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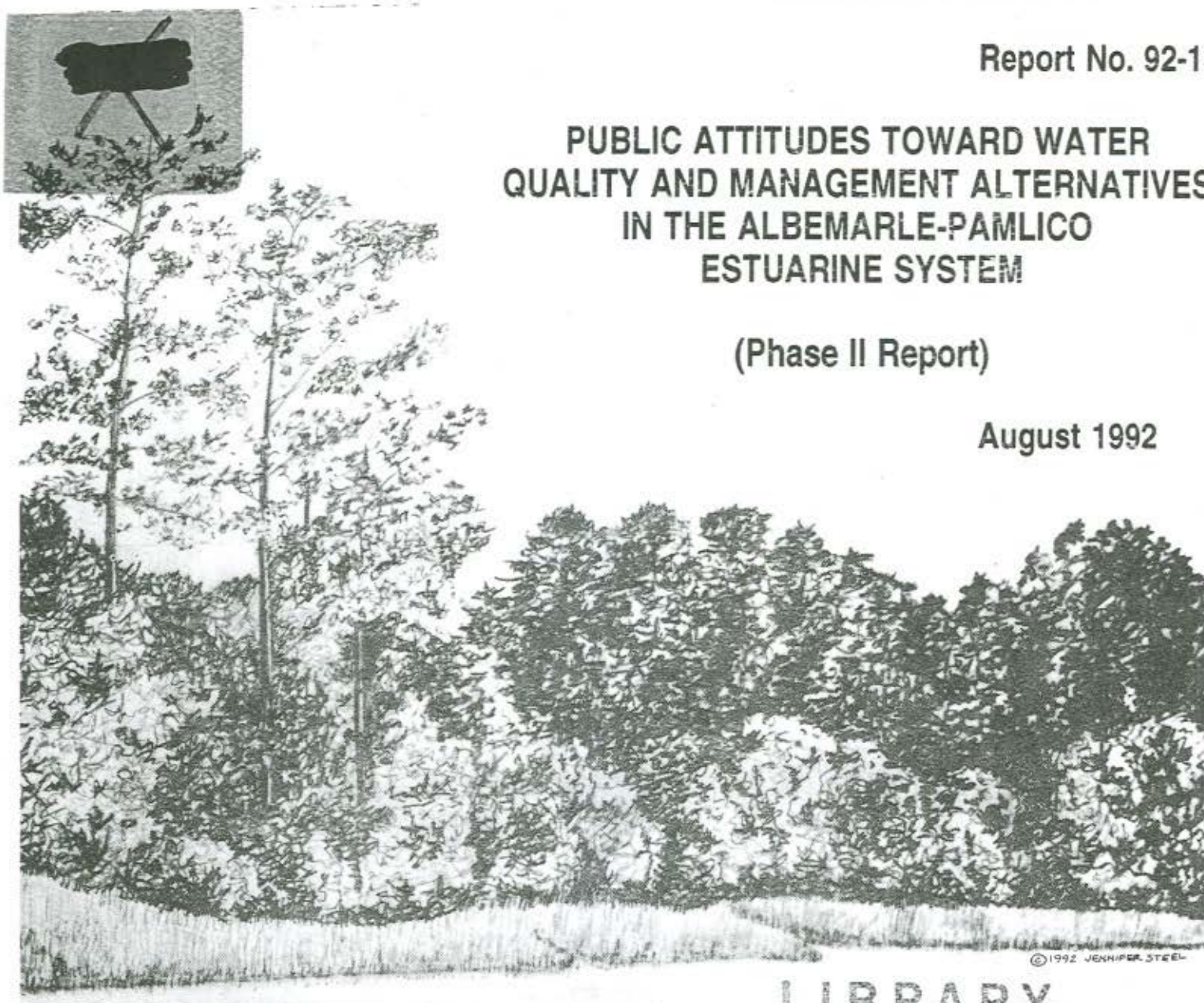
PUBLIC ATTITUDES TOWARD WATER QUALITY AND MANAGEMENT ALTERNATIVES IN THE ALBEMARLE-PAMLICO ESTUARINE SYSTEM

(Phase II Report)

August 1992



ALBEMARLE-PAMLICO ESTUARINE STUDY

NC Department of Environment, Health, and Natural Resources

Environmental Protection Agency National Estuary Program

PUBLIC ATTITUDES TOWARD WATER QUALITY AND MANAGEMENT ALTERNATIVES IN THE ALBEMARLE-PAMLICO ESTUARINE SYSTEM

(PHASE II REPORT)

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EXECUTIVE SUMMARY

The purpose of this study was to evaluate peoples' knowledge and attitudes about natural resources in the Albemarle-Pamlico Estuarine (A/P) system and management alternatives designed to protect these resources. Information in this report was collected through a scientific telephone survey of 1,133 people selected at random from across the entire state of North Carolina, as well as the Virginia portion of the A/P Study area. A mail survey was also completed by a sample of 662 public officials at the town, county and state levels from across North Carolina. Support of these groups is critical to accomplishing the ultimate goals of effective management.

An important focus of this research was to determine the attitudes of the general public and public officials regarding alternative management strategies to protect the natural and human resources in the A/P system. With the assistance of an advisory committee, fifteen different management alternatives were identified that cover the range of possible actions that could be taken. Attitudes about the roles of various interest groups in managing the A/P system were assessed. A determination was made of an individual's own willingness to pay for water quality protection, through a variety of alternative payment mechanisms. The general types of behavioral changes individuals would be willing to make were identified. Finally, attitudes were assessed about what public policy changes should be made to manage the A/P system. The following are some of the major findings of this study:

- Both public officials and the general public expressed only moderate awareness about the resources and problems of the A/P system. Proactive and strategic educational programs are needed to increase awareness and understanding.

- Almost all respondents placed high value on the resources of the A/P system. In fact, non-economic values were seen as more important than economic values, especially for the general public. This implies that educational efforts must focus on economic and noneconomic benefits and costs.

- Respondents expressed considerable concern over water pollution problems. However, respondents expressed more concern about water pollution for the whole state or local areas than for the A/P system. Concerns were even greater for the loss of fish and wildlife habitat in the A/P system than for water pollution, especially among the general public. This suggests the need to stress the importance of the A/P system for the entire state.

- Responses to the questions about the causes of pollution problems in the A/P system indicate considerable confusion and a general lack of knowledge. Both groups tend to see point sources as much more serious than nonpoint sources. This is counter to the technical data available for the A/P system.

- Respondents from both groups were likely to believe government is doing too little to control water pollution from all sources. Overall, respondents saw the need for much greater enforcement of existing water quality regulations. Public officials reported a great need for improving coordination among the various agencies and groups involved with managing the A/P system.

- Results show considerable support for a wide range of alternative strategies for managing water quality and natural resources in the A/P system. In particular, nearly all respondents support research, monitoring and education programs aimed at improving understanding of the A/P system.

- Enforcement and expansion of existing regulations, especially those dealing with point source pollution, were among the most highly supported alternatives, even if this means higher personal and social costs. Respondents also supported stronger regulations on septic tanks and tougher enforcement of existing development laws.

- Given the low recognition of nonpoint source pollution problems, the alternatives for controlling agricultural pollution received less support than those related to point sources. Cost sharing was more popular than tougher regulations. Strategies for managing the impacts of fishing practices on the A/P system were also relatively low in terms of overall support. However, a majority still favored even the least popular alternatives.

- Results of the contingent valuation analysis indicate a considerable willingness to pay for new or improved programs for managing the A/P system. Even with the relatively conservative estimates of this research, the overall support levels ($29 million) should help fund new and existing management efforts.

- Certain payment mechanisms will be more acceptable than others for both the general public and public officials. Most people feel that groups who benefit from and/or degrade the natural resources of the A/P system should pay a greater share of the costs for protecting the system. In general, strong support was found for: higher pollution fines, raising fees charged to sportsmen and users of various public facilities, raising building permit fees, and higher water/sewer rates. The only form of tax that appears acceptable involves raising luxury taxes. Relatively little support was found for raising sales taxes, property taxes, or income taxes.

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INTRODUCTION

Most problems facing the Albemarle-Pamlico Estuarine (A/P) system arise directly or indirectly from human activity. Many different human activities interact directly with the A/P system. Many of these activities (e.g., agriculture, commercial forestry, waste disposal, residential and commercial development, mining and industrial development, and national defense) **affect** water quality and the natural resources. Other activities (e.g., commercial fishing, sports fishing, recreation and tourism, and wildlife habitat) are adversely **affected by** degraded water quality. Pressures on the system from these activities will continue to increase as a result of future population growth and economic development.

Technical solutions to many land use and water quality problems affecting the A/P system are available, but obstacles exist to their implementation. For example, many obstacles tend to be institutional or human-related (i.e., socio-economic). The public may have little understanding of or appreciation for the complexity of most water quality problems and land use issues. This is particularly true for nonpoint source water pollution, where numerous, unrelated land use decisions can have significant adverse impacts on the Albemarle-Pamlico Estuarine system. Also public policies and institutions may not always be effective, efficient, and equitable in their attempts to manage natural resources.

Increased public awareness and positive public attitudes will be necessary to improve water quality and protect habitat, because citizens must be willing to support and pay for management programs. Resource managers and political leaders need to understand the attitudes of a broad, representative sample of the public, including those citizens who have not been involved in the Albemarle-Pamlico Estuarine Study's public meetings or citizen's advisory committees. Successful resource management will require strong support from different segments of the public, including elected and appointed public officials. Such support will best be achieved by understanding public attitudes and knowledge.

This study uses a combination of social science research methods to analyze a wide range of attitudes and beliefs regarding the natural resources of the A/P system. The information in this report was collected in a scientific telephone survey of 1,133 people selected at random from across the entire state of North Carolina, as well as the Virginia portion of the A/P Study area. We also present results of a mail survey that was completed by a sample of 662 public officials from across North Carolina. The support of each group is critical to accomplishing the ultimate goals of effective management.

This work should enhance the understanding and appreciation of the complex nature of public attitudes by resource managers, political leaders, and concerned citizens. In addition, this work should help build support for the goals of the A/P Study by identifying educational needs. Survey research can also provide a credible means

to ensure involvement in resource decision making by citizens who would not normally become directly involved. Results of this project should facilitate development and implementation of the Comprehensive Conservation Management Plan.

Phase I examined basic attitudes and knowledge about the Albemarle-Pamlico Estuarine system held by the general public in the A/P study area. Public attitudes about the importance of the A/P system resources were evaluated. We determined respondents' uses of the water resources and fisheries of the Albemarle-Pamlico Estuarine system for recreation. Questions also examined how the public feels about conflicting uses of the Albemarle-Pamlico Estuarine system for specific purposes (e.g., recreation vs. development). Awareness and recognition of water quality problems were assessed. We determined the extent of concerns related to different water resources. We assessed respondents' attitudes regarding the causes of water quality problems. They were asked to rate the relative severity of different pollution sources (e.g., agriculture, industry, municipal waste treatment, and septic systems). We also determined how well the public understands and appreciates the consequences of water quality problems. The first year survey also included an assessment of respondents' awareness and knowledge, including public awareness of the Albemarle-Pamlico Estuarine Study and other government programs. Finally, we analyzed respondents' use and evaluation of different information sources.

Phase II of this project (reported here) extends the first year's work to determine how the resources of the A/P system should best be managed. We asked about a wide range of alternative strategies for controlling the problems that have been identified. An important focus in Phase II was to determine the attitudes of the general public and public officials regarding support for alternative management strategies to protect the natural and human resources in the A/P system. During the second phase, we worked with our advisory committee to develop fifteen different management alternatives that cover the range of possible actions that could be taken. We also determined attitudes about the roles of various interest groups in managing the A/P system. Along with evaluation of these specific management alternatives, these results also assessed individual's own willingness to pay for water quality protection, through a variety of alternative payment mechanisms. We assessed the general types of behavioral changes individuals would be willing to make. Finally, we determined attitudes about what public policy changes should be made to manage the Albemarle-Pamlico Estuarine system.

The final report for Phase I contained a review of related literature from other Estuary projects and related research studies. It also presented our general theoretical orientation. For brevity, we will not repeat that information here. The interested reader can consult the Phase I final report available from the Albemarle Pamlico Estuarine Study ("Public Attitudes Toward Water Quality and Management Alternatives in the A/P System: Phase I Report II).

PROJECT PROCEDURES

Purpose and Objectives

The specific purpose of this project has been to evaluate peoples' knowledge and attitudes about natural resources in the Albemarle-Pamlico Estuarine system and management alternatives designed to protect these resources. This work accomplishes the following specific objectives in two phases.

Objectives for Phase I

1. Evaluate public understanding of the causes, severity, and consequences of water quality problems in the Albemarle-Pamlico Estuarine system.

2. Provide scientifically valid description and comparison of the attitudes of different segments of the public about the importance of the Albemarle-Pamlico resources.

3. Analyze the nature and extent of consensus and differences among groups of affecting and affected users of the Albemarle-Pamlico Estuarine system.

Objectives for Phase II

4. Provide scientifically valid description and comparison of the attitudes of different segments of the general public and public officials about the causes, consequences, and severity of resource management problems.

5. Determine the relative importance of different values of the A/P system and assess willingness to pay for water quality and habitat protection.

6. Analyze levels of support or opposition for a variety of alternative management strategies and payment mechanisms.

Questionnaire Development

We initially established a 25 member advisory committee to help us plan and conduct our project. During the course of the project, this committee grew to include almost 40 people. The committee included university scientists, agency personnel, industry officials, environmentalists and citizen representatives. During Phase I, our committee provided valuable advice on the selection of respondents and design of the questionnaire for our in-person interviews. The committee nominated individuals for

our in-person interviews from several different groups: agriculture, forestry, commercial fishing, recreational interests, industry, development, environmental groups, and local government. We also asked the committee for nominations of resource managers and scientists.

With help from our advisory committee we developed an in-person interview survey instrument that provided considerable background information useful in designing the telephone surveys for both Phase I and Phase II. We asked questions on a number of different topics, including: nature and causes of problems and issues; evaluation of current and future management strategies; barriers to water quality improvement; influence of different groups, levels of government, and the public; nature of public attitudes; educational strategies and approaches; and evaluation of the A/P study. The interviews were completed by March of 1990. Tapes from completed interviews were transcribed and the responses were analyzed. These results were summarized in the Phase I report.

We conducted an extensive literature review of other surveys related to environmental attitudes. This effort included written contact with over 150 social scientists from around the country. We also wrote the coordinators of all the other estuary programs. We compiled and organized all survey questions that could possibly be used in our telephone and mail interviews. Based on these reviews and information from the in-person interviews, we drafted the telephone and mail survey instruments. We sent our advisory committee several drafts of each survey for review. Meetings were held to review and finalize the survey instruments. The committee also made recommendations regarding the sample design and other matters.

Sample Design for Telephone Survey

Given the study's objectives, the research design employed was cross-sectional utilizing a random sample of households with telephones. For Phase II, the universe for the survey was defined as the 100 counties in North Carolina and the 16 counties/independent cities in Virginia within the watershed of the Albemarle-Pamlico Estuarine system. Because we were interested in both subarea variations and the region as whole, it was necessary to design a sampling strategy that would permit us to examine both. This required a compromise. On the one hand, drawing a random sample from the entire area would result in only a small number of interviews being conducted with respondents from coastal counties, while the majority of interviews would be conducted with people from the more populous parts of the area (e.g., Wake County). In this case, the lowest standard errors of estimation would be achieved for the entire area when the sample is distributed in proportion to the distribution in the population. On the other hand, we could have selected cases from each subarea equally. That would produce the lowest standard error of estimation for subarea differences. Therefore, we selected an option that allows us to generalize to the

region as a whole, minimizes obtainable standard errors, and assures enough cases in each subarea to make meaningful comparisons.

