

# ALBEMARLE-PAMLICO ADVOCATE

... the newsletter of the Albemarle-Pamlico Estuarine Study

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## From The Public Coordinator

It doesn't seem quite possible, but it is time for another issue of our newsletter. So much has been happening within the Albemarle/Pamlico Study that the perception of time flying has taken on new meaning—reality!

The reality of the situation is that in addition to the Citizens' Advisory Committees (CACs) meeting regularly, the Policy Committee (PC), the Technical Committee (TC), and all the standing subcommittees of the TC are also meeting. Much of their activity is a result of the third cycle "Request for Proposals" (RFP), which was issued in late November, 1988. The request yielded fifty-nine proposals, which were broken down as follows: Resource Critical, 9; Water Quality, 17; Human Environment, 10; Fisheries, 8; and Public Participation, 15. All of the proposals were reviewed, internally, by various program and agency personnel and, externally, by independent evaluators possessing expertise in the areas of concern.

The review process then underwent four more levels of scrutiny, beginning with the CACs, the Citizens' Affairs, Monitoring and Technical Review subcommittees of the Technical Committee, the full Technical Committee, and finally, the Policy Committee. Proposal revisions are expected to occur this month with cooperative agreements between the researchers and the EPA slated for April. The Office of Marine & Estuarine Protection (OMEP) presentation is also scheduled for April. This cycle's funding package for selected proposals is expected to exceed one million dollars.

The discussion of proposals was not the only agenda item at the Roundtable meeting held in New Bern on the evening of February 27th. It was the second such opportunity for all four of the administrative boards of the A/P Study to meet. The meeting was well attended and offered a chance for discussion on a number of topics including a **proposed bill** from the N.C. Legislature to create an A/P Study Commission; the proposed creation of the Roanoke River Wildlife Refuge; and a "vehicle" to carry the A/P Study into the implementation phase of the program. The Roundtable meeting was followed the next day by a Policy Committee meeting where two new PC members were proposed for inclusion on the committee.

Dr. Bill Queen, of East Carolina University's Institute for Coastal & Marine Resources, was invited to fill the vacancy created by the resignation of Dr. Dirk Frankenburg; and Don Bryan, Mayor of the Town of Nags Head, was approached to fill a newly created seat on the committee for a local government official. A draft budget for FY '89-'90 was also discussed with final action pending a special call meeting of the PC on March 15th in Raleigh.

As was promised in our last issue, the "Project Highlights" column carries the remainder of the sampling of project abstracts corresponding to the six major categories of program information. These were, if you recall, presented at our first Annual Review Meeting (10/88) held in Washington, N.C. Also included are the comments made by the evaluator teams relative to these program areas. This issue, too, carries a listing of available A/P Study publications. There are a limited number of these documents available, and public

distribution will be made on a first-come, first-served basis until they can be reprinted. Our "Technical Corner" column features an article on the Citizens' Monitoring program made possible by an A/P Study grant to the Pamlico-Tar River Foundation. To round out this issue, our "Ask An Expert" column focuses on the work done for the A/P Study by Dr. Paul Tschetter (E.C.U.) on "Demographic Trends in Permanent and Temporary Populations in the A/P Study Area."

We hope the information provided to you through our newsletter is useful and interesting. Our intention is to keep you abreast of what is happening within the program and to answer questions you may have regarding A/P Study efforts. Should you have requests, comments, or criticisms, please make them known to our Public Involvement Coordinator (and newsletter Editor), Joan Giordano. She can be reached at 919/946-6481.

## Citizens' Advisory Committee Chairman's Message

by: Parker Chesson, Chairman  
Albemarle Citizens' Advisory Committee

The Albemarle-Pamlico Estuarine Study is approaching its third year of activities. From my perspective, there is an increasing awareness that grassroots support for the program must be increased as we rapidly approach the development of a comprehensive management plan for the Albemarle and Pamlico estuarine waters.

We must do a better job of carrying the program to citizens. Also, state and local elected officials must be better informed about the program—what it is **and** what it is not. Some have the perception that the A/P Study program is a monster coming down the road to force another bureaucratic, regulatory program on coastal land and waters. The A/P Study program will, in my opinion, fail if this approach is taken or if such a perception is created.

