved allocation of wasteload limits and hydrodynamic analysis. Actual modeling efforts will take place during the FY 1990 funding in the form of two projects being carried out by the U.S. Geological Survey. Refer to the previous section on information acquisition for details of these individual projects.

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 among all projects competitively submitted with 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). Animal waste management problems have been identified by both states' environmental agencies. Virginia will be rectifying farm waste lagoon problems and evaluating land application of the lagoon effluent as a supplemental fertilizer source. 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.

There are two priority action plans that were previously funded and follow-up efforts are needed during FY 1990 to complete these comprehensive plans. The projects are: 1) evaluation of the effectiveness of a stormwater detention basin in an urban setting and 2) utilization of innovative agricultural Best Management Practices (BMPs) in the Bennett's Creek watershed. Further details of these projects can be found in the following text and Table 7.

- 1) PROJECT NO. 449 Evaluation of Pollutant Removal by an Urban Removal Stormwater Detention Pond

This project is a follow-up to the priority action plan funded last year to build an urban stormwater detention pond. Due to the limited funding to build the structure little money was available to evaluate the pollutant removal effectiveness. Information will be gained on the chemical characteristics of stormwater from a typical urbanized drainage area in eastern North Carolina and the effectiveness of a dry detention pond in removing total suspended solids, nitrogen and phosphorus, several heavy metals, BOD, organic carbon and fecal coliforms from the stormwater. Overall, the research will provide resource managers with quantitative information on the merits of dry detention ponds, relative to other BMPs for controlling urban stormwater pollution in eastern North Carolina.

2) PROJECT NO. 455 Upper Bennett's Creek Watershed: Agricultural
BMP Effort

A second year of funding has been approved to continue intensive efforts in targeting agricultural BMPs toward animal waste management activities in this watershed. Installation of critical BMPs include such devices as solid set waste management system, livestock exclusion from streams, filter strips, land applied animal waste, and stock rotation systems. This project also provides an educational element by bringing a technical assistant into direct contact with individual farmers for interaction. Innovative approaches can be designed and implemented based on a specific need that arises. These innovative agricultural BMPs can be a model for the rest of the agricultural community throughout the A/P Study area, and potentially be fully approved for the N.C. Cost Share Program.