The sampling design was based on advice from a statistical consultant and our advisory committee. We chose to use a disproportionate stratified random sample. The counties making up the universe were stratified into five areas: Mountain, Piedmont, Coastal Plain, Tidewater, and Virginia. The areas within North Carolina are standard geographic regions and have been used extensively in research by the authors, as well as others. The counties included within each are presented in Table 1. The number of cases for each subarea was generated using the formula: N_h^2, which is the proportionality factor applied to the number of residents in each subarea. The 1990 population and proportionality factors for the regions are:

	Population	Proportionality Factor
Mountain	948,178	3.94
Piedmont	3,623,181	5.15
Coastal Plain	1,389,177	4.25
Tidewater	668,101	3.67
Virginia	814,047	3.82
Total	7,442,684	20.83

A total sample size of 1,100 was determined to be sufficient to represent this universe, based on the availability of funds. Multiplying the sample size (1,100) by the proportionality factor of each subarea and dividing by the total proportionality factor (20.83) results in the anticipated number of cases: 208 for the Mountain, 272 for the Piedmont, 224 for the Coastal Plain, 194 for the Tidewater and 202 for Virginia. Since a disproportionate stratified random sampling technique was employed to generate the sample, it was necessary to adjust the results for the region as a whole. By applying weights to the data, we were able to generalize to the entire area.

Table 1. North Carolina and Virginia Study Area Counties by Region

MOUNTAIN

Alleghany	Caldwell	Henderson	Mitchell	Transylvania
Ashe	Cherokee	Jackson	Polk	Watauga
Avery	Clay	Macon	Rutherford	Wilkes
Buncombe	Graham	Madison	Surry	Yadkin
Burke	Haywood	McDowell	Swain	Yancey

PIEDMONT

Alamance	Cleveland	Granville	Moore	Stanly
Alexander	Davidson	Guilford	Orange	Stokes
Anson	Davie	Iredell	Person	Union
Cabarrus	Durham	Lee	Randolph	Vance
Caswell	Forsyth	Lincoln	Richmond	Wake
Catawba	Franklin	Mecklenburg	Rockingham	Warren
Chatham	Gaston	Montgomery	Rowan	

COASTAL PLAIN

Bertie	Edgecombe	Hertford	Nash	Scotland
Bladen	Gates	Hoke	Northampton	Wayne
Columbus	Greene	Johnston	Pitt	Wilson
Cumberland	Halifax	Lenoir	Robeson	
Duplin	Harnett	Martin	Sampson	

TIDEWATER

Beaufort	Chowan	Hyde	Pamlico	Tyrrell
Brunswick	Craven	Jones	Pasquotank	Washington
Camden	Currituck	New Hanover	Pender	
Carteret	Dare	Onslow	Perquimans	

VIRGINIA

Virginia Beach	Isle of Wright	Dinwiddle	Prince Edward	Prince George
Chesapeake City	Surry	Mecklenburg	Charlotte	Greenville
City of Suffolk	Sussex	Nottoway	Southampton	Brunswick
				Lunenburg

Sampling weights (raising factors) were generated by dividing the actual number of cases for each subarea in the sample into the total population for each subarea:

	Population		Number		Weight Factor
Mountain	948,178	/	211	=	4494
Piedmont	3,623,181	/	279	=	12,986
Coastal Plain	1,389,177	/	236	=	5,886
Tidewater	668,101	/	199	=	3,357
Virginia	814,047	/	208	=	3,914

Dividing these numbers by 6,569 (the number of persons each case in the sample represents of the total population), yields the weights applied in the statistical analysis for the region as a whole. Throughout this report, the analysis for the entire study area was based on weighted data using the following weights:

	Weight Factor		Number		Weight
Mountain	4,494	/	6,569	=	.684
Piedmont	12,986	/	6,569	=	1.977
Coastal Plain	5,886	/	6,569	=	.896
Tidewater	3,357	/	6,569	=	.511
Virginia	3,914	/	6,569	=	.596

Phone numbers for the sample were selected using a random digit dialing technique. This ensures that all households with phones had an equal opportunity of being included in the sample. A professional sampling firm (Survey Sampling, Inc.), generated the random list of telephone numbers for each of the subareas. Each county is represented in proportion to the total for the subarea in which it falls. Three digit prefix numbers were identified for each area and the remaining four numbers were produced randomly. The numbers were then screened to remove businesses and those not in service.

A total of 1,133 interviews were completed: 211 in the Mountain, 279 in the Piedmont, 236 in the Coastal Plain, 199 in the Tidewater, and 208 in Virginia. Interviews averaged 24 minutes in length. Repeated efforts were made to contact households to assure a representative sample. A minimum of twelve attempts were

made before a number was eliminated from consideration. Attrition typically took the form of refusals or termination before interview completion. An overall completion rate of 70.5 percent was obtained by dividing the number completed by the total number contacted (completed, terminated, and refused). The disposition by status for the total sample was:

Status	Frequency	Percent
Refused	471	29.3
Terminated	4	0.2
Completed	1,133	70.5
TOTAL	1,608	100.0

The interviews were conducted by the Center for Urban Affairs and Community Service of NCSU. The Center employs a cadre of interviewers who were extensively trained prior to conducting the interviews for this study. A copy of the final telephone survey instrument has been included in Appendix A. The cover sheet which was used to maintain a record of the status of each interview was also included. Ten percent of each interviewers' completed surveys were systematically selected for verification.

Sample Design for Mail Questionnaire

A cross-sectional design using a combination of purposive and random sampling techniques was used to gather information on North Carolina public officials. The specific groups of public officials to be interviewed were determined in consultation with our advisory committee and a statistical consultant. We decided to interview public officials at the town, county, and state levels within North Carolina.

A list of almost 2500 city council members, aldermen and commissioners was obtained from the North Carolina League of Municipalities. A systematic random sample of every tenth official was selected from this list for a total of 244 potential respondents. We also randomly selected one third of the towns or cities. For those selected, a questionnaire was sent to the city/town manager (if available) or mayors of those towns or cities without a manager or administrator. This represented 172 potential respondents resulting in a total of 416 at the town level.

A similar list of county level officials was obtained from the North Carolina Association of County Commissioners. A one in three systematic random sample of county commissioners was selected resulting in a total of 178 receiving the questionnaire. All available county managers were included in the universe as

potential respondents. The total number of potential respondents at the county level was 279.

At the state level, a number of different agencies and groups were identified as important for program development and policy formation concerning the A/P system. Questionnaires were sent to all members of the state legislature, Executive Department Secretaries, the Council of State, and the Governor. Administrative representatives and program managers from various government departments having responsibility for water quality, natural resources, wildlife and related areas were also identified and sent questionnaires. All members of the Environmental Management Commission, Coastal Resources Commission, Wildlife Management Commission, the Marine Fisheries Commission, and the Soil and Water Conservation Commission received the questionnaire. In addition, questionnaires were sent to N.C. Cooperative Extension District Directors, Soil and Water Conservation Area Conservationists and Regional Coordinators, and the Executive Directors of the Regional Councils of Government. In all, a total of 339 questionnaires were sent to state level respondents.

The processing of the mailed questionnaire was handled by the Center for Urban Affairs and Community Service of NCSU. Tracking of each questionnaire was made possible by use of an ID number applied to each questionnaire. A total of three contacts were made to ensure a high rate of return: the first mailing of the questionnaire included a personalized letter from the Secretary of the Department of Environment, Health and Natural Resources; the second mailing was a postcard reminder; and, the third mailing included a personalized letter from the researchers and a second copy of the questionnaire. This approach represents standard practice in mail questionnaire designs.

A total of 1034 questionnaires were mailed and 662 were returned, representing a 64 percent completion rate. This represents a very acceptable rate of return for a mail survey. The overall sample disposition was as follows:

Level of Government	Number Returned	Number Mailed	Rate of Return
County	169	279	60.6%
Town	275	416	66.1%
State	218	339	64.3%
TOTAL	662	1034	64.0%

Measurement and Analysis of Survey Data

In an effort to limit the length of this report, copies of the complete telephone and mail questionnaires are included in Appendices A and B. This should provide interested readers with information on how each variable is measured. Once the surveys were completed, they were checked for accuracy and keyed to computer disk. Each record was 100 percent verified. Many of the variables were recoded. In most cases, "don't know" responses were treated as missing. A codebook was developed and is available from the authors. Basic analysis was performed using standard statistical programs on both a mainframe computer and microcomputer.

Data presented in this report were analyzed, for the most part, using descriptive statistical measures, (e.g., the arithmetical mean and percentage distributions). To measure and assess the relative importance of differences between public officials and the general public Chi-square statistics were computed (details available from the authors). The results of multivariate analysis were based on regression statistics which are presented in Appendix C of this report. That appendix also contains a general discussion of the interpretation of such statistical measures and measurement of variables included in the model.

SURVEY RESULTS

In this section we present the results of the telephone survey conducted with the general public and the mail survey of public officials. The results are presented in four main sections. First, we discuss the sample characteristics. Second, we describe the general responses to the questions on the survey. This includes descriptive statistics, as well as comparisons of the similarities and differences between the general public and the public officials. Third, we assess the factors that are related to support for each of the alternative management strategies and payment mechanisms. Finally, we discuss the survey results related to willingness to pay for water quality and habitat protection in the A/P system.

Sample Characteristics

As shown in Table 2, the general public sample conforms to expectations with regard to the distribution within the subareas. About 25 percent of the sample was located in the Piedmont region, 19 percent in the Mountain region, 18 percent in the Tidewater, 21 percent in the Coastal Plain and 18 percent in Virginia. The distribution of the sample by residence shows that 37 percent of the sample lived in rural areas, 21 percent lived in small towns, 18 percent lived in suburbs, and the balance (24 percent) lived in cities. For the sample of public officials, the distribution conforms to expectations with 42 percent coming from towns, 26 percent from counties and 33 percent from the state level (Table 3).

Other demographic characteristics of interest include gender, race and age. About 52 percent of the general public sample was female and 48 percent male. This represents the proportions in the population. Interviewers were instructed to select respondents to obtain a balance of men and women. For the sample of public officials, 86 percent were male and 14 percent were female. This distribution, reflects labor market variations. In the case of race, 82 percent of the general public sample was white and 18 percent was black and other races. Over 90 percent of the sample of public officials was white, with the remainder reporting black and other races. Just under one-fifth of the general public sample was less than 30 years of age and nearly 10 percent was 70 years of age and over. The ten year age categories between these two extremes ranged from 14 percent of the sample in each of the categories aged 50-59 and 60-69 to 24 percent aged 30-39. The sample of public officials, as expected, had more respondents between the ages of 40 to 69 (75 percent) and relatively small numbers under 40 years of age (16 percent).

Table 2. Sample Characteristics of General Public

Regional Distribution	
Mountains	19%
Piedmont	24%
Tidewater	18%
Coastal Plain	21%
Virginia	18%
Area of Residence	
Rural Area	37%
Small Town	21%
Suburb	18%
City	24%
Gender	
Male	48%
Female	52%
Race	
White	82%
Other	18%
Age	
Under 30	17%
30-39	24%
40-49	23%
50-59	14%
60-69	14%
70 and Over	8%

Education	
Eight Years or Less	5%
9th through 11th	9%
High School	33%
Some College	15%
Associate Degree	8%
Bachelor's Degree	20%
Some Graduate Work	2%
Graduate Degree	8%
Household Income	
Under $5,000	4%
5,001 to 10,000	5%
10,001 to 20,000	17%
20,001 to 30,000	22%
30,001 to 40,000	17%
40,001 to 50,000	14%
50,001 to 60,000	8%
60,001 to 80,000	6%
80,001 to 100,000	4%
Over 100,000	3%

Table 3. Sample Characteristics of Public Officials

Level of Government	
Town	42%
County	26%
State	33%
Gender	
Male	86%
Female	14%
Race	
White	93%
Other	7%
Age	
Under 30	3%
30-39	13%
40-49	27%
50-59	26%
60-69	22%
70 and Over	9%
Education	
Eight Years or Less	1%
9th through 11th	1%
High School	18%
Some College	10%
Associate Degree	2%
Bachelor's Degree	31%
Some Graduate Work	7%
Graduate Degree	30%

Variations in environmental attitudes and knowledge about environmental quality have also been found to be associated with other socioeconomic characteristics such as education and income. The respondents were asked to report their highest grade in school completed. Table 2 shows that five percent of the general public sample had finished eight years or less, 33 percent had graduated from high school, 20 percent graduated from college and 10 percent had taken some graduate work or held a graduate degree. In contrast, only one percent of the public officials had finished eight years or less, 17 percent had completed high school, 30 percent graduated from college, and over 37 percent had taken some graduate work or held a graduate degree (Table 3). Clearly, the public officials had received more formal education than the general public. The distribution of family income for the general public sample tends to approximate a normal distribution. Around four percent of the sample had family incomes under $5,000 and about three percent had incomes over $100,000. Each of the three categories from $10,000 to $40,000 contained close to one-fifth of the sample.

Descriptive Survey Results and Group Comparisons

In this section we present the key findings from the telephone and mail surveys. For both surveys, our approach is to describe the general pattern of results for each question or set of questions. We then assess the extent to which there are statistically significant differences between the general public and the public officials. In that case we have used the chi-square statistic to assess the statistical significance of any observed differences. If the chi-square is statistically significant (at a probability level of at least .05) then we can conclude that the differences are real and did not occur by chance. The actual chi-square statistics are not reported, but are available from the authors.

We have grouped the results into several main sections: awareness and information; environmental beliefs and behaviors; perception of problems; support for management alternatives and payment mechanisms; and public policy development and program implementation. In almost all cases, the results are portrayed graphically. Question wording is generally provided within the context of the discussion. A complete copy of both surveys are included as Appendices A and B. In most cases we are comparing results from the Phase II (1991) telephone survey of the general public with results from the Phase II (1991) mail survey of public officials. In some other cases, we compare the results from the Phase I (1990) telephone survey of the general public with the results from the Phase II (1991) mail survey of public officials. For one set of questions (related to environmental beliefs) we are able to include results from both Phase II surveys and the Phase I telephone survey. We have clearly indicated which survey(s) included each of the questions.

Awareness and Information

We wanted to determine the overall level of awareness respondents had about the A/P system. The general public (1991) and public officials were asked "In general, how much have you heard or read about the resources, uses, and problems of the A/P system, Would you say a lot, some, a little, or nothing?" Figure 1 indicates that over 40 percent of general public and over half of the public officials had heard or read either a lot or some about the A/P system. Almost one quarter of the general public claimed to have no awareness of the A/P system. In general, awareness was significantly higher among the public officials than the general public.

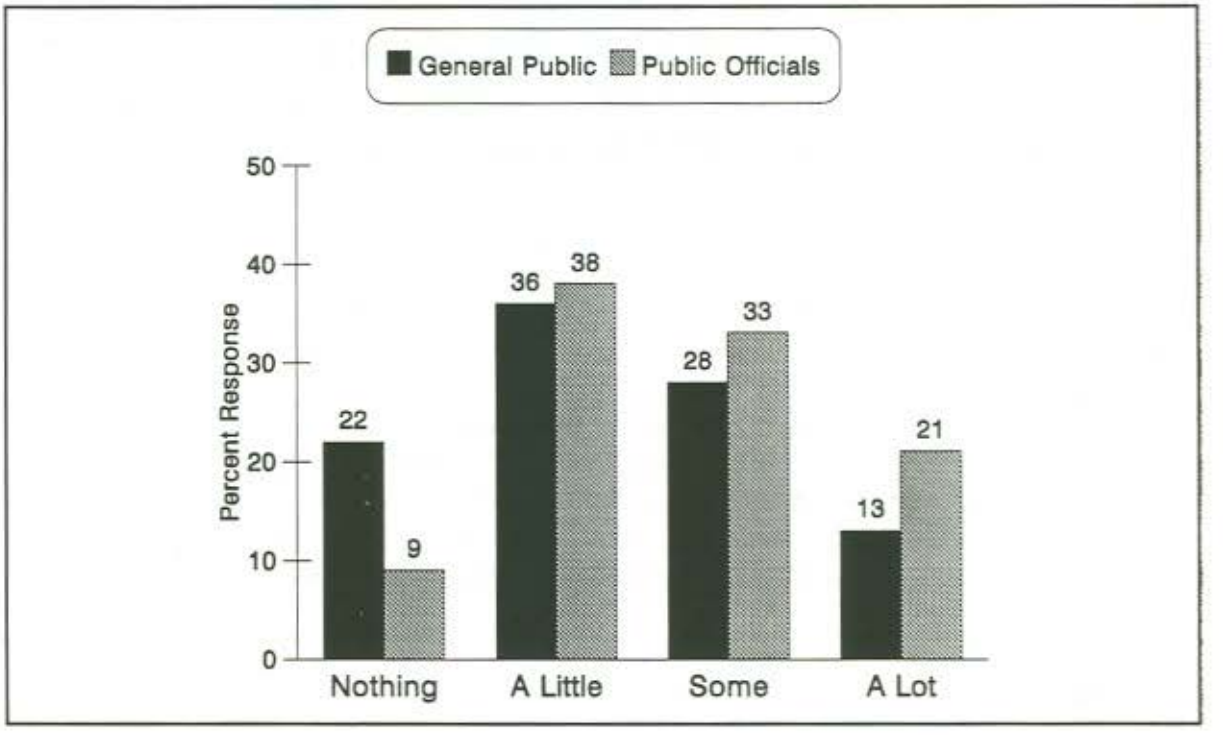

Figure 1. Amount respondent had heard or read about the A/P system.