I believe the long range success of the A/P Study program will depend on

several factors. We certainly must develop a better information base to help decision makers. This will be the easiest part of our task. The more difficult part will involve changing human behaviors and perceptions. There must be coordinated action by all who affect our coastal waters. All parties—fishermen, farmers, land developers, business interests, citizens in general, and others—must become participants in the program's discussions.

Long term success of the A/P Study program will require that all contributors to our pollution problem be asked to take reasonable steps to address the problem. And, all contributors should be involved in developing whatever reasonable steps we take. New programs or regulations should not be sprung on an unsuspecting public.

The main ingredient in achieving the above will be good communication. We must do a better job of explaining the A/P

Study program and why this effort is so important. This will require a coordinated

and concentrated effort from all of us, from the Citizens' Advisory Committee,

the Technical and Policy Committees, and state leaders all the way to the Governor's office.

## Technical Corner

### Citizens' Monitoring Network

by Tom Perlic, Coordinator

During the first four months of the Citizens' Monitoring funding year, great progress has been made in establishing monitoring sites throughout the A/P Study region. As of the end of March, fifty-four (54) sites are collecting data and sending it weekly to the coordinator's office in Washington, NC. Sites collecting weekly data range from Elizabeth City, west to Rocky Mount, and south to the New Bern-Havelock area. Plans are made to establish monitoring sites in the Currituck Sound and Core Sound areas in the next few weeks.

In order for complete understanding of the Citizens' Monitoring program, a discussion of chemical parameters being monitored needs to be undertaken. In fresh or low-salinity systems, chemical

parameters monitored include pH, air and water temperature, turbidity, dissolved oxygen, and nutrient (nitrate and phosphate) analysis. In saline systems, salinity measurements are recorded instead of nutrients, due to the rapid uptake of nutrients in salt-water systems. Most chemical analyses are color comparison tests where reagents are added to the water sample and then compared to a set of standard colors. The dissolved oxygen test is a direct titration where reagents are added to the sample to produce color and/or phase changes that are very easy to notice. The amount of dissolved oxygen in the system is then read directly from the piper used in the titration.

When the data is sent to the Coordinator's office in Washington, NC, it is

immediately entered into a personal computer spreadsheet program. This system allows great flexibility in providing feedback to the monitors that shows them what is happening at their sites. This system has graphic capabilities which are used to generate presentations of the data at each site over a six-month, or yearly interval. Data will also be entered into the State Division of Environmental Management's computer system where it will be available for analysis.

If anyone would like more information on the A/P Study Citizens' Monitoring program please call the Coordinator of the program at (919) 946-9492. The office is located in the Pamlico-Tar River Foundation's office in Washington, NC.

## Ask An Expert

We hear about projects concerning the "Human Environment" within the A/P Study. What do these projects study?

### Population Estimates for the A/P Study Counties

by Paul Tscherrer

The purpose of this project was to provide a baseline characterization of the demographics for the 33 county Albemarle-Pamlico Estuarine Study (A/P Study) area. The methodology for estimating population size and change had to take into account the unique geographical and socio-economic characteristics of the counties in the study area. The relevant characteristics are the counties' proximity to the ocean and the sounds and their nonmetropolitan character.

Fourteen of the 33 A/P Study counties directly border the Atlantic Ocean and/or the Albemarle and Pamlico Sounds. The remaining 19 counties form the drainage basins for the Albemarle and Pamlico Sounds. Proximity to the ocean and sounds provides an important recreational base for economic development. In 1987, there were an estimated \$646.4 million in tourist expenditures within these 14 coastline and sound counties. Two counties, Carteret and Dare, accounted for 85.7 percent of these tourism expenditures. Such revenue figures indicate there is a large recreational population frequenting these counties. Evidence also indicates that the size of the recreational population has increased over time.

The other defining demographic characteristic of the 33 A/P Study counties is their nonmetropolitan character. The two exceptions are Currituck and Wake

Counties. Wake County includes the Raleigh metropolitan area, and Currituck County is part of the Norfolk-Virginia Beach metropolitan area. The 14 counties bordering the coast and sounds are overwhelmingly nonmetropolitan. In fact, in the four counties bordering the Atlantic Ocean the largest town, Morehead City, had a year-round population of 6,700 people in 1987. Importantly, the recreational population, when added to the year-round population, significantly increases the effective total population in the coastal and sound counties.