BUDGET

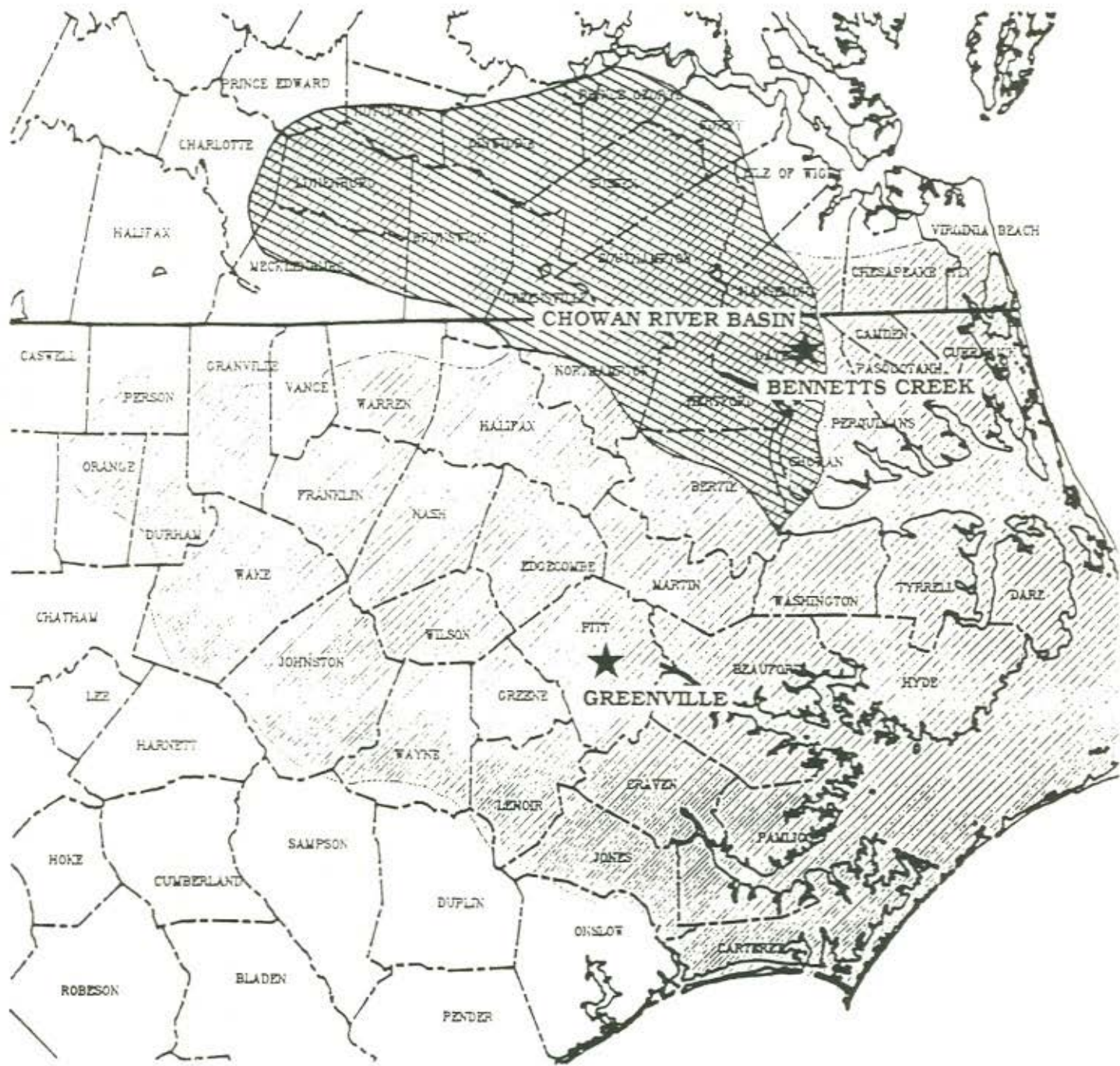
The A/P Study budget is funded each year primarily from funds provided by the Environmental Protection Agency's (EPA) Office of Marine and Estuarine Protection to the Department of Environment, Health, and Natural Resources and other institutions within the State of North Carolina through cooperative agreement grants. Tables 8 and 9 indicate the general breakdown of the base budget for FY 1989 and FY 1990. There is a 25 percent non-federal share requirement for the Study. DEHNR provides most of the 25 percent share with the state appropriation except in the case of priority action plans in which the grant recipient provides the 25 percent share. Additional funds are provided by various federal and state agencies and other organizations that directly participate in the program. Table 10 provides a complete breakdown of all funding sources for FY 1990.

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. The 1991 schedule revolves around the funding year selection process and EPA's deadline for submission of a proposed budget package (Table 11).

FIGURE 4

PRIORITY ACTION PROJECTS



Scale 1:1,000,000
April 1989

TABLE 7

THE ALBEMARLE-PAMLICO ESTUARINE STUDY
Priority Action Plans-Project Status 1990

<u>No.</u>	<u>Project Name</u>	<u>Mgmt. Conf.</u> <u>Purpose #</u>	<u>Products</u> <u>Delivered/</u> <u>Projected</u>	<u>Date of</u> <u>Delivery</u>	<u>Total</u> <u>Cost</u>	<u>Source</u> <u>Funds</u>	<u>Responsible Organization</u>	<u>Percent</u> <u>Non-Federal</u> <u>Share</u>
449	Evaluation of Pollutant Removal by a Demonstration Urban Storm- water Detention Pond	3,4	Study Report	08/14/91	86,992	EPA/State Appropriation	East Carolina University	57
455	Upper Bennett's Creek-BMP	3,4	Implementation Report	08/14/91	113,667	EPA/State Appropriation	EHNR-Division of Soil & Water Conservation	25

Management Conference Purpose

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
3. Develop relationships between pollutant loads and estuarine uses and quality
4. Develop a comprehensive conservation and management plan (CCMP)
5. Develop a plan to coordinate implementation of the CCMP
6. Monitor the effectiveness of CCMP actions
7. Develop a federal consistency plan