We also wanted to find out where respondents got their information about water pollution. On the 1990 (Phase I) telephone survey of the general public and the mail survey of public officials a question was asked in the following form: "How much information on water pollution have you gotten from each of the following sources?" We asked if they had received a lot, some, or no information for each of nine different sources. These results are shown in Figure 2. Most respondents got information from the mass media. In fact, over 90 percent got a lot or some information from television. Public officials were much more likely to get information from newspapers. Members of the general public were more likely to read magazines. Public officials were more likely to read books.

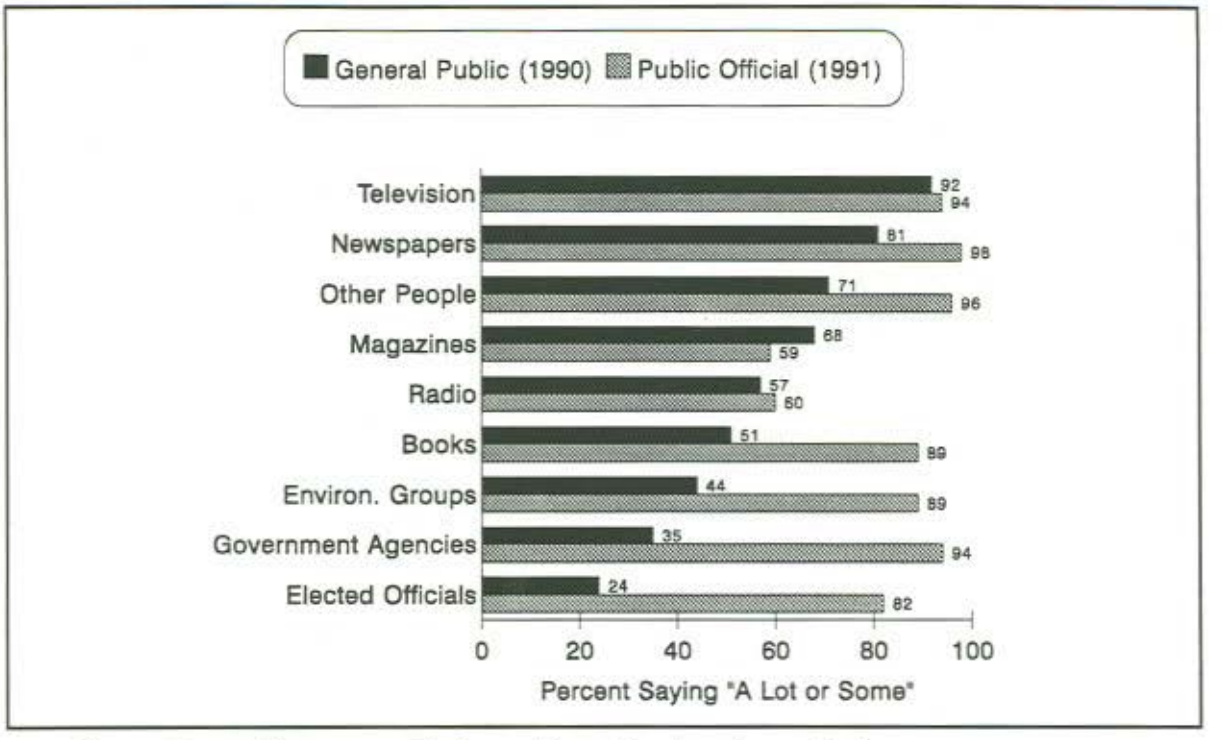

Figure 2. Sources of information about water pollution.

Almost three quarters of the general public and almost all the public officials got information from other people. We found that respondents from the general public did not get much information directly from formal groups. Public officials, on the other hand, were much more likely to receive information about water pollution from: environmental groups, government agencies, and elected officials.

Environmental Beliefs and Behavior

People do not just appreciate natural resources in the abstract, but they tend to value them for specific uses. In Figure 3 we present the responses to a question about the A/P system that asked "People have different reasons for valuing the rivers and sounds of the A/P system. Is (INSERT REASON) very important, somewhat important, or not important to you personally?". We only present the results for the percent who said the particular values were "very important". There is agreement among the general public and the public officials that the most important reason for protecting the A/P system is to know it is protected for future generations.

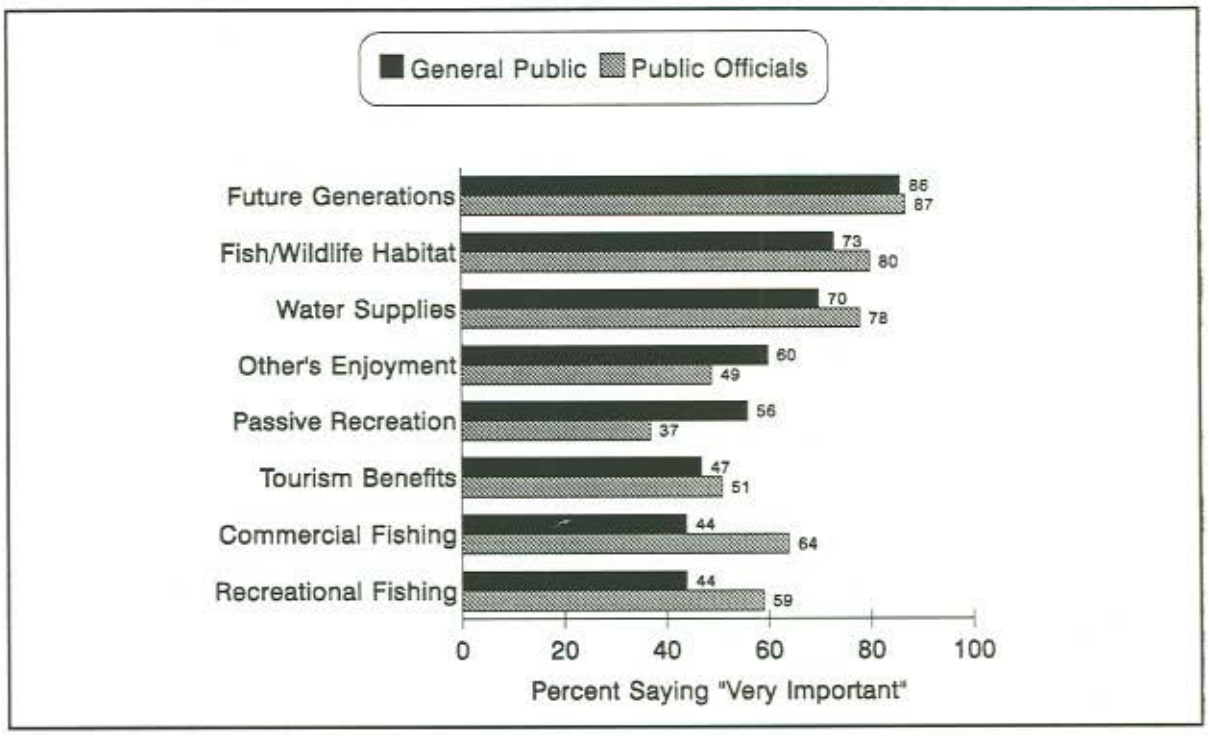

Figure 3. Importance of different reasons for valuing the A/P system.

The public officials believed that five of the values were more important than did the general public. Public officials rated these in terms of relative importance: fish and wildlife habitat in the A/P system; use of water from the A/P system for city or town water supplies; the economic benefits related to recreation and tourism in the A/P system; use of the A/P system by commercial fishermen; and use of the A/P system for recreational fishing, boating, or swimming. On the other hand, the general public rated two values of the A/P system as significantly more important than did the public officials: knowing that other people may use and enjoy the A/P system and use of areas in the A/P system for picnicking, bird watching, or nature study. Overall, these two were intermediate in terms of their overall value to the general public, but were the least important to the public officials. The general public rated commercial and recreational fishing as much less important that did the public officials.

We wanted a reliable and valid method of assessing the extent to which respondents hold more general environmental values and beliefs. To do this we used a well-established attitude scale known as the "New Environmental Paradigm" scale. All twelve items are of the Likert scale format. Respondents were asked to respond to each statement in terms of their level of agreement (i.e., strongly agree, agree, disagree, or strongly disagree). These twelve items represent three main underlying dimensions of environmentalism: balance of nature; limits to growth; and human control over nature. Results for individual items are shown in Table 4, in terms of

respondents' agreement with the pro-environmental statement or disagreement with the anti-environmental statements. This set of questions appeared on all three surveys: Phase I (1990) phone survey of the general public; Phase II (1991) phone survey of the general public; and the Phase II mail survey of the public officials. Statistically significant differences among these three groups will be presented. Overall, responses to these twelve statements indicate a very high level of environmental values and beliefs among the general public, as well as among public officials.

The first set of items assesses respondents' concerns over human impacts on the balance of nature. Almost all respondents (over 75 percent of the public officials and about 90 percent of the general public) either agreed or strongly agreed that such impacts are of major concern. Public officials were less likely to believe "The balance of nature is delicate and easily upset." Most also agreed that "When humans interfere with nature it often produces disastrous consequences." Again, the members of the general public were significantly more likely to agree with that statement. All groups agreed that "Humans must live in harmony with nature in order to survive." Agreement was also quite strong with the statement that "Mankind is severely abusing the environment." Public officials were less likely to hold this belief.

The second dimension of environmental values covered by this scale involves respondents' attitudes about limits to growth. Again, responses clearly indicate strong environmentalism. However, these are not held as strongly as those relating to balance of nature. The highest level of agreement was with the statement that "To maintain a healthy economy we will have to develop a 'steady state' economy where industrial growth is controlled." Many also agreed that "The earth is like a spaceship with only limited room and resources." Agreement was high among the general public that "We are approaching the limit of the number of people the earth can support." The general public was significantly more likely to be in agreement with the first three of these statements than were the public officials. About three-quarters felt "There are limits to growth beyond which our industrial society cannot expand." All groups were basically the same on this question.

Table 4. Percentage of respondents expressing environmental beliefs in response to New Environmental Paradigm scale

	General Public (1990)	General Public (1991)	Public Officials (1991)	Group Differences[3]
BALANCE OF NATURE[1]				
a. The balance of nature is very delicate and easily upset.	91	88	76	***
b. When humans interfere with nature it often produces disastrous consequences.	89	90	78	***
c. Humans must live in harmony with nature in order to survive.	97	94	95	NS
d. Mankind is severely abusing the environment.	94	93	84	***
LIMITS TO GROWTH[1]				
e. We are approaching the limit of the number of people the earth can support.	69	67	44	***
f. The earth is like a spaceship with only limited room and resources.	82	84	77	***
g. There are limits to growth beyond which our industrial society cannot expand.	74	76	74	NS
h. To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.	89	89	77	***
PEOPLE OVER NATURE[2]				
i. Mankind was created to rule over the rest of nature.	59	55	50	***
j. Humans have the right to modify the natural environment to suit their needs.	60	63	58	NS
k. Plants and animals exist primarily to be used by humans.	63	58	59	**
l. Humans need not adapt to the natural environment because they can remake it to suit their needs.	79	77	83	***

[1] Environmental beliefs are indicated by agreement or strong agreement with these statements.
[2] Environmental beliefs are indicated by disagreement or strong disagreement with these statements.
[3] Differences between two or three groups are statistically significant at $p<.001$ (***) or $p<.01$ (**) NS means no groups are significantly different.

The final set of items in this scale involved respondents' beliefs about the extent to which people should control or use nature for their own purposes. In this case, **disagreement** with a particular statement reflects environmental beliefs or values. This dimension appears to reflect less strongly held environmental beliefs than the other two sub-scales just discussed. However, once again environmentalism is still reflected by a majority of responses. The strongest belief involves considerable disagreement that "Humans need not adapt to the natural environment because they can remake it to suit their needs." Public officials were more likely to disagree with that statement (indicating a stronger environmental belief). Well over half disagreed that "Plants and animals exist primarily to be used by humans" and "Mankind was created to rule over the rest of nature." The pattern for these two statements is somewhat different in that respondents from the general public in Phase I tend to differ from the respondents in Phase II, as well as from the public officials. About 60 percent of the respondents from all groups disagreed with the statement: "Humans have the right to modify the natural environment to suit their needs."

We were also interested in assessing the types of pro-environmental behaviors that citizens had engaged in recently. We asked the general public (1991) to tell whether they had done any of nine activities during the previous 12 months (Figure 4). Four behaviors were quite common among the respondents: watching television specials on the environment (85 percent); reducing use of lawn and garden chemicals (84 percent); recycling newspapers, glass, or other items (83 percent); and reducing water use by conservation (76 percent). Two other actions were reported by about three out of five respondents: reading a conservation or environmental magazine (62 percent) and not buying a product because it caused environmental problems. Almost half (45 percent) said they had contributed money or time to an environmental or wildlife conservation group. Two behaviors were relatively less common among the respondents: contacting a government agency to get information or complain about an environmental problem (22 percent) and attending a public hearing or meeting about the environment (20 percent).

Perception of Problems

We were interested in determining the level of respondents' concerns about water pollution and habitat loss. We asked about four different reference points for such concern: water pollution in the state of North Carolina or Virginia, the A/P system, and respondents' own area; as well as damage to fish and wildlife habitat in the A/P system (Figure 5). Overall, public concern was greatest for damage to fish and wildlife habitat in the A/P system. Three quarters of the general public and almost 80 percent of public officials were very concerned. Most of the rest were somewhat concerned. However, public officials did tend to express significantly greater concern than the general public.