A combination of methodologies was used to estimate the year-round and the overnight recreational populations. The latter was estimated using a housing unit approach. The basic premise is that the residential population is equal to the number of occupied housing units multiplied by the average household size. Four types of housing units constitute the recreational infrastructure, i.e., private housing units, motel rooms, campsites, and marina boat slips. Data for each sector were gathered from a variety of sources, e.g., census housing data, electric utility data, motel, campground, and marina directories, and fieldwork using telephone interviews and on-site visits.

Trends in the year-round population can be briefly summarized. For the 33 county A/P Study area the population grew by 3.8 percent during the 1960s, 15.4 percent during the 1970s, and 11.2 percent during the 1980s. The last 30

years have shown a remarkable turnaround in individual population growth patterns for the year-round population. During the 1960s, 8 of 14 coastal/sound counties and 22 of 33 A/P Study counties lost population. The 1970s and 1980s reversed this trend. During the 1970s, all of the coastal/sound counties and 30 of 33 A/P Study counties gained population. The trend continued in the current decade as 13 of 14 coastal/sound counties and 31 of 33 A/P Study counties gained population.

Importantly, the growth rates tended to be highest in the coastline counties of Carteret, Currituck, and Dare. Among the sound counties, Craven County had the highest growth rates over the time period. Among the drainage basin counties, Wake, and its adjacent counties, had the highest growth rates over the 30 year period. Counties which lost population during the time period tended to be predominantly rural and isolated, depending to a large extent on agriculture.

Trends in the recreational population are more complex given the variety in the recreational infrastructure. As expected the coastal counties, particularly Carteret and Dare, had the largest recreational infrastructures. With the notable exception of campgrounds, all types of recreational housing grew over the time period. During the current decade the growth rate has been highest for motel rooms (45.5 percent) followed by private housing (29.6 percent) and marina boat slips

*Coming together is a beginning;*

(29.1 percent).

Among the coastal counties, growth in private housing, rentals and second homes, has clearly led the way during the 1980s. Carteret, Dare, and Hyde Counties have each posted gains of more than 70 percent in the number of seasonal housing units. The most noticeable change in private housing during the late 1970s and 1980s has been the development of large scale condominium projects. The three coastal counties also had significant gains in the number of motel rooms. While the number of motel rooms in Hyde County more than doubled, Carteret County posted a gain of 49.4 percent and Dare County posted a gain of 29.4 percent.

While private seasonal housing constituted the largest sector of recreational housing in the sound counties, marina activity has posted the highest growth rates. Beaufort, Craven, and Pamlico Counties have led marina growth during the 1980s. The number of boat slips grew by 56.8 percent in Craven County, followed by Beaufort County with a gain of 52.1 percent and Pamlico County with a gain of 45.0 percent. In fact, boat slips outnumbered motel rooms in all three counties.

By combining recreational housing data with information on occupancy rates and average household (party) size for each type of housing, we were able to estimate the overnight recreational population. The total recreational population for the A/P Study counties increased from 164,124 people in 1980 to 217,796 people in 1987, a gain of 32.7 percent. As expected, a majority of the estimated overnight population was concentrated in just 2 coastal counties, Carteret and Dare. In 1980, 53.1 percent of the total recreational population was concentrated in Carteret and Dare Counties. By 1987, this figure had increased to 60.6 percent.

The recreational population growth rates for individual counties paralleled the rates for the housing infrastructure. Significant gains were concentrated in the coastal and sound counties. Among the coastal counties, Carteret (56.8 percent), Dare (46.3 percent), and Hyde (92.6 percent) all had dramatic gains during the current decade. The gains in the recreational population in the sound counties were more modest, averaging less than 10 percent. The only exception was Pamlico County which grew by 41.3 percent. Pamlico's growth was due to gains in private seasonal units and marina activity.