TABLE 8
ALBEMARLE-PAMLICO ESTUARINE STUDY
Base 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

<u>Item</u>	<u>Cost</u>	<u>Percent</u>	<u>Guideline</u>
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	<u>1,013,156</u>	<u>59.6</u>	(60)
Total	\$1,700,000	100.0	

TABLE 9
ALBEMARLE-PAMLICO ESTUARINE STUDY
Base 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
 \$1,700,000 Total

II. Possible Supplemental Funding Sources

\$ 75,000 EPA FY 1990 Possible Priority Action Plan [Clean Water Act Section 205(1)]
 \$ 75,000 Total

III. Base Budget Breakdown

<u>Item</u>	<u>Cost</u>	<u>Percent</u>	<u>Guideline</u>
A. Administration	\$ 221,698	13.0	(15)
B. Information Management	186,000	11.0	(15)
C. Public Participation	278,714	16.4	(10-20)
D. Technical Info. Acquisition	862,327	50.7	(60)
E. Priority Action Plan	<u>151,261</u>	<u>8.9</u>	---
Total	\$1,700,000	100.0	

TABLE 10
ALBEMARLE-PAMLICO ESTUARINE STUDY

Fund Sources FY 1990

FEDERAL	Source Of Funds	Amount	Type Of Award
	Environmental Protection Agency	1,200,00	CWA Section 320 CWA Section 205
	U.S. Geological Survey	263,600	*Hydrodynamic Model- ing Project (No. 467) *Flow/Flow Pattern Project (No. 468) *Monitoring Project (No. 465)
	Army Corps of Engineers	135,000	*Hydrodynamic Model- ing Project (No. 467)
	N.C. Striped Bass Management Board (U.S. Fish & Wildlife Service)	40,000	*Hydrodynamic Model- ing Project (No.467)
	National Oceanic & Atmospheric Administration	31,078	*Submerged Aquatic Veg. Project (No. 416) *Blue Crab Disease Project (No. 461)
	TOTAL	\$1,669,678	
STATE	Source of Funds	Amount	Type of Award
	North Carolina Matching Funds	500,000	State Appropriation
	North Carolina In-Kind Contributions	146,819	Twenty Funded Projects (see text)
	TOTAL	\$ 646,819	
TOTAL FEDERAL SHARE		$\$1,669,678 / 2,316,497 = 72\%$	
TOTAL STATE SHARE		$\$ 646,819 / 2,316,497 = 28\%$	

TABLE 11

ALBEMARLE-PAMLICO ESTUARINE STUDY SCHEDULE-1991

<u>Date</u>	<u>Event</u>
January 11, 1991	Review Call For Proposals (submittal due date)
January 28-31,1991	CAC Meetings to Evaluate Specific Proposals
February 19, 1991	Technical Committee Meeting to Consider Subcommittees' Proposal Recommendations
March 5, 1991	Roundtable Meeting of All Committees
March 6, 1991	Policy Meeting to Consider Technical Committee's Proposals and Annual Budget Recommendations
March 18-30, 1991	Return Selected Proposals to Authors for Revisions
April 12, 1991	Revised Proposals to Director/Subcommittees
April 22-25, 1991	CAC Meetings
May 8,1991	Technical Committee Meeting
May 17, 1991	Final Cooperative Agreement Packages
June 11-12, 1991	Policy Committee Meeting
August 5-8, 1991	CAC Meetings
August 20, 1991	Technical Committee Meeting
August 28, 1991	Roundtable Meeting of All Committees
August 29, 1991	Policy Committee Meeting
September 2, 1991	Projected EPA Award of Funding
September 12, 1991	Annual Researchers Review Workshop
September 17, 1991	Technical Review Subcommittee Meeting
October 4, 1991	Annual Public Meeting
October 28-31, 1991	CAC Meetings
November 12, 1991	Technical Committee Meeting
November 26, 1991	Policy Committee Meeting
November 27, 1991	Call For Proposals Sent Out