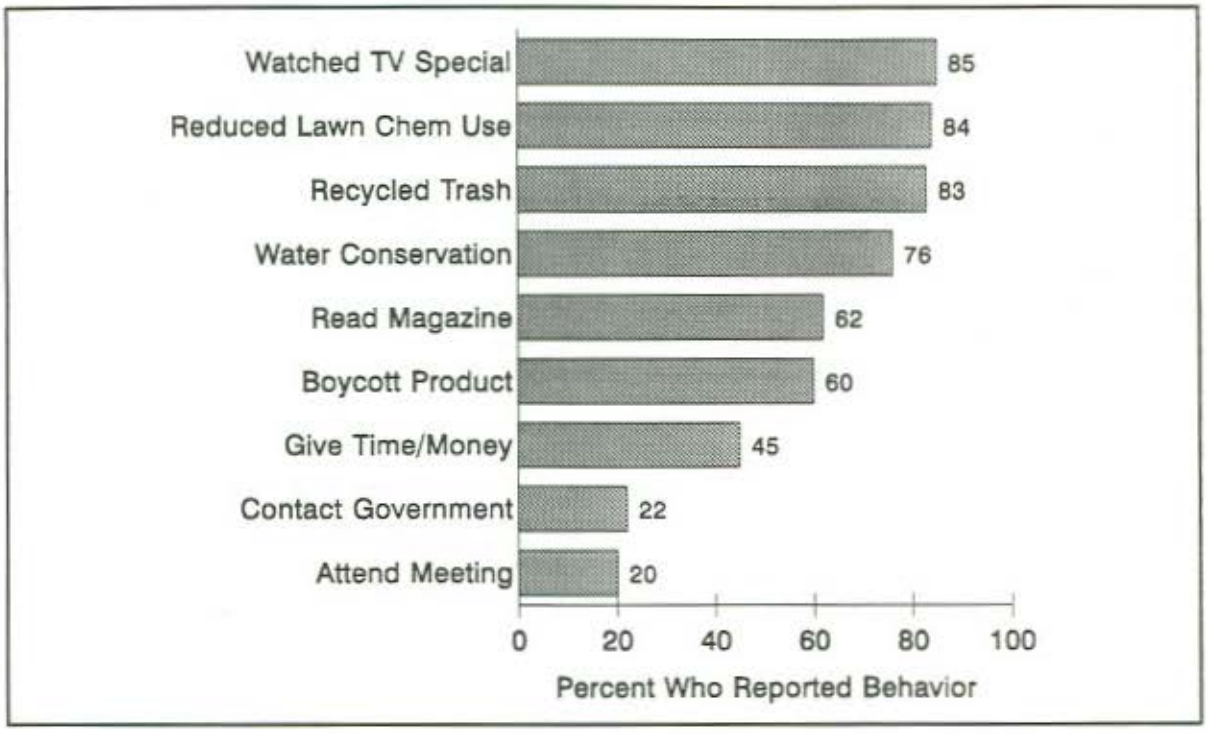

Figure 4. Pro-environmental behaviors reported by members of the general public.

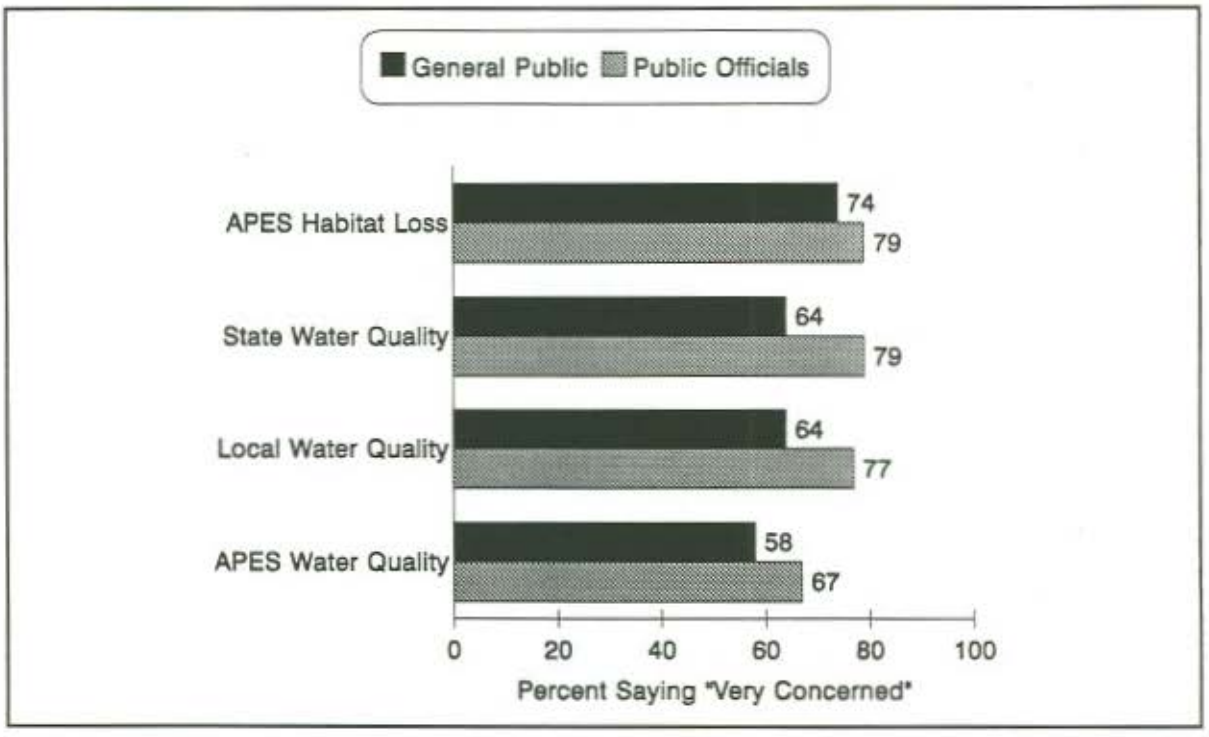

Figure 5. Level of concern for water pollution and habitat loss.

Respondents were also asked "Thinking about the entire state of North Carolina (Virginia), are you very concerned, somewhat concerned, or not concerned about pollution of lakes and rivers?" Most of the general public (64 percent) and public officials (79 percent) were very concerned about water pollution in their state. Just under a third were somewhat concerned. Very few said they were not concerned. Public officials expressed significantly higher levels of concern than did the general public. The results were similar when we asked about concern over water pollution **in their local area.** Again, almost two thirds of the general public and over three quarters of the public officials said they were very concerned about water pollution in their local area. Most of the others were somewhat concerned. Public officials also expressed significantly greater concern about local water pollution problems.

Finally, concerns were relatively lower (but still quite high) when asked about water pollution **in the Albemarle-Pamlico Estuarine system**. Almost 60 percent of the general public and over two thirds of the public officials felt water pollution was a serious problem and about a third felt it was somewhat of a problem in the A/P system. Again, public officials expressed significantly greater concern about water pollution problems in the A/P system.

We asked a series of questions to learn what people thought were the main causes of water pollution. The question stated that "There's disagreement about how much effect different sources of pollution have on water quality in the A/P system. Do you think (READ ITEM) has/have a lot, some, or almost no effect on water quality in the A/P system?" Results are shown in Figure 6 .

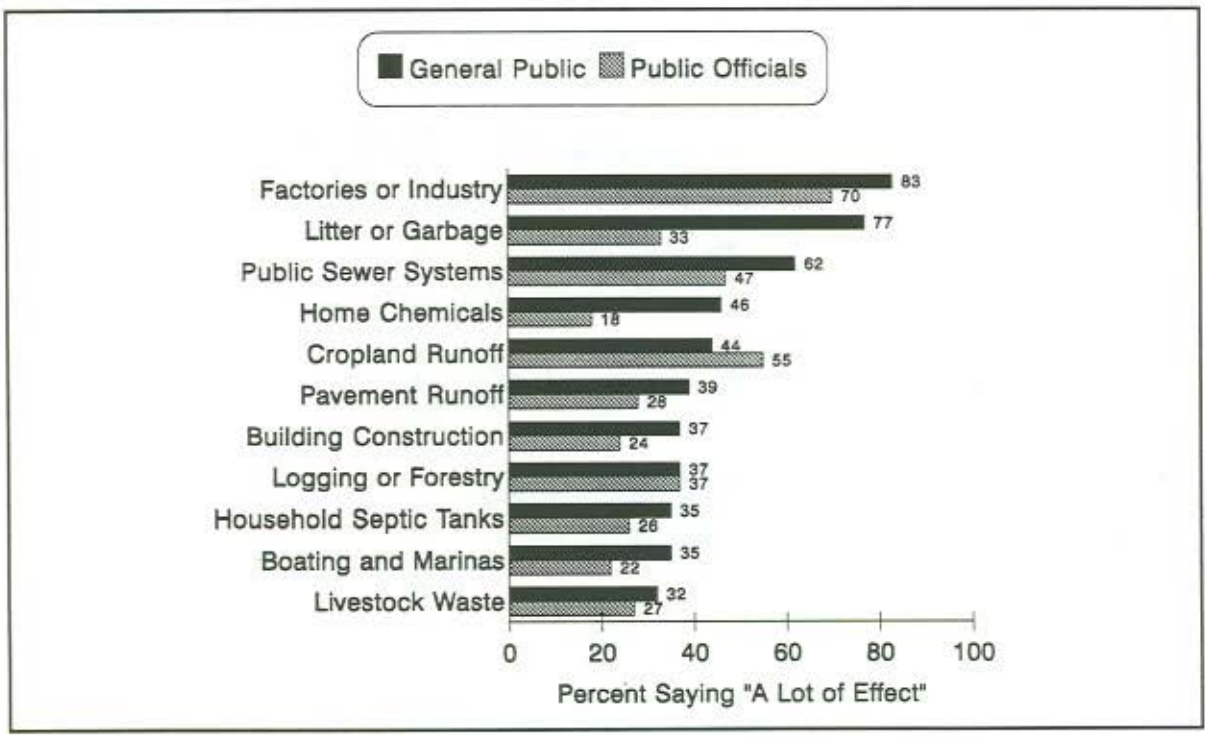

Figure 6. Perceived severity of effects of different causes of water pollution in the A/P system.

Among the general public, the top three perceived causes of water pollution are those that are most visible or tend to receive the greatest media coverage. Almost all (83 percent) felt that factories or industry have a lot of effect on water pollution in the A/P system. Over three quarters (77 percent) believed that litter or garbage have a lot of effect. Almost two-thirds (62 percent) perceived city or county sewer systems as having a lot of effect. The eight other possible effects were perceived to have a less serious effect on water quality. These tend to be nonpoint sources of pollution that are less readily apparent and tend to receive less attention from the media.

Public officials tend to have different opinions about the relative importance of the various possible causes of water pollution in the A/P system. For all the categories (except logging and forestry practices) these differences are statistically significant. Public officials agree with the general public that factories or other industries represent the most serious effect of pollution (but the percentage responses are significantly different). One of the key differences is that public officials believe that cropland runoff is the second most important cause of water pollution problems (which was rated fifth by the general public). This is the only pollution source that public officials rated as more serious than did the general public. Public officials and the general public agree that public sewer systems are the third most important cause of pollution. There are some other notable differences between the two groups as shown in Figure 6. For example, members of the general public are more likely than public officials to rate their own contributions (e.g., litter and home lawn or garden chemicals) as relatively more serious.

Another important area we wanted to assess involves attitudes about the effectiveness of government programs and policies to control water pollution problems. We asked respondents, "In your opinion is government doing too much, too little, or the right amount to control water pollution from each of the following?" In this case, we asked about seven specific potential causes of water pollution. Results shown in Figure 7 compare the responses of public officials to the Phase II mail survey with the telephone interviews with the general public conducted as part of Phase I. In all cases, the general public were significantly more likely than public officials to feel there was too little government control of the various sources of pollution.

Considering the responses to the earlier questions about pollution sources, it's not surprising that respondents were most likely to feel government is not doing enough to control water pollution from industrial waste. In fact, over three quarters of the respondents thought government is doing too little in this area. Most respondents from the general public also felt that government was doing too little to control water pollution from shoreline development and municipal sewer systems. The public officials were much less likely to feel that way. Between one-half and two thirds of respondents felt government is doing too little to control water pollution from rural nonpoint sources of pollution: agriculture cropland and livestock waste. We find significant differences between the two groups in their belief that government is doing

too little to control pollution from forest land with the general public feeling more that way. As a final point, we note that just over half of all respondents felt government is doing too little to control water pollution from household septic tanks.

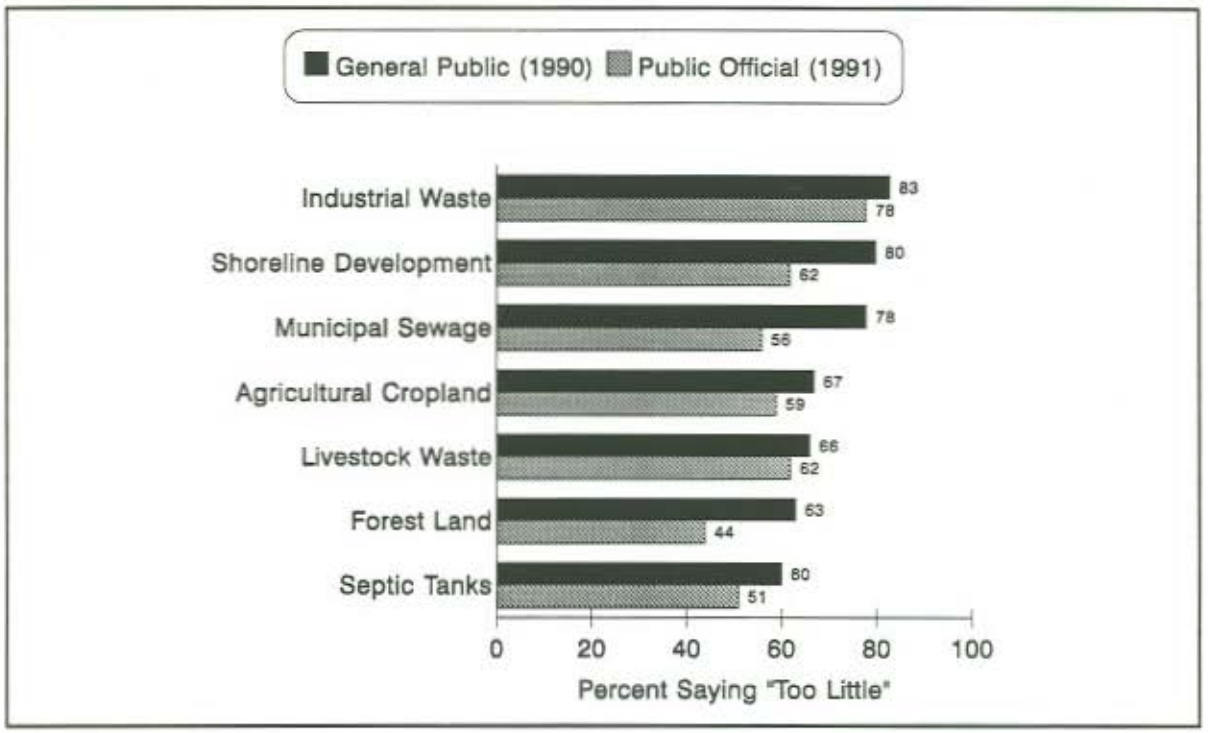

Figure 7. Perception of government control over water pollution in the A/P system.

We also wanted to find out how respondents felt, in general, about government response to water pollution problems (Figure 8). We asked, "Do you think there is too much, too little, or the right amount of enforcement of existing water pollution regulations?" In this case, almost all members of the general public interviewed during Phase I (90 percent) believed there was too little enforcement of existing regulations. Only nine percent felt there was a right amount. In fact, only one percent of the respondents thought there was too much enforcement of existing water pollution regulations. Public officials who completed the mail survey as part of Phase II were much more likely to feel that there was the right amount of enforcement (24 percent). However, almost three quarters (73 percent) of the public officials did feel there is too little enforcement of existing regulations.