Finally, we wanted to measure the population impact that the recreational population had on the year-round population. To do this we calculated a recreational ratio by dividing the total population (recreational + year-round) by the year-round population. If there were no recreational population then the ratio would be 1.00. As expected, the largest ratios occurred in 3 coastal counties (Carteret, Dare, and Hyde) and 1 sound county (Pamlico).

With an estimated total overnight

population of 84,573 people, Dare County had a recreational ratio of 4.23 in 1987. This means that during peak seasonal periods the total population was more than 4 times greater than the year-round population. Carteret County, with a total overnight population of 117,806 people, had a ratio of 2.33 in 1987. The peak seasonal population more than doubled the year-round population. Although Hyde County had a small year-round population, with an estimated peak overnight population of 12,467 people in 1987, its recreational ratio was 2.15.

Several conclusions can be drawn from the analysis. First, the A/P Study study area includes counties in striking contrast.

## Project Highlights

The following abstracts of funded projects, "Heavy Metal Pollutants in Organic-Rich Mud of the Pamlico River Estuarine System: Their Concentration Distribution and Effects Upon Benthic Environments and Water Quality" by Stanley Riggs, Paul Strout, Eric Powers, John Bray, Richard Moore and J. Craig Hamilton, and the "Albemarle-Pamlico Press Tour" by Todd Miller of the N.C. Coastal Federation, complete the series of abstracts corresponding to the six major categories of A/P Study research. Also included in this column is the balance of the evaluators' comments pertaining to the Human Environment, Water Quality and Public Participation components of our program. They are, as you may recall, the result of our first Annual Meeting held in October, 1988.

### Heavy Metal Pollutants in Organic-Rich Mud of the Pamlico River Estuarine System: Their Concentration, Distribution, and Effects Upon Benthic Environments and Water Quality

#### Principal Investigators:

Stanley Riggs, Paul Strout, Eric Powers  
John Bray, Richard Moore & J. Craig  
Hamilton  
East Carolina University  
Greenville, NC 27858

Discharge of apparently low concentrations of heavy metals from both natural and anthropogenic point and non-point sources into coastal waters does not rule out pollution problems in estuarine environments. High absorption capabilities of clay minerals and high chemical reactivity of organic matter, both major components of suspended and bottom sediments, continuously strip trace metals from the water column. The cumulative effect of large discharge volumes even with low concentrations over long time periods leads to metal enrichment. Storms, biological processes, and man routinely suspend the mud sediments into the water column. These processes concentrate the metals within bottom sediments to levels that exceed acceptable water level concentrations. The toxic metals are then potentially available for further concentration and movement through the food chain by abundant filter and detritus feeding organisms living within the organic-rich mud environments. The EPA list of pollutants of priority concern includes the following metals: arsenic, cadmium, chro-

The area includes some of the fastest growing counties in North Carolina and also other, isolated rural counties that are still losing population. Second, the coastal and sound counties are a site for continuing, dramatic recreational development, which includes growth in private housing, motels, and marine activity. Third, recreational development is clearly led by the construction of private seasonal housing units including condominium projects. Fourth, the most dramatic marina development is occurring in the sound counties, and fifth, development in the coastal counties is overwhelmingly concentrated on the barrier islands.

mium, copper, lead, mercury, nickel, and zinc. Our study concerns the concentrations of these, as well as 16 other metals in sediments from the Pamlico River Estuary. This will provide a basin-wide assessment of the extent of heavy metal pollution, a prerequisite essential for proper management and preservation of our estuarine resources.

Organic-rich muds were cored at 150 stations within the Pamlico River estuarine system reflecting a regional grid and known point and non-point sources within the basin. Each core (0.5 to 4.0 meters in length) has been subsampled at 10 to 30 cm intervals for subsequent chemical and physical analysis. Trace metal concentrations are being determined for 24 elements, including those on the EPA's list of priority pollutants. In addition, water content, particle size, and percent organic material are being measured. These data will be used to determine where heavy metals concentrate within the basin, as well as environmental conditions favoring heavy metal enrichment. Deeper cores are being used to determine pre-industrial and pre-agricultural conditions in N.C.

Results obtained to date indicate important spatial and temporal variability in heavy metal concentrations. Surface sediments have significantly higher concentrations (by factors of 3 to 6 times) of arsenic, cadmium, copper, lead, and zinc than sediments from deeper in the cores. Sediments from tributary creeks containing known point-source discharges, are enriched (from 5 to more than 30 times) in cadmium, chromium, copper, nickel and zinc compared to sediments from the main channel. These data suggest anthropogenic sources are partly responsible for metal enrichment throughout the estuary.

### Albemarle-Pamlico Press Tour

#### Principal Investigator:

Todd Miller  
N.C. Coastal Federation  
Newport, NC 28570

The North Carolina Coastal Federation in conjunction with Duke University Marine Laboratory organized a three day press tour last April. The bus trip began at Duke Marine Lab. Stops were made in Ocracoke, Buxton, Avon, Manteo, Engelhard, Lake Murrells, Swan Quarter Wildlife Refuge, farm fields between Swan Quarter and Washington, Washington,

*Keeping together is progress;*

Texasgulf, and forest managed by Weyerhaeuser. In addition, travel time on the bus was devoted to talks regarding on-going Albemarle-Pamlico Estuarine Study projects, including growth management and sea level rise, taxes, land ownership, water management, sea turtles, and surface ground-water hydrology.

There were three objectives of the tour:

- (1) Develop more indepth understanding about coastal issues among press members for their future reference when covering coastal stories;
- (2) Generate immediate publicity about the Albemarle-Pamlico Estuarine Study to help the public better understand what it is all about;
- (3) Provide a project that persons with a broad range of interests could come together to accomplish.

The tour succeeded on all three objectives. Regarding the first two objectives, just about every major newspaper in the state participated as well as the Washington Post. In addition, local papers covered portions of the tour that occurred in their communities. Television stations from Greensboro, Raleigh and Washington also participated. Many of the reporters are assigned to cover environmental stories, and they all indicated that the trip was worthwhile in developing a better understanding of coastal issues.

In regard to the third objective, the tour succeeded because of the cooperation and ability of a diverse group of people in working together. Every effort was made to present all sides of each issue examined. It took the involvement of fishermen, farmers, scientists, businessmen, industry representatives, and government officials to plan and conduct the tour. The tour provided one of the first opportunities ever for people with different interests to work together. This should be of value later when these interests are asked to do their part to implement the Comprehensive Conservation Management Plan slated for completion by the Albemarle-Pamlico Estuarine Study in November 1992.