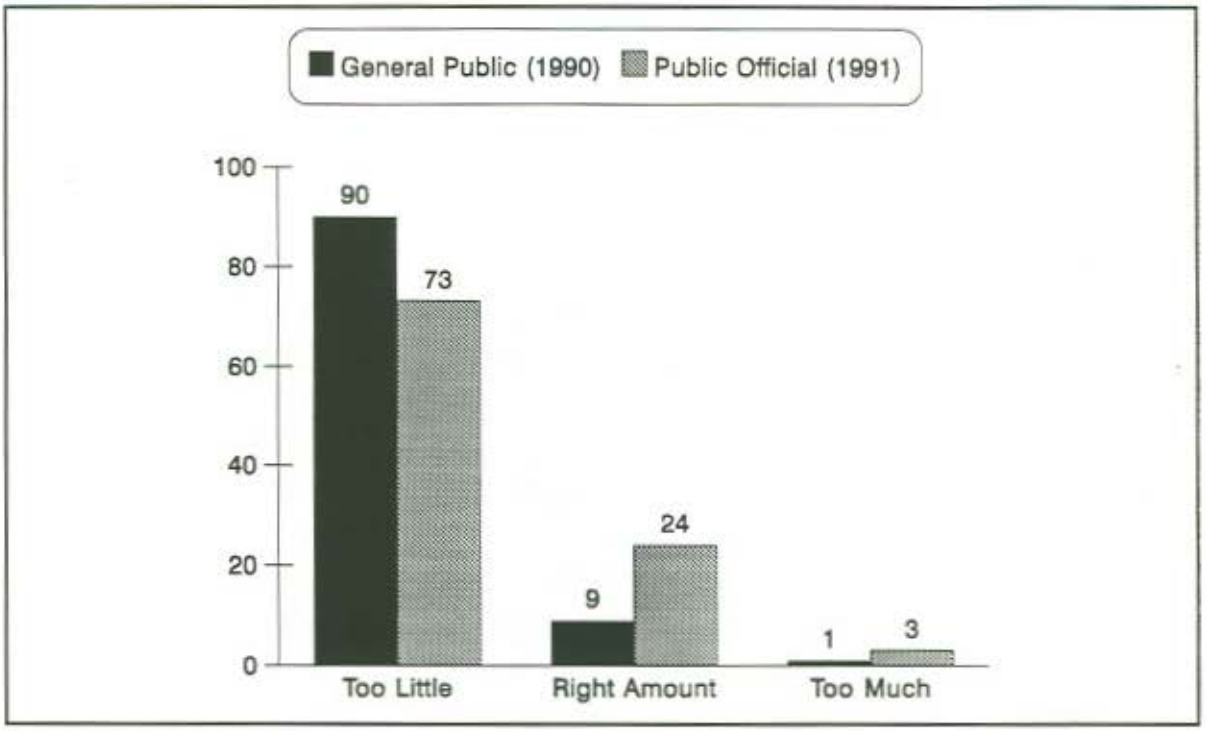

Figure 8. Perceptions of level of enforcement of existing water quality regulations.

Support for Management Strategies and Payment Mechanisms

One of the key objectives of this research was to assess the extent to which the general public and the public officials support or oppose a number of specific management alternatives for dealing with the environmental problems facing the A/P system. In this section we describe the overall support expressed by the general public and public officials for 15 possible management strategies (Figure 9). We highlight any significant differences between these two groups. In a later section we analyze the types of people that will be most likely to either support or oppose the specific management alternatives. It is important to note the exact wording of these various management alternatives. These are shown in the questionnaires provided in Appendices A and B. Readers should note that special care was taken to present two sides of most issues related to resource management and control of pollution.

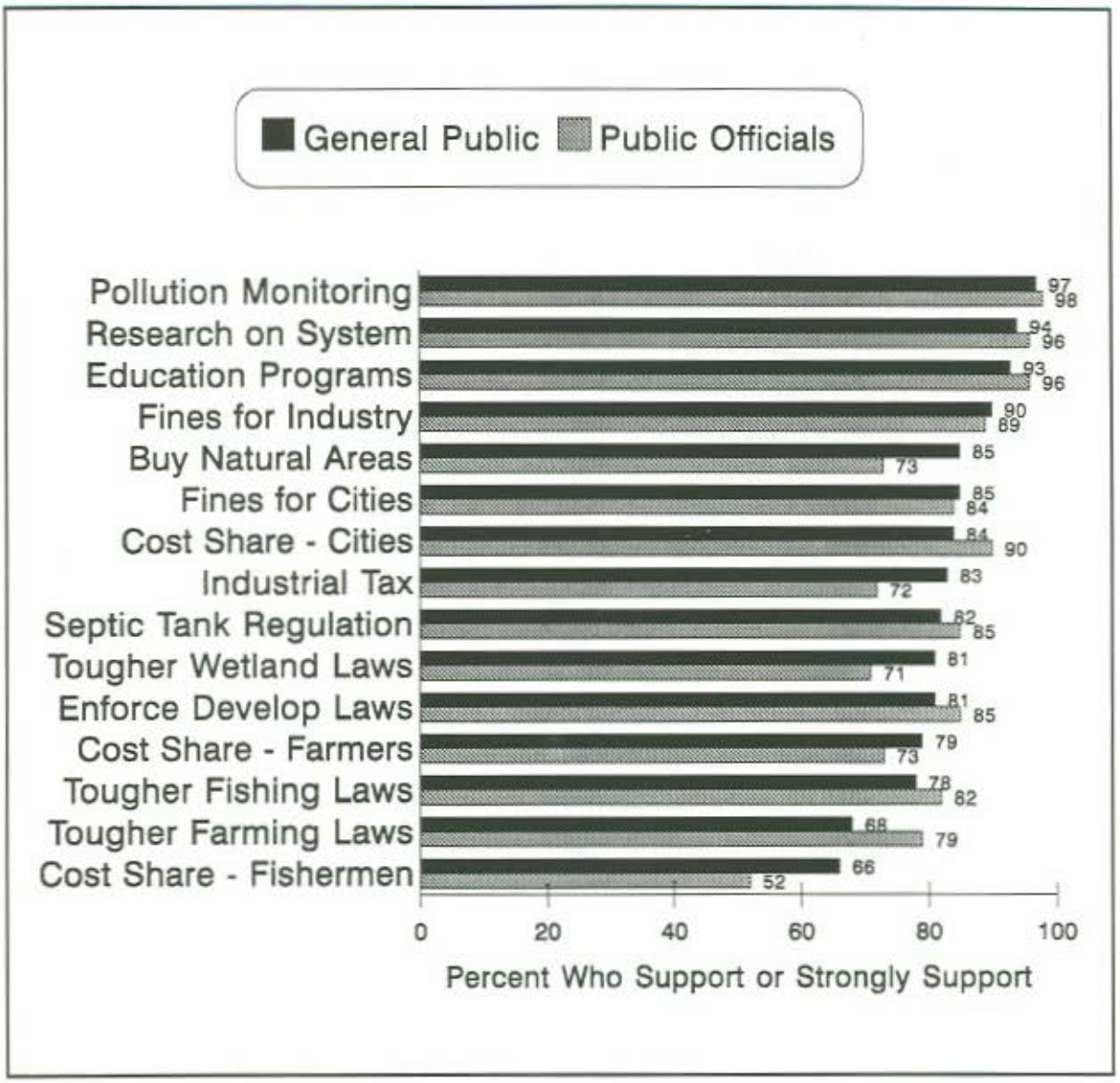

Figure 9. Level of support for alternative management strategies.

Almost all respondents clearly recognized the importance of developing a better understanding of and appreciation for the resources and problems in the A/P system. Near unanimous support was expressed for: water quality monitoring programs that would help regulate sources of water pollution; more research to better understand pollution and habitat needs in the A/P system; and government programs to educate people about water quality and habitat in the A/P system. The public officials were significantly more likely than the general public to support the latter two alternatives.

Four of the next five most supported alternatives relate to the control of municipal and industrial point source pollution. Almost nine out of ten respondents from both groups supported tougher enforcement of existing laws and higher fines on industries that exceed legal pollution limits, even if that meant higher product prices or lost jobs. Members of the general public were much more likely to support taxing industries on the amount of pollution they produce within legal limits. Both groups also agreed on their support of the need for tougher enforcement of existing laws and higher fines for cities that exceed legal limits on sewage discharges (even if this means increased sewer fees and taxes). Public officials were more likely to support using federal or state government money to help cities build new sewage treatment plants.

Two alternatives were presented for managing significant natural resources within the A/P system. Members of the general public were quite likely to support using government money to buy undeveloped coastal land to keep it in its natural condition. This alternative was much less popular among the public officials. The same pattern was found for support of stronger laws to prevent loss of wetlands, even considering that such laws could take away some property owners rights to use their land. It is important to note, however, that wetlands were defined in a relatively narrow way to include "marshes, swamps, and bogs".

Development pressures can pose significant risks to the A/P system. Two alternatives assess support for control of coastal development. At least four out of five respondents supported tougher enforcement of existing development laws even if that could mean increased housing costs and/or taking away some land owners options for using their property. Public officials were significantly more supportive of this strategy. Similar levels of support were found for tougher regulation for septic tank installation and maintenance. Here there were no significant differences between the two groups.

Two alternatives were presented for addressing nonpoint source pollution from agriculture. Support was higher for agricultural cost sharing than for stronger regulations. Members of the general public were more likely than public officials to support using government money to help farmers install pollution, control practices. On the other hand, public officials were significantly more likely than members of the general public to support tougher laws on agricultural pollution, even if that meant higher food prices or some farmers going out of business.

In a similar pair of questions, two alternatives were presented for restricting fishing practices. In this case, compared to cost sharing, support was much higher among both groups for tougher laws to restrict practices (such as trawling or mechanical harvesting) even if this meant higher seafood prices and/or some fishermen going out of business. Public officials were more likely to support the tougher restrictions. The general public was more supportive of using government

money to help fishermen buy new equipment to protect fishing and fish habitat. Overall, this was the least supported of all 15 management alternatives.

We also were able to assess how much support or opposition exists for alternative mechanisms that could be used to raise money to fund new or existing programs (Figure 10). In a later section we will analyze which types of respondents were more likely to support the various payment mechanisms. We also leave discussion of the amount that people would be willing to pay until a later section of this report.

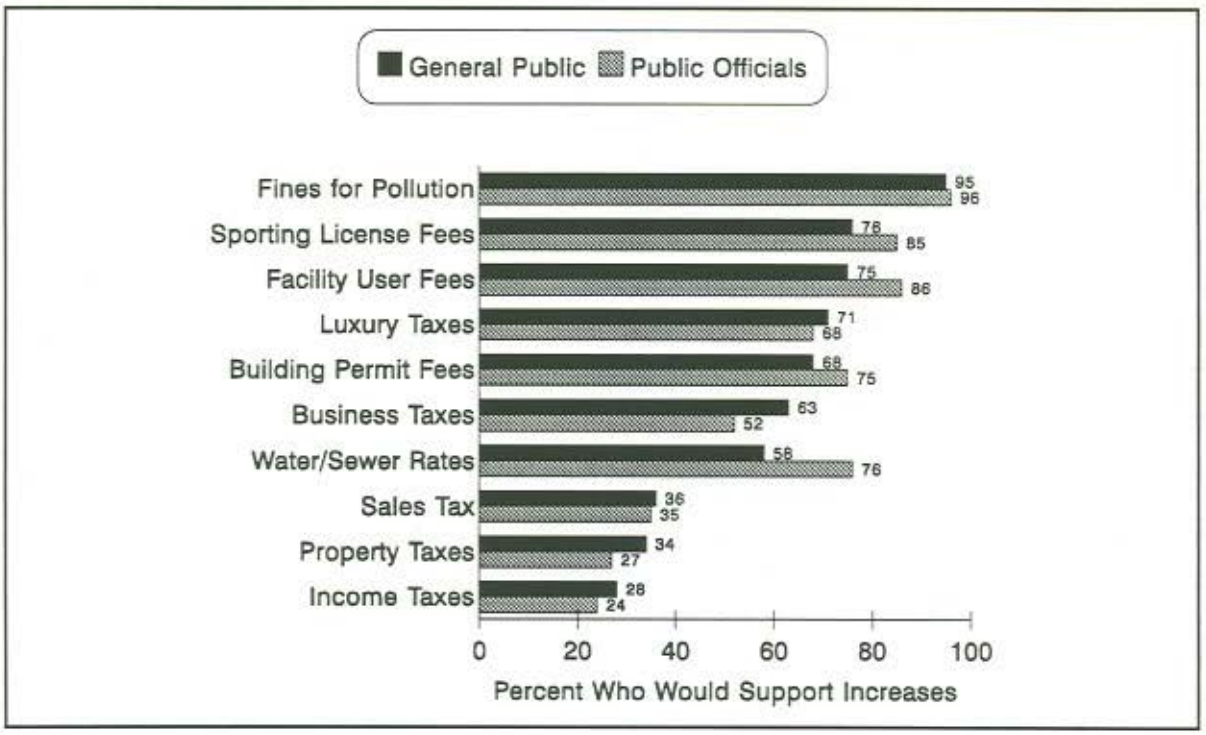

Figure 10. Level of support for alternative payment mechanisms.

By far, the most acceptable payment mechanism will be to increase fines for pollution. Almost all (over 95 percent) of the general public respondents and the public officials support or strongly support this alternative. The next two most popular payment mechanisms involve asking those who directly use the A/P system to pay more to manage and protect it. Three quarters of the public and about 85 percent of the public officials support increasing fishing or hunting license fees, as well as user fees for public facilities. The support expressed by the public officials was significantly greater than that expressed by the general public.

Four other alternatives appear to have a moderate (between 50 and 75 percent) level of support, but in some cases the levels differ significantly between the general public and the public officials. Over two-thirds of respondents from both groups would support increasing luxury taxes. Public officials were more likely to support raising building permit fees, while the general public was much more likely to support raising business taxes. There was a dramatic difference in terms of the support expressed for raising water and sewer rates. While three quarters of the public officials supported that option, just over half of the general public respondents found it acceptable.

Three final payment mechanisms appear generally unacceptable to both groups. Just over a third of each group would support raising sales taxes. There was no significant difference here. The general public was relatively more likely to support raising property taxes or income taxes. Although these results show that such taxes would be hard to support politically, the fact that over a quarter would support such unpopular options indicates the great importance attached to the A/P system.

Another important type of question involves the support for programs to protect the A/P system relative to other types of programs. Respondents were asked to choose between programs for the A/P system and other areas as follows: "If new money were available, should it be spent on (OTHER PROGRAM) or protecting the A/P system?" Figure 11 shows the relative importance of the different programs. There are some significant differences, as well as similarities between the general public and the public officials.

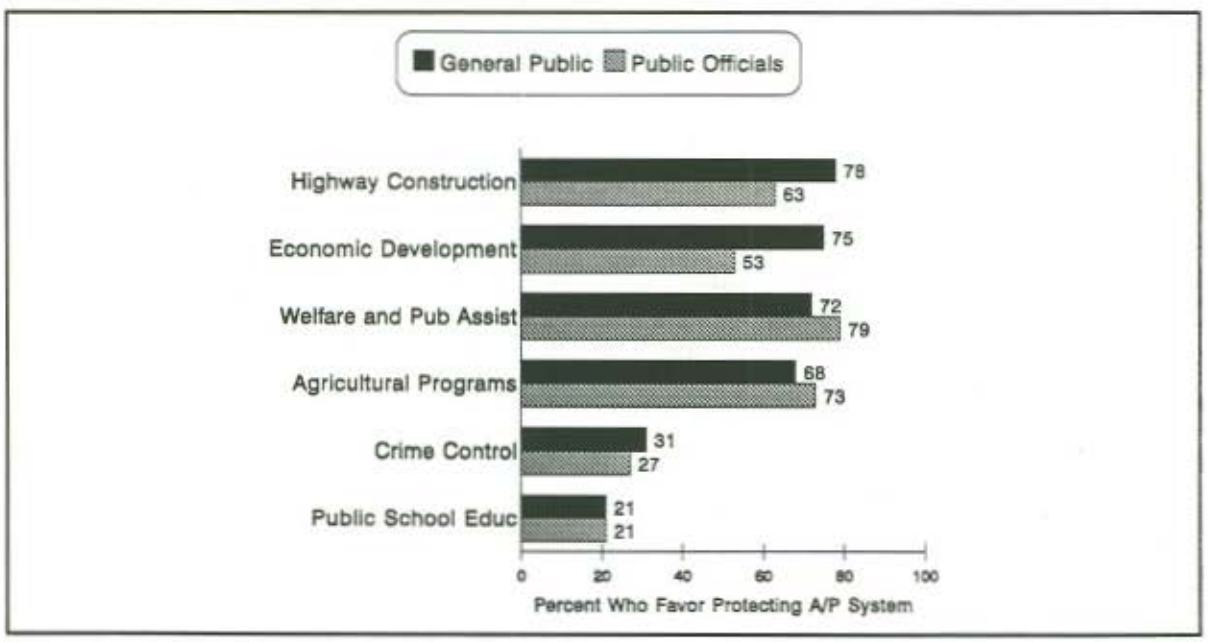

Figure 11. Relative support for spending new public funds on protecting the A/P system versus other programs.