Water Quality  
by: Doug Rader

#### Major Conclusions

1. Solid progress is being made in understanding water quality relationships in the A/P Study region.
2. Consensus high-priority areas from the work plan for the A/P Study being adequately addressed include:
  - a. trends in existing water quality data (underway, USGS)
  - b. detailed maps of point sources, with coordinates tied to effluent monitoring data (underway, LRIS)
  - c. completion of the modern soil survey in the region — critical to nonpoint source controls (DSWC/Hyde Co.)
  - d. flow analyses in the Neuse and Pamlico Rivers — critical to effective point-source control via waste-load allocation process, and identification of nonpoint target areas (initial work underway, USGS)
  - e. evaluations of cumulative impacts of land-use modification and BMP's to control them (USGS underway and NSCU)
  - f. function of wooded swamps in providing waste treatment (UNC)
  - g. potential for eutrophication in A/P Sounds (UNC)
  - h. surveys of toxic substances in A/P Study regions (sediments, ECU; in biota, FWS) (except organics in sediment, biota in open water)
    - i. survey of sedimentary patterns in A/P Study region (UNC)
3. Consensus high-priority areas from the work plan for the A/P Study that have **not** yet been adequately addressed include:
  - a. comprehensive land-use map (an absolute **must!**) NOTE: Being funded FY '89-90
  - b. development of adequate estuarine waste-load allocation models
  - c. development of nonpoint pollution models for analyses of cumulative impacts, allowing credible evaluations of potential management actions.
  - d. analysis of large-scale nutrient loadings in all sensitive/nutrient enriched tributaries, with specific recommendations for basinwide, multiple-source reductions for both N & P.
  - e. analysis of pulp mill effluent effects (toxics, long-term BOD, etc.)
  - f. analysis of alternative indicators of fecal contamination.
  - g. designs of optimal BMP packages for agriculture and forestry in different soils NOTE: This is being addressed through Early Implementation projects. Nothing is being done on forestry to date.
  - h. characterization of the relationships of anoxia to productivity in brackish waters.
    - i. great need to determine what the **baseline** water quality conditions are and where they are going — in the water column, in sediment, and in fish tissue. (Monitoring by DEM & USGS.)
    - j. need to determine the importance of **sediments** as pollutant sinks and as sources of bioavailable heavy metals. NOTE: Riggs' & Wells' work addresses this need.
    - k. need to determine the role and contribution of **wetlands** to water quality protection and how we can better protect them. NOTE: Drinson's & Kuenzler's & Roe's work are identifying these areas.
    - l. need to determine more precisely what **conditions** must prevail for an algae bloom to occur and the relative importance of **N** and **P** and **soluble** vs. **sediment-associated** nutrients to eutrophication potential. NOTE: Hans Pearl's work is addressing this.
4. A/P Study water quality efforts should move towards more clearly defined management objectives: improved waste load allocations, cumulative impact predictions for proposed land-use modifications, reducing pollutant loading from point and non-point sources, enhanced wetland protection, etc.
5. A/P Study should explore protecting adjacent and isolated wetlands immediately as waters of the US and NC where quality and uses are being lost by conversion.
6. A/P Study should evaluate the adequacy of resources devoted to existing waste discharge compliance and enforcement programs for all point-sources in control basin (schools, POTW, industries)
7. A/P Study should identify critical areas to nominate for Outstanding Coastal Resource Water status, and propose protection criteria for them. These areas should include wetlands.
8. A/P Study should anticipate the intensification of development of marinas and sound-side development by documenting heavy metal, organic, and nutrient pollution.
9. A/P Study should expand the citizens' monitoring efforts with the completion of the estuarine version of the "streamworld" manual as an integral part of its monitoring program. (NOTE: Being done currently).
10. The "status and trends" reports should be moved up to allow adequate time for management-action analysis. Sections should be developed as deliverables from existing projects where possible (e.g. water quality from USGS, fish trends from DMF, etc.)
11. Where well-documented implementation activities exist, Priority Action Plans should be prepared and carried out. Examples include: nonpoint pollution reductions (under 319, 205j) from EPA, Currituck water management, nutrient sensitive waters in the Pamlico River system, etc.
12. Liaison should be established more closely with legislative water quality committees, and with local government.
13. The workplan for the study should be evaluated to ensure that analysis needed for Comprehensive Conservation Management Plan production is completed in a timely fashion.

#### Public Participation by: Fran Flanigan

This evaluation contains comments and recommendations on the public participation projects funded by the A/P Study. I was pleased to have been invited to serve as an outside reviewer for the first annual meeting, and hope my comments are useful to you as you move into the third year of the program.

Before listing my comments, I have to say that the review process itself could have been improved. Specifically, reviewers should have been provided with more information than simply one page abstracts. There was no information provided on the costs of various projects, no guidelines as to what was expected out of the review process, nor did staff assure an opportunity for reviewers to meet with principal investigators to informally discuss the projects. I believe all of these things should be considered for next year's review process. Finally, I think you need to make it clear to the program committees how you expect review comments to be used in the process of planning the next steps of the program.

Following are my comments, based on the review session October 14, 1988 and the abstracts provided to me before the meeting:

1. The process of public review in order to evaluate, refine and modify program plans is very healthy. You should continue to do this on an annual basis.
2. The funded projects from last year in general appeared excellent. The public service announcements, media tour, citizen monitoring program and citizen handbook were excellent ideas and

*Working together is success*

appear to have been very well executed. However, I cannot discern an overall strategy into which these pieces fit. I don't see a connection between these contracted projects and the work of your staff, and I didn't get a sense that any project follow-up to provide needed continuity is planned (except for the monitoring project). NOTE: The A/P Study Public Involvement Plan is in final version and addresses this need.

3. There seems to be a lot of emphasis on outreach and education; equal attention needs to be paid to the process of generating citizen comment and incorporating it into the policy-making process.
4. A/P Study is fortunate to have two active committed Citizen Advisory Committees (CACs). Their input to policy decisions should be sought and viewed as legitimate and constructive. There may need to be some clarification of the CAC's role in the program. In my opinion, their top

priority is to provide you with thoughtful advice. They should not be viewed as the program's cheerleaders.

5. One of the most difficult parts of a resource management program is to **ask the right questions**. Special care needs to be devoted right now to the shaping of questions, so that when you get to the point of developing a comprehensive management plan—in another year or two—you have generated the appropriate information to answer your management questions.
6. The most important thing you are doing in the A/P Study is **building an institution**—a human institution—that can sustain the complex process of managing the Albemarle and Pamlico Sounds into the future. Give as much care to the institution-building as you are giving to the science.
7. This institution needs to be built on consensus. Participants in that consensus

must include scientists, managers, elected officials and citizens. You need to achieve consensus on problem definition as a basis for action. Keep in mind that the goal of the A/P Study is to produce a management plan that includes implementation strategies and schedules.

8. Constructing a management process that covers a big geographic area and cuts across the responsibilities of many agencies is an extraordinarily complex task. The A/P Study program is ambitious—it is attempting things that we as a society haven't done very well in the past. The process will be built and improved in small incremental steps, as long as participants keep an eye on the ultimate objective and are willing to work together. Don't give up. Recognize that a good beginning has been made, but that a great distance is yet to be traveled.
9. Learn from others. Estuaries around the country are dealing with similar prob-

### Albemarle-Pamlico Estuarine Study Publications List

No.	Abbreviated Title	Author/Editor	Status
86-01(I)	Existing Management Programs	Drower (UNC)	Available
87-01(P)	Source Document	Rader et al. (A/P Study)	Available
87-02(P)	Workplan	Rader et al. (A/P Study)	Draft Available
87-03(I)	Proceedings: Modeling Workshop	Stewart/Duffy (WTRR / SCI)	Available
87-04(I)	Proceedings: Remote Sensing Workshop	Stewart (WTRR)	Available
87-05(I)	Proceedings: Fish Disease Workshop	Stewart (WTRR)	Available
87-06(P)	Citizens' Monitoring Pilot	Lekson (PTRF)	Available
88-01/02(P)	Baseline Monitoring Network	Rader et al. (A/P Study)	Available
88-03(P)	Citizen's Guidebook	Kennedy (NC Coastal Federation)	Available
88-04(P)	Status Report, March 1988	Rader (A/P Study)	Available
88-05(P)	Beaufort County Magazine	Rader (A/P Study)	Available
88-06(I)	Water Quality/Hydrology Bibliography	Bales (USGS)	Available
88-07(I)	Red Tide Persistence	Tyler (Versar)	Draft Stage
88-08(P)	Project Abstracts for the Period 1987-89	Holman (A/P Study)	Available
88-09(I)	Turtle Excluder Device	Pearce/Sreer (Mariners' Marine/DMF)	Draft Stage
88-10(I)	Submerged Aquatic Vegetation (Eastern)	Ferguson (NOAA)	Draft Due
88-11(P)	Can Albemarle and Pamlico Be Saved?	Taylor (Wildlife of NC)	Available
88-12(I)	Obstructions to Anadromous Fish Migration	Collier (USFWS)	Draft Due
88-13(I)	Value of Recreational Fishing A/P Estuaries	K. Smith (NCSU)	Draft Available
88-14(I)	Analysis of Fringe Wetlands in A/P Sounds	Drinson (ECU)	Draft Available

Reprints of the above listed publications can be had by contacting Joan Giordano, Public Involvement Coordinator, A/P Study, P.O. BOX 1507, Washington, N.C. 27889. A limited number of copies is available.

(I) Information Acquisition Documents

(P) Public Participation or Program Documents

lems and in some cases have made scientific and institutional advances that could be illuminating for the A/P Study. Shared knowledge and experience can speed up the process and avoid mistakes that others have perhaps already made.

10. Seize the opportunity to make the tough decisions and to craft new ways of doing business in the Albemarle and Pamlico Sounds. Strong public support will enable you to do this and you clearly have the beginning of that support, waiting to be marshaled.