For the general public, protecting the A/P system is much more important than spending government money on four other program areas. Over three quarters of the general public think the A/P system is more important than programs for highway construction and economic development. Over two-thirds of the general public believed that money should be spent on protecting the A/P system rather than on welfare and public assistance programs or agricultural programs. Under one-third of the general public felt that the new money should be spent on the A/P system compared to crime control. Only about one in five felt the protection of the A/P system should be given priority over money for public school education.

The public officials also tend to see the same four program areas as less important than protecting the A/P system. However, the relative ranking expressed by the public officials for the four shows some interesting differences. The public officials, in this case, were even more likely to favor spending more money on the A/P system rather than for welfare and public assistance or agricultural programs. Just under two-thirds of the public officials favored the A/P system over highway construction programs. Public officials expressed basically the same level of support for programs to protect the A/P system as they did for economic development.

The general public and the public officials are in agreement that two program areas (crime control and public school education) are more important than protecting the A/P system. The differences between the general public and public officials are significant for the other four program areas. The general public feels much stronger than public officials that money should be spent to protect the A/P system rather than highway construction and economic development. The public officials, on the other hand, had a greater tendency than the general public to rate the A/P system as more important than welfare and public assistance and agricultural programs.

Public Policy Development and Program Implementation

In this final set of descriptive results we discuss a variety of questions that have relevance to the development of public policies and implementation of management alternatives. For the most part, these questions were only asked of public officials because we felt the general public would not have enough understanding of current policies and programs to assess these types of issues.

We were interested in determining the type of barriers that could limit existing, as well as new, initiatives to manage the A/P system. Public officials were asked to assess "To what extent do each of the following limit the effectiveness of efforts to protect water quality and habitat in the A/P system?" Figure 12 shows the relative importance of the different factors. Public officials felt two factors included on the questionnaire seem to represent the most serious barriers: conflicts among special interests and low levels of public knowledge. Over half of all public officials felt these

factors limit effectiveness to a large extent. Very few felt they did not limit program effectiveness at all.

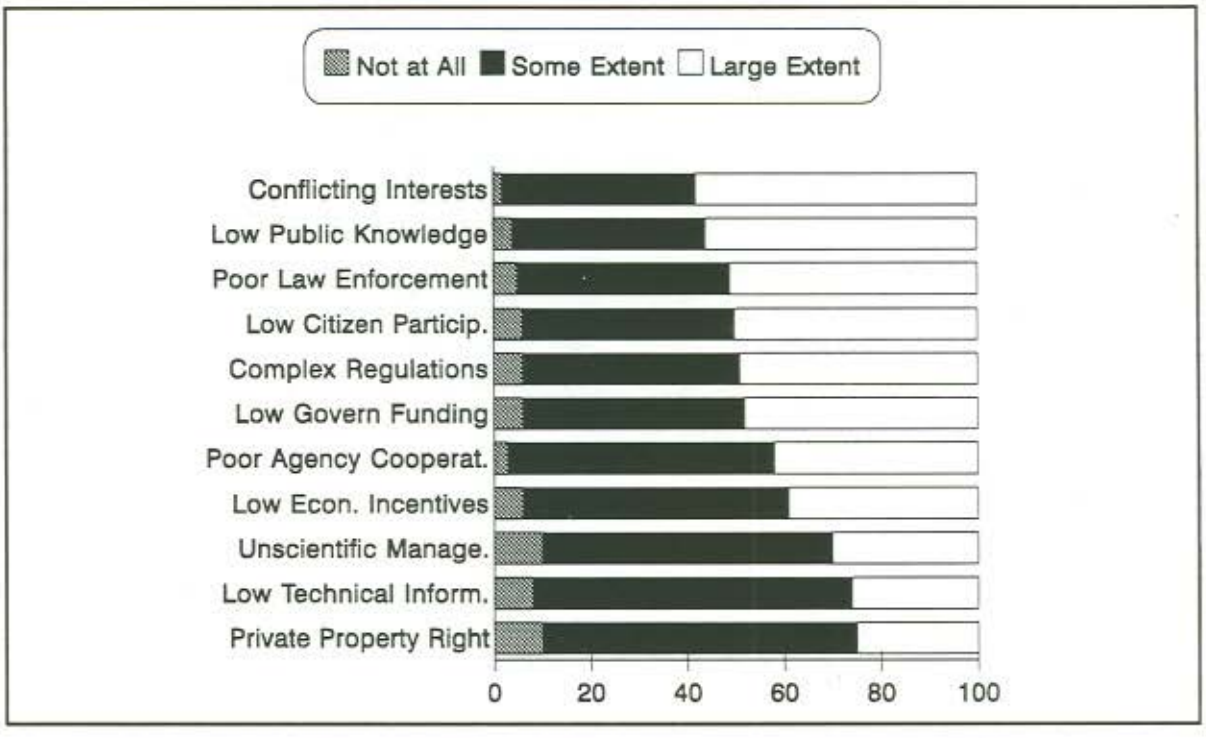

Figure 12. Public officials' perception of the extent to which different factors limit effectiveness of management efforts.

Public officials felt that four other factors also have a relatively large effect on the effectiveness of management programs. About half of all respondents felt that the following limited effectiveness to a large extent: inadequate enforcement of existing laws; lack of citizen participation; complex regulations; and inadequate government funding. Again relatively few felt that these did not limit effectiveness at all. Two other factors also appear to present a moderate limitation on effectiveness: inadequate cooperation among agencies and insufficient economic incentives.

We also attempted to assess the public officials' attitudes about the relative influence that different groups have over decisions about how to manage the A/P system. Respondents were asked "How much influence do each of the following groups have over management in the A/P system?" Public officials were asked to rate each group as to whether it had too much, the right amount or too little influence. Figure 13 shows the relative influence of the different groups. Although there is no clear distinction between the groups, some interesting patterns emerge.

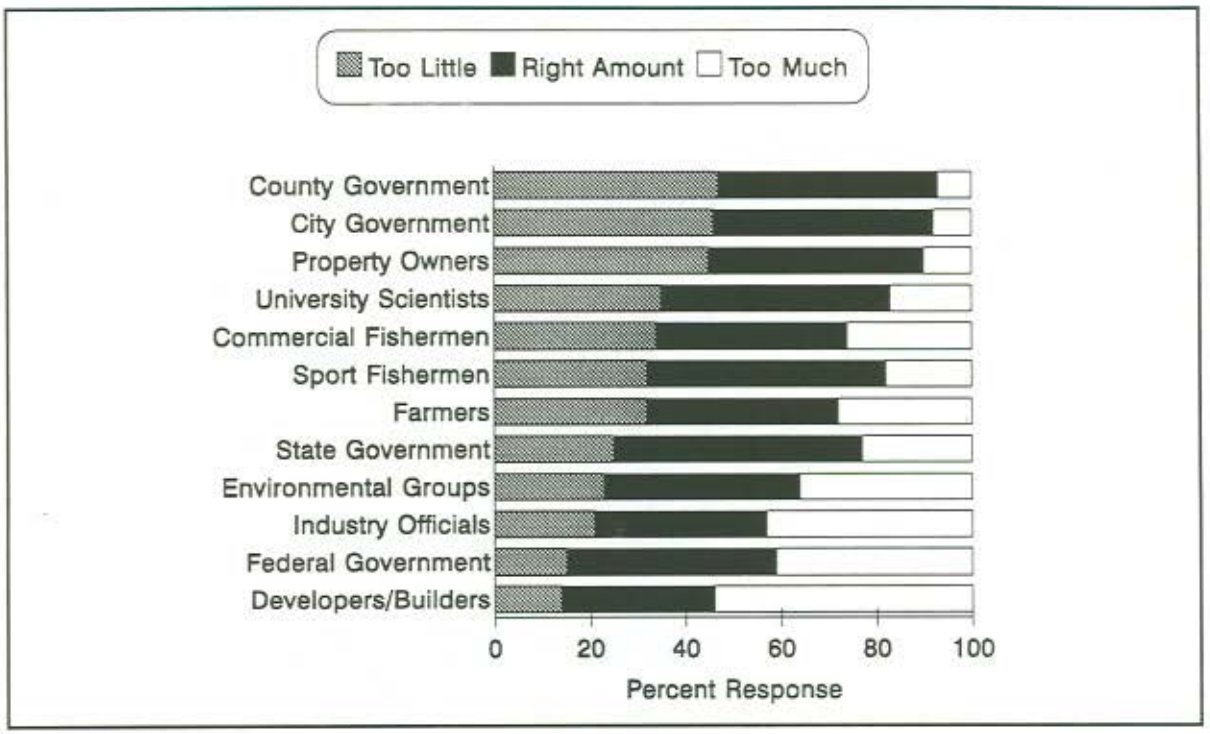

Figure 13. Public officials' perception of relative influence different groups have on management decisions.

Almost half of all public officials felt that three groups had too little influence over management: county government officials; city/town government officials; and property owners. About one third of all public officials felt that the following groups had too little influence: university scientists; commercial fishermen; sport fishermen; and farmers. The percentage of respondents who thought these four groups had too much influence did vary significantly. Over a quarter of the public officials felt commercial fishermen and farmers had too much influence. Less than 20 percent felt that university scientists and sport fishermen had too much influence.

The final five groups shown in Figure 13 vary quite a bit in terms of respondents' assessment of their relative influence. Just as many respondents (about a quarter) felt state government had too much influence as felt the state had too little influence on management of the A/P system. Just over one third of the public officials felt environmental groups had too much influence, while less than a quarter felt they had too little. The majority felt that industry officials had either too much (43 percent) or the right amount (36 percent) of influence. Few (15 percent) of the state and local public officials in this sample felt that the federal government officials had too little influence. Almost as many (41 percent) felt that the federal government had too much influence as felt that they had the right amount (44 percent). Developers and builders represent the only group that a majority (54 percent) of public officials felt had too

much influence over management of the A/P system. Only 14 percent of the respondents felt this group had too little influence.

Another set of questions indicates that public officials felt government agencies at different levels should play different roles in managing the A/P system. We asked respondents to rate each major government level in terms of their roles in setting policies and implementing programs. Figure 14 shows the responses for each of the two sets of questions. Respondents were first asked "How much responsibility should each of the following levels of government have for setting policies to protect water quality and habitat in the A/P system -- None, Some, or A Lot?" Almost two thirds (63 percent) of the public officials felt that state government should have a lot of responsibility for setting policy. About half (48 percent) thought that county government should have a lot of policy responsibility. Over a third (38 percent) thought city/town government should have a lot of responsibility. Less than a third (31 percent) felt the federal government should have a lot of responsibility for setting policy. In fact, ten percent stated that the federal government should have no responsibility for setting policy.

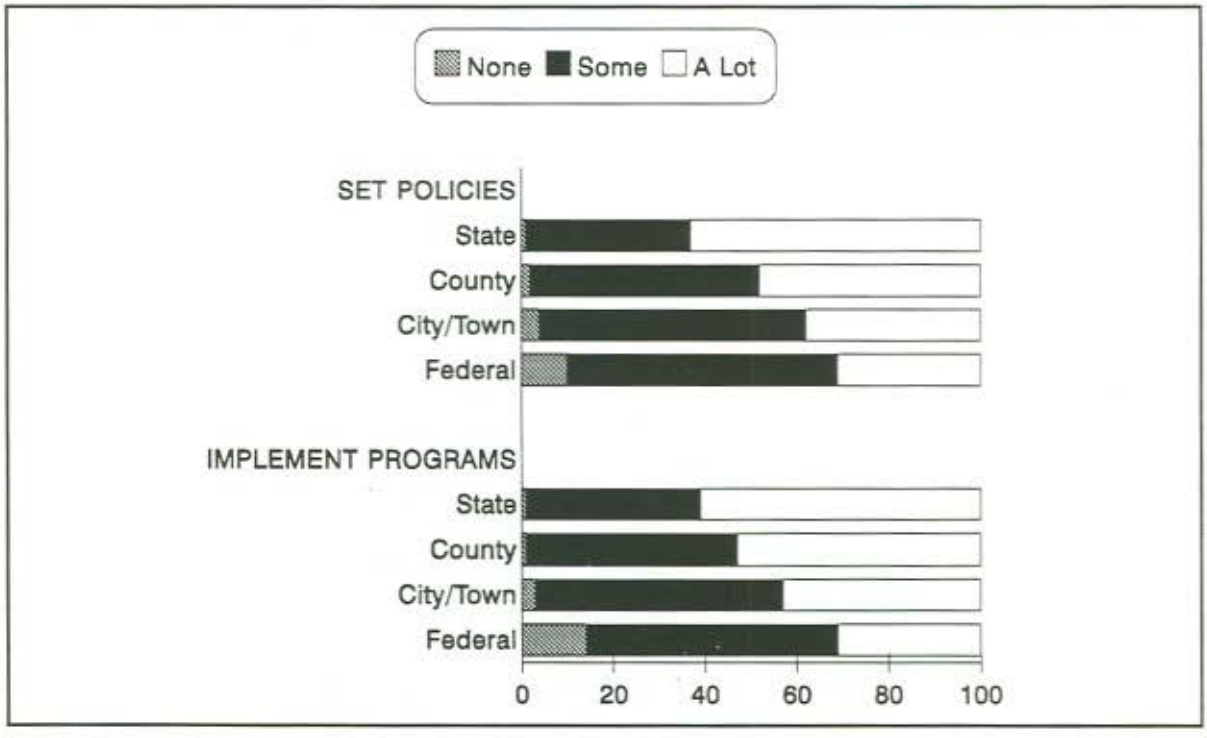

Figure 14. Public officials' perception of roles for different levels of government in managing the A/P system.

The same pattern of responses was found when respondents were asked the same basic question in reference to implementing programs (Figure 14). Just under two thirds (61 percent) of the public officials felt that state government should have a lot of responsibility for implementing programs. Over half (53 percent) thought that county government should have a lot of responsibility for program implementation. In this case, more respondents (43 percent) thought city/town government should have a lot of responsibility for program implementation than for policy development. Again, under a third (31 percent) felt the federal government should have a lot of responsibility for implementing programs. In fact, 15 percent stated that the federal government should have no responsibility for implementing programs to protect water quality and habitat in the A/P system.

A variety of different public and private organizations are involved in managing the A/P system. Answers to three questions about the extent of cooperation are presented in Figure 15. First, public officials were presented with the following question: "Different government agencies at the federal, state, and local level have responsibility for protecting water quality in the A/P system. In your opinion, how do these agencies work together: poorly, adequately, or well?" Almost two thirds (64 percent) of the public officials thought the agencies work together poorly. Another third said "adequately". Only three percent felt the agencies work well together.

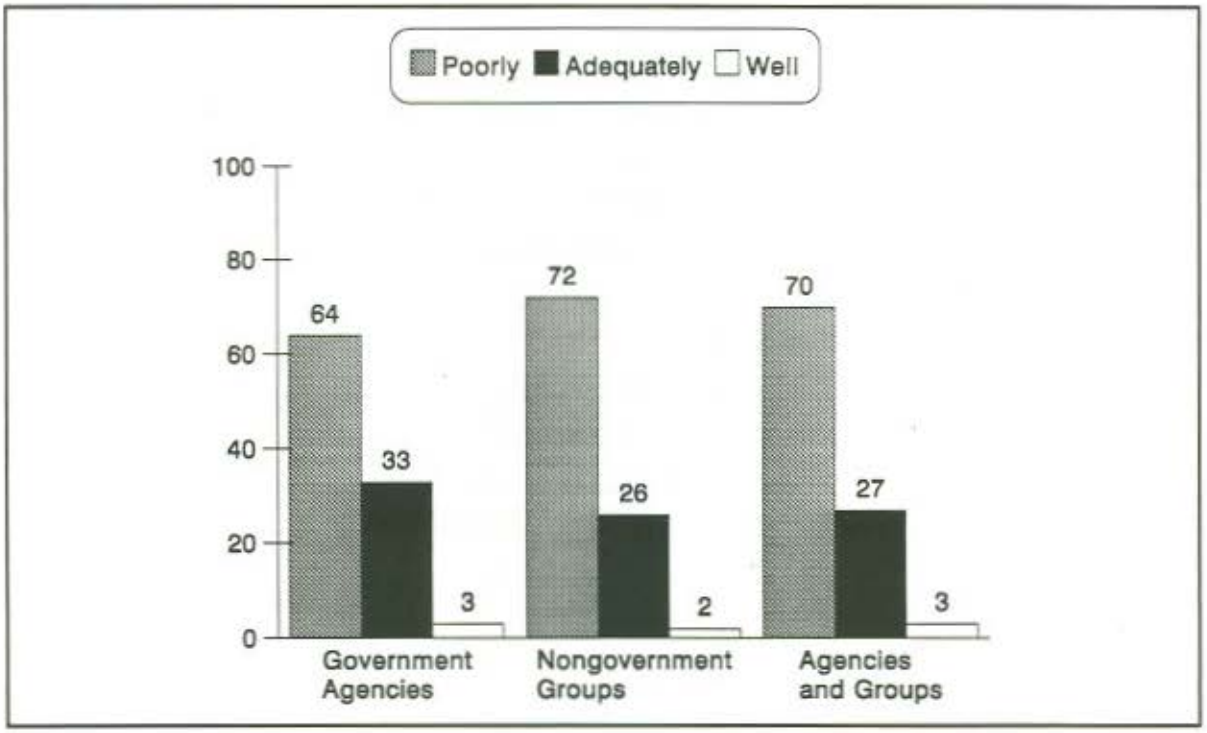

Figure 15. Public officials' opinions about how well agencies and groups work together to manage A/P system.

Next public officials were asked to rate the level of cooperation among a number of nongovernmental groups, including environmental, fishing, farming, and business interests. In this case, the reported cooperation is even lower than for the government agencies. Almost three quarters (73 percent) of the public officials felt these groups work together poorly. The pattern is much the same when asked about how these nongovernmental groups work with government agencies. In this case, 70 percent said that the groups and agencies work poorly together.

We asked the general public (in Phase II) a series of questions about the level of confidence they had in a number of different groups and agencies. This was not asked of the public officials because they, in fact, were among the groups being evaluated. Figure 16 shows the general public's response to the question "How much confidence or trust do you have in the willingness and ability of (GROUP NAME) to effectively protect water quality and habitat in the A/P system: a lot, some, or almost no trust?" By far, respondents express the greatest confidence in environmental groups. Over half (54 percent) said they would have a lot of trust in such groups.

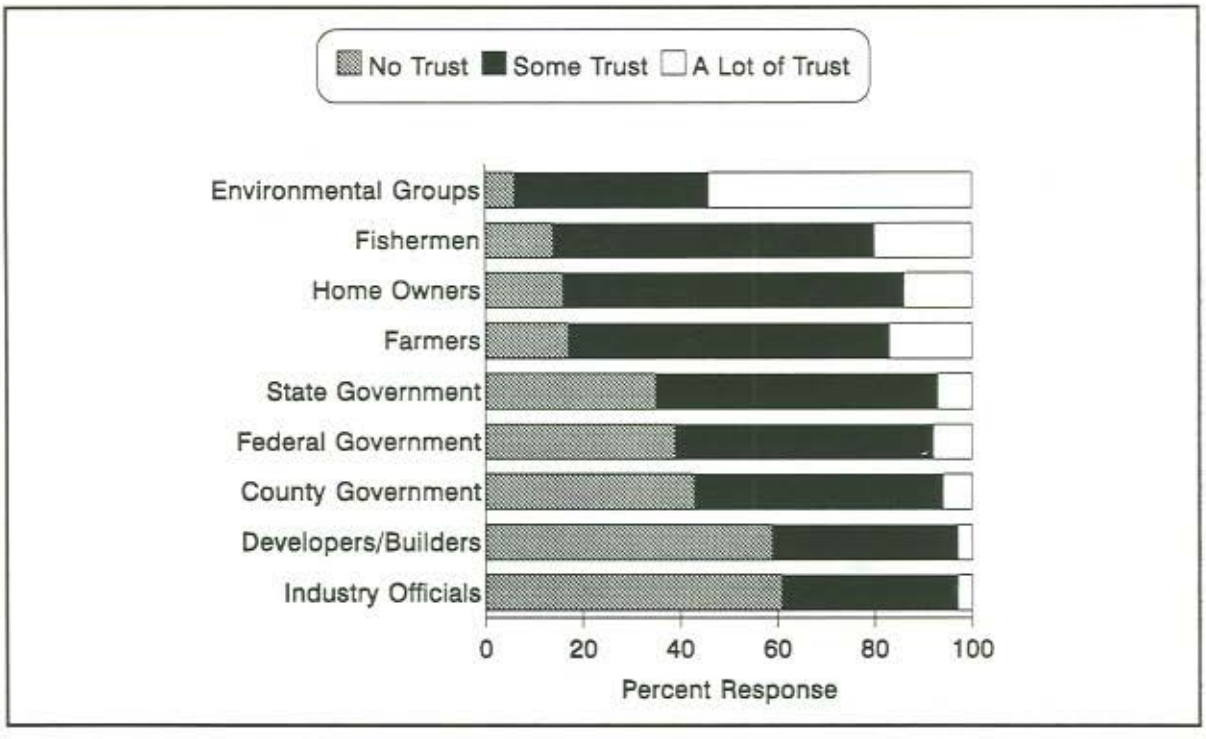

Figure 16. Confidence in different groups expressed by general public respondents.

Three groups appear to receive a moderate level of confidence from the respondents. Around two-thirds of the general public reported some trust in fishermen, home owners, and farmers. The three levels of government are next in terms of public confidence. Just over half would have some trust in the government. However, over one third reported no confidence in government to effectively protect the A/P system. Finally, about 60 percent of the general public would have no trust in two groups: developers/builders and industry officials. Just over a third would have some confidence; but only three percent of the respondents would have a lot of confidence in these groups.

On a final point, we wanted to learn whether or not respondents felt citizens had enough opportunity to help shape environmental decisions. The Phase I (1990) telephone survey of the general public and the Phase II mail survey of public officials, asked, "Do average citizens have too much, too little, or the right amount of opportunity to influence government decisions about the environment?" Results for the two groups are shown in Figure 17. Most members of the general public (69 percent) and public officials (60 percent) felt that average citizens have too little opportunity to influence government about the environment. About a third felt citizens have the right amount of opportunity. Only one percent of the general public and four percent of the public officials felt citizens have too much influence over environmental decisions. The differences between the public officials and general public are statistically significant.

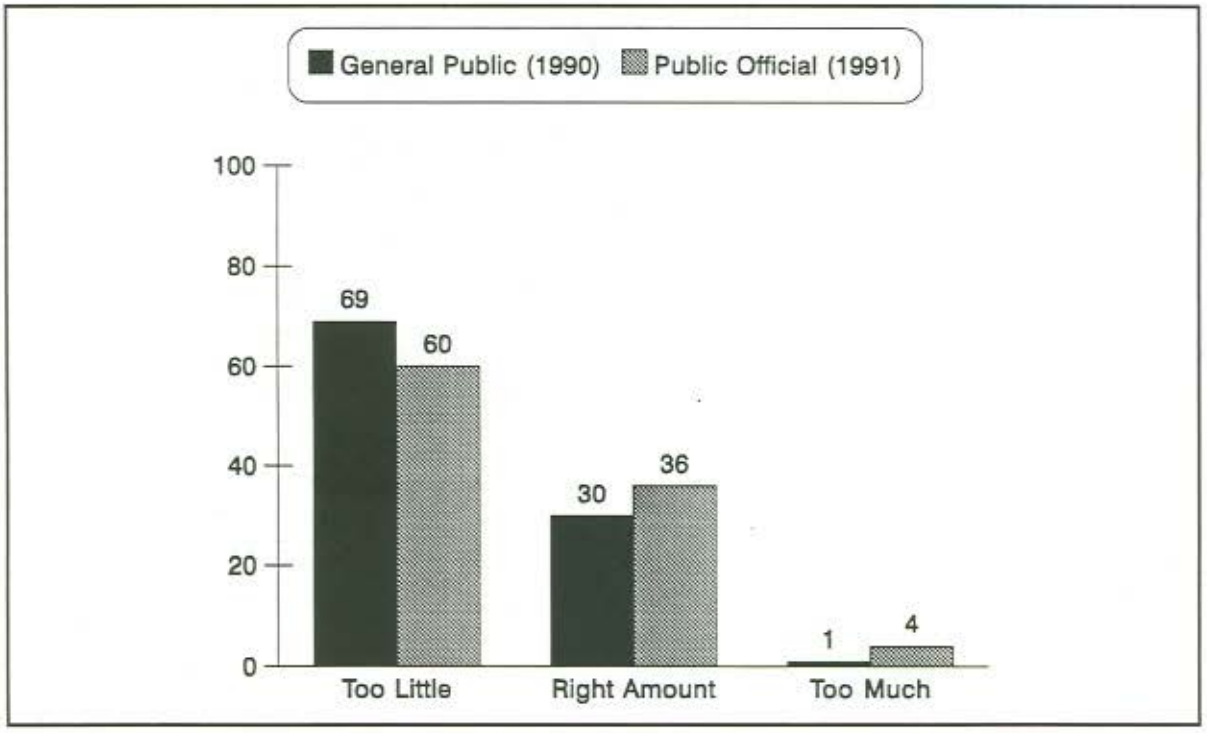

Figure 17. Perception of average citizens' opportunity to influence government decisions about the environment.

Multivariate Model and Results

The model that we are testing in this analysis is shown in Figure 18. This is a modified version of the illustrative theoretical model presented in the Phase I final report. We have developed our current model based on social science theory and review of past research on related topics. This literature and past research were discussed in the Phase I final report. Through this multivariate analysis we will be able to identify the type of people who hold environmental attitudes, as well as support the different management alternatives and payment mechanisms. Appendix C provides more detail on our analysis, including tables that summarize the results, and information about how the variables were measured on the survey. This analysis also examines the relative influence of environmental attitudes (as intervening variables) on support. We continue our systematic comparison of support expressed by the public officials and the general public. Therefore, we have chosen to include only those variables in this analysis that were measured by both the Phase II telephone survey and the mail survey.

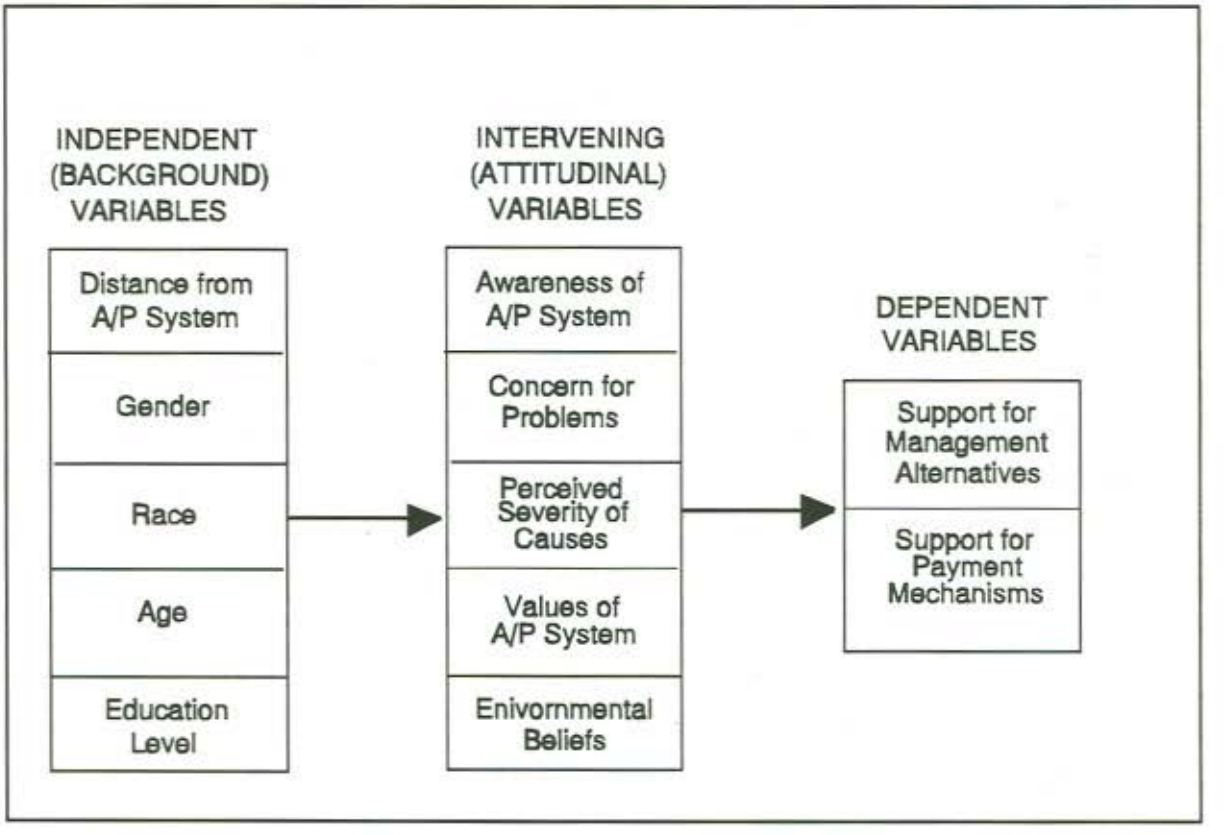

Figure 18. Theoretical model of influences on environmental attitudes and support for management alternatives and payment mechanisms.

Our theoretical model implies directional relationships among the key variables. The following are the specific research hypotheses that are indicated in the conceptual model shown in Figure 18.

H1: Respondents living closer to the A/P system will have the following characteristics: greater awareness of the A/P system; greater concern for problems; greater perceived severity of pollution causes; greater appreciation for the values of the A/P system; and greater support for all management alternatives and payment mechanisms.

H2: Female respondents are expected to have the following characteristics: greater awareness of the A/P system; greater concern for problems; greater perceived severity of pollution causes; greater appreciation for the values of the A/P system; stronger environmental beliefs; and greater support for all management alternatives and payment mechanisms.

H3: White respondents are expected to have the following characteristics: greater awareness of the A/P system; greater concern for problems; greater perceived severity of pollution causes; greater appreciation for the values of the A/P system; stronger environmental beliefs; and greater support for all management alternatives and payment mechanisms.

H4: Younger respondents are expected to have the following characteristics: greater awareness of the A/P system; greater concern for problems; greater perceived severity of pollution causes; greater appreciation for the values of the A/P system; stronger environmental beliefs; and greater support for all management alternatives and payment mechanisms.

H5: Respondents with more years of formal education are expected to have the following characteristics: greater awareness of the A/P system; greater concern for problems; greater perceived severity of pollution causes; greater appreciation for the values of the A/P system; stronger environmental beliefs; and greater support for all management alternatives and payment mechanisms.

H6: Respondents with greater awareness of the A/P system are expected to show greater support for all management alternatives and payment mechanisms.

H7: Respondents with greater concern for problems are expected to show greater support for all management alternatives and payment mechanisms.

H8: Respondents who perceive the severity of pollution causes as greater are expected to show greater support for all management alternatives and payment mechanisms.

H9: Respondents with greater appreciation for the values of the A/P system are expected to show greater support for all management alternatives and payment mechanisms.

H10: Respondents with stronger environmental beliefs are expected to show greater support for all management alternatives and payment mechanisms.

Influences on Environmental Attitudes

Turning to the detailed results from the regression analysis, many interesting observations can be made about the relative importance of demographic characteristics, as well as of attitudes about water quality and natural resources. The tables in Appendix C follow the model presented in Figure 18. The appendix begins with a discussion of statistical analysis procedures, as well as details on variable measurement and coding. Measurement of the variables included in this section should be evident from the descriptive survey results just presented (including pertinent graphs and tables). Several scales that combine responses have been constructed. These are also described in Appendix C.

Effects of the set of variables on awareness of the A/P system for both the general public and public officials are shown in Table C-1 (See Appendix C). The most important predictor of awareness among the general public and public officials is distance from the A/P system. The negative coefficients indicate that, as expected, the shorter the distance from the A/P system, the greater the awareness of the system resources, uses and problems. Race, age and education are also significantly related to awareness. Whites, older persons, and those with a higher number of years schooling completed are most aware. Gender is not a significant predictor of awareness for either the general public or public officials.

Table C-2 shows the relationships between the background demographic variables and concern for water pollution and habitat problems. The index of concern includes items ranging from state level concern about water pollution to concerns about the A/P system specifically. The most important predictor of concern for the general public is age and for public officials it is distance from the A/P system. Older persons were more concerned which is the opposite of our hypothesis. As expected, those living closer to the system reported greater concern. Education is important only for the general public. Among public officials, whites are less concerned than nonwhites, which is contrary to expectations. Gender appears to be an important predictor of concerns for water pollution and habitat problems, with women being more concerned than men.

The model showing the relationships between perceived severity of causes of water pollution in the A/P system and the background variables is presented in Table C-3. The only significant predictor of perceived severity is gender, with women perceiving the causes to be more serious than men. No other variable, differentiates perceived severity of water pollution causes. Moreover, the set of variables explains a relatively small amount of the variation in this dependent variable especially for the public officials.

One of the most important aspects of this research was to assess the value people place on the resources of the A/P system. Among public officials distance from the system is the best predictor of perceived values. For the general public education is the most important. While distance is not most important among the general public, it is significant. For both groups, the shorter the distance from the system, the greater the value placed on the system. Race and education are significant variables in predicting perceived values among the general public. However, nonwhites place a greater value on the system than whites. Among public officials it appears that older persons place a greater value on the system than younger persons.

Some interesting results are found in the case of environmental beliefs. The relative ability of the background demographic variables to explain the strength of environmental beliefs vary from our theoretical expectations for the two groups. As shown in Table C-5, none of the coefficients are statistically significant for public officials. Among the general public, education level is the most important predictor, followed by race, age, and gender. Younger persons, those with more education, whites, and women have the strongest environmental beliefs. These results provide support to the idea that one's background characteristics affect beliefs, for members of the general public, but not for the public officials.

Support for Management Alternatives

The preceding discussion focused on the relationships between the independent and intervening variables. We now turn our attention to the effect each set of variables has on the dependent variables, namely support for management strategies and payment mechanisms. The relative explanatory value of the independent variables for a scale of support for all 15 management strategies are generally consistent with the hypotheses (Table C-6). Moreover, the results show that the intervening variables are powerful predictors of support for the management alternatives and that a substantial amount total variance is explained. It is also clear that the intervening attitudinal variables are better predictors than the independent, background variables for both public officials and the general public.

One interesting result reported in Table C-6 is that environmental beliefs are the most important determinant of support for all management alternatives, after controlling for the effects of all other variables in the model. This means that an increase in environmental beliefs, is associated with an increase in support for all management strategies. Among public officials all the intervening variables are significantly related to all management alternatives. Among the general public all but awareness and values of the A/P system are statistically significant. With the exception of awareness of the A/P system for the general public, all relationships between the intervening variables and support for all management alternatives are in the anticipated direction. That is, greater awareness (among public officials only), greater concern, greater perceived severity of causes, greater value of the system, and stronger environmental beliefs are associated with greater support of the management strategies. In the case of the demographic variables, only education has a positive impact on support for management strategies for both the general public and public officials. While many of the coefficients for the background characteristics are not statistically significant, they are in the expected direction. For the public officials, younger respondents showed more support for the management strategies than older respondents. Distance from the A/P system has a positive effect on support for all management strategies, contrary to expectations. That is, an increase in distance from the A/P system is associated with an increase in support.

Now that we have examined the combined model for all management strategies, it will be helpful to determine if the same relationships hold for each management alternative separately. The effects of the background (independent) and attitudinal (intervening) variables are not as consistently related to support for higher fines on industrial pollution (Table C-7). We do find that environmental beliefs are the best predictor of support for higher fines on industrial pollution for both public officials and the general public. There is a positive relationship between these variables. Concern for problems is the only other variable that has a statistically significant effect on support for higher fines. Among public officials, those who perceive the severity of causes to be greater, younger persons, and whites are most supportive of higher fines for the general public. For the general public, whites and persons with more formal education are most likely to support higher fines.

In Table C-8, we present the coefficients for the relationships between the independent and intervening variables and support for pollution taxes on industrial discharge. Again, we find that environmental beliefs have significant positive effects on the dependent variable. However, in the case of public officials, it is not the most important variable. Severity of causes is the best predictor among public officials. In fact, among public officials, no other variables have a significant effect on support for pollution taxes. Those general public respondents living farther from the A/P system and younger persons are more likely to support higher pollution taxes.

Tables C-9 and C-10, show the effects of the independent variables on support for higher fines and cost sharing of municipal treatment plants. There is a positive relationship between environmental beliefs and support for higher fines and cost sharing. Concern for problems and severity of pollution causes show a rather consistent pattern of relationships with support for higher fines and cost sharing for municipal treatment plants among the general public and public officials. Of the background variables, only race has a significant effect on support for higher fines for municipal treatment plants among public officials, with whites showing the greatest support. For the general public, men and those with more years of school are more likely to support higher fines than their counterparts. Nonwhites and younger respondents are most likely to support cost sharing. None of the other background characteristics has a significant impact on these dependent variables.

Some interesting results are found when we examine the models dealing with management alternatives about agricultural pollution (Tables C-11 and C-12). As with the preceding management alternatives, for both groups environmental beliefs are good predictors of support for tougher laws to control agricultural pollution and cost sharing of agricultural best management practices. Education level and perceived severity of causes of pollution have a positive impact on support for tougher laws to control agricultural pollution for both the general public and public officials. The only variable that is statistically significant for both groups in the case of cost sharing is race. Nonwhites are most supportive of cost sharing of agricultural best management practices. For the general public, women and younger respondents also expressed greater support for cost sharing. This set of independent and intervening variables explains a greater amount variance in the case of tougher laws than for cost sharing.

The models of the management alternatives for support of tougher laws to control fishing practices and support of cost sharing for fishing equipment are presented in Tables C-13 and C-14. Environmental beliefs continue to be a dominant variable in explaining variation in support for the management alternatives. For control of fishing practices, those public officials who perceive the severity of causes to be great and have greater awareness of the A/P system are most supportive. Among the general public, men, older persons, higher educated, those who perceive the severity of causes to be great, and those with greatest concern for problems are more supportive of tougher laws than their counterparts. Among public officials, the only other variable having a significant impact on support for cost sharing is gender, with men being most supportive. In the general public sample, women, younger persons, those who place the most value on the A/P system, and those who perceive the severity of causes to be greatest are most supportive of cost sharing.

The two management alternatives dealing with development are support for tougher enforcement of shoreline development laws and support for government purchase of undeveloped coastal land. The coefficients used to identify which independent variable impact these management alternatives are presented in Tables

C-15 and C-16. Controlling for the effects of the other variables in these two models, environmental beliefs is again the most important variable. It is interesting to note that among public officials, as distance from the A/P system increases, support for tougher enforcement of laws increases. Awareness and severity of causes are also significant factors for the public officials. Education level has a positive effect on support for tougher enforcement of shoreline development laws for both groups. Among the general public, whites, men, older persons, and those with greater concern for problems are more supportive of tougher enforcement of laws. Race is the only background variable that has any noteworthy influence on support for government purchase of land among the general public. Of the attitudinal variables, concern for problems and perceived severity of causes among the general public, and awareness of the A/P system, severity of causes and values of the A/P system among public officials have an influence on support for government purchase of coastal land.

The coefficients showing the relationships of the independent and intervening variables with support for tougher pollution laws on septic tanks are reported in Table C-17. For both groups, the higher education and greater distance from the A/P system, the greater the support for this management alternative. This is the first individual management alternative in which the distance variable was statistically significant for both groups. However, the pattern is positive. Environmental beliefs and perceived severity of causes positively impact support for tougher septic tank laws among the general public and public officials. Concern for problems among the general public and awareness of the A/P system for public officials are positively and significantly related to this management alternative.

The influences on support for stronger wetland protection laws are shown in Table C-18. Again, we find that environmental beliefs are the most important variable for both groups. The stronger the environmental beliefs, the more support for stronger wetland laws. Increased concern for problems and severity of causes of pollution are associated with an increase in support for stronger laws among both groups. In the general public sample, higher educated persons and whites support tougher laws. In the public officials sample those living farther away and those with a higher education do likewise.

Turning to the management alternative having to do with support for government education programs we find that distance once again is significant for both groups (Table C-19). For both groups, nonwhites tend to be more supportive. Among the general public, the young and higher educated tend to be more supportive than the older and less educated. In the case of the attitudinal variables, it is clear that environmental beliefs continue to be the most important explanatory variable for both groups. All other attitudes, except perceived severity of causes, are positively significant for the public officials. Concern for problems and perceived severity of causes among the general public positively affect support for education programs.

Results for the two remaining management alternatives (support for more research and support for increased water quality monitoring) are presented in Tables C-20 and C-21. For the public officials, all of the attitudinal variables positively and significantly influence support for research, except perceived severity of causes. All five attitudes support increased monitoring. With the exception of education, in the support for more research model, none of the background characteristics are statistically significant in either model for public officials. Among the general public, the effects of concern for problems, environmental beliefs, and age are significant for these two management alternatives. The negative effect of age implies that the young more strongly support research and water quality monitoring. Distance and education level are also positively related to these management alternatives.

Support for Payment Mechanisms

Respondents were asked to indicate their level of support for different ways government could raise money to pay for water quality and habitat protection programs. In this section, we report the results of regression analyses of the effect of background characteristics and attitudinal variables on the all payment mechanisms together and then separately. Table C-22 shows the relationships between the independent and intervening variables and a scale of overall support for all payment mechanisms. Not surprising, the environmental beliefs variable retains its ranking as the most important predictor. Among the other attitudinal variables, concern for problems and perceived severity of causes are positively and significantly related to support for the payment mechanisms. These relationships hold for both the general public and public officials. Of the background variables, education is the only one that is significantly associated with support for all the payment mechanisms among both groups. The relationships vary for the other background variables. Greater distance and younger age for the general public and male gender for public officials are important predictors of support for all payment mechanisms.

Turning now to the individual payment mechanisms, Table C-23 presents the results about support for raising business taxes. For the set of attitudinal variables, environmental beliefs and perceived severity of causes influence support for raising business taxes among both public officials and the general public. Values of the A/P system are significant for the general public. Distance, age (negatively) and gender affect support for raising business taxes in the general public sample. None of the background variables is significantly related to this payment mechanism among public officials.

As with the business taxes, environmental beliefs and perceived severity of causes influence support for raising building permit fees (Table C-24). This holds for both samples. Of the set of background variables, only education has an effect on this payment mechanism for the public official group. Distance, age (negative) and education are important variables in the model for the general public.

The results for raising property taxes are shown in Table C-25. As with the other payment mechanisms, environmental beliefs and perceived severity of causes emerge as significant predictors of support for raising property taxes. Again higher education is related to greater support for raising property taxes for each group. Whites and men in the public official sample support an increase in property taxes, whereas only the young significantly support raising property taxes among the general public.

For the payment mechanism of raising water and sewer rates, there is an evident increase in the number of background variables having an impact (Table C-26). Age and education level are significant for both groups. That is, the young and higher educated support this payment mechanism. For the general public sample, those living the greatest distance from the A/P system and whites are more supportive of raising water and sewer rates than their counterparts. Gender has a negative impact on this payment mechanism in the public official sample, with males showing the greatest support. Concern for water pollution and habitat problems emerges as a significant factor explaining variations in support for raising water and sewer rates for both samples. Environmental beliefs is the only other attitudinal variable significantly related to this payment mechanism for both groups. Perceived severity of causes is an important predictor in the model for the public officials.

Table C-27 presents the results for the payment mechanism of raising sales taxes. A distinctive feature of the data is that the estimated model explains a relatively smaller proportion of the variation in support for this payment mechanism than for the other payment mechanisms. Among public officials, the only variable significantly related to this payment mechanism is environmental beliefs. In the case of the general public, we find distance, age, and environmental beliefs to be related. The amount of variance explained may be quite small due to the unpopularity of this payment mechanism.

Table C-28 shows the influences on support for raising fishing and hunting license fees. Again, the estimated model does not do particularly well, but is better than the one for sales tax reported on above. The attitudinal variables do not explain much variation, with the exception of environmental beliefs for each group and perceived severity of causes in the model for public officials. It is interesting to note that among public officials distance is negatively related to this payment mechanism. That is, the shorter the distance, the greater the support. No other background variable is significant in the public official sample. Education level and gender are positively related to support for raising fishing and hunting license fees for the general public.

In the model of support for raising income taxes, we find for the first time that environmental beliefs are not statistically significant in the public official sample (Table C-29). However, the coefficient for environmental beliefs is in the right direction and it is significant for the general public. Perceived severity of causes emerges as an important predictor for both groups. Of the background variables, age and education level are important in the general public model. Gender, race and education level are important variables in the public official model. The young, higher educated, whites and males are most supportive of this payment mechanism.

One of the interesting findings shown in Table C-30 is the contrast in effects of distance on support for raising user fees for public facilities. In the case of the general public, distance is positively related to raising user fees, that is the farther the distance, the greater the support. For public officials, the opposite holds true. That is, the shorter the distance, the stronger the support for raising user fees. Race and education have an influence in the model for the general public, with whites and the higher educated showing the greatest support. No other background factor is relevant for public officials. Of the attitudinal variables, environmental beliefs have an influence in both groups, and perceived severity of causes is important among public officials.

Influences on support for raising luxury taxes are presented in Table C-31. Environmental beliefs and perceived severity of pollution causes have a positive effect on support for raising luxury taxes among both the general public and public officials. Results for the influence of the background characteristics are generally quite weak and tend to be inconsistent.

Finally, results about support for raising pollution fines are reported in Table C-32. Environmental beliefs continue to have a strong impact in both groups. The stronger the beliefs, the greater the support for raising fines for pollution. Concern for problems also emerges as an important predictor of this payment mechanism for both groups. Age appears to be an important predictor, with younger persons showing greater support for raising fines for pollution. Among the general public, persons living a greater distance from the A/P system and those with higher levels of school completed are more supportive of this payment mechanism than those living closer and those with lower levels of school completed.

In summary, these efforts to identify those groups most likely to support the various management alternatives and payment mechanisms, suggest a number of conclusions. There is clear and overwhelming support of the importance of environmental beliefs in understanding levels of support for the various management alternatives and payment mechanisms. Of the other attitudinal variables, perceived severity of causes and concern for problems are also important. These results suggest that in order to gain support for these payment mechanisms and management alternatives, it will be necessary to change values and beliefs. Simply increasing awareness alone will not be enough. Education level is the most important

demographic variable and age appears to be the second most important. These results can be used to target groups requiring special attention. Further implications of these results will be discussed in the final section of this report.

Willingness to Pay for Protecting the A/P System

One of the key goals of this project was to assess the extent to which people will be willing to pay more to protect water quality and habitat in the A/P system. A portion of the Phase II general public telephone survey contains a "contingent valuation" question. Contingent valuation (CV) is a method developed to estimate the value of non-market goods, such as water quality and habitat. Respondents were presented with the following policy referendum question:

> "We already pay for the types of government programs we've just discussed through federal, state, and local taxes **(THE MANAGEMENT ALTERNATIVES DISCUSSED EARLIER)**. However, government will need more money if water quality and fish and wildlife habitat