### Human Environment

by Ray Durby

The ultimate goal of the Albemarle-Pamlico Estuarine Study is the development of a Comprehensive Conservation and Management Plan for the region. Management, of course, involves people; people are the targets of management efforts, since people (and their businesses and other institutions) are the causes of estuarine problems, and people will be beneficiaries and will pay the costs of management actions.

Thus it is important we realize now, rather than later, that estuarine management means, "people management." To manage people effectively and efficiently, we believe answers to four critical questions are needed. Those questions and the status of A/P Study research to answer them follow:

#### 1. Who is using the Albemarle-Pamlico Estuarine System—what benefits are they receiving and what problems are they causing?

People are the beneficiaries of the estuarine system and, because management will impose costs on people and their governments, we need to be certain that benefits will exceed those private and public costs. Research by V. Kerry Smith and his associates is measuring benefits to sports fishermen from good water quality (and those benefits appear to be substantial). Benefits from other uses of the estuarine environment, however, have yet to be measured, as do the public and private costs of effective management.

People, of course, are also the cause of estuarine problems—they pollute the water, they overfish the finfish resource and so forth. A/P Study-sponsored research by Tschetter is estimating the increase in people (and those are substantial) who are permanent and transient occupants of the A/P Study counties. That is a start, since more people equal more pollution, but as important as overall number, is where people are locating and how wastes associated with them are being disposed. This we do not know very well. Research by a number of other investigators is exploring how the environment is responding to peoples' activities, such as sewage treatment, plant discharges, and drainage from farm fields, and that too, may provide clues as to how to manage people to improve environmental quality.

#### 2. Why do people (and their institutions) behave in ways which damage the estuarine system? Are they ignorant of the effects of their actions? Malicious? Responding to a reward structure that does not recognize environmental damage? Have regulatory enforcement mechanisms failed to perform adequately?

No A/P Study research is addressing those questions, but the answers are important, since they will suggest how the A/P Study management program should be structured (i.e., they will indicate the extent to which management should emphasize education, regulation, or the provision of new incentives).

#### 3. What management measures should be used to induce or require changes in peoples' and governments' behavior, so that it contributes to, or ceases to detract, from environment quality?

The A/P Study also has yet to substantially assess management tools (various organizational, regulatory, educational, etc. measures) to determine whether they will work (change behavior as desired) and whether they are efficient (produce more benefits than they cost governments and the private sector) and feasible (politically acceptable). One project, Clark's pilot study of the feasibility of planning for and regulating the use of public trust waters is underway. That is a start, but in our opinion, management research needs to be given higher priority.

#### 4. How well are existing regulations and other management programs administered by the State of North Carolina and local governments performing to protect environmental quality? Is coverage adequate? Is enforcement adequate? Are they effective?


An extensive state land and environmental management program is already in place. The A/P Study does not need to (in fact cannot) develop a management system from scratch. But we need to know why the current system is not working (if it was working, we wouldn't need the A/P Study program). Research by Nichols is examining

whether existing programs are designed well (in terms of criteria drawn from policy science literature), but it is vastly underfunded and is not looking at whether programs on the books are actually complying with those programs' various regulations. Until we know how well existing regulations and policies are working, it will be difficult to devise a better system. (Environmental data seem to be indicating that the management system as a whole is failing; we need to know, however, program by program what is going wrong and why).

In summary, we believe people (users, abusers, and managers) need to move from the bottom to the top of the list of A/P Study priorities. We need (1) clear management goals and objectives; (2) analyses of how people, firms and governments are likely to respond to various educational programs, incentives, and regulations; (3) analyses of the benefits and costs of various new management alternatives and improvements to existing measures; and (4) careful measurements and review of citizens' attitudes toward management alternatives and their willingness to pay for a quality environment.

The Albemarle-Pamlico Estuarine Study (A/P Study) wishes to thank the external evaluators for their constructive comments and their input during the Annual Review. The general consensus among the evaluators is that the A/P Study is off to a strong start and that some mid-course correction may be indicated in certain areas. The process of self-evaluation, aided by concerned and dedicated citizens, is a healthy and beneficial exercise which will yield positive results, particularly when the Comprehensive Conservation Management Plan is being drawn and implemented. We on staff have profited from the meeting process and are delighted to see the program progress to a new level.



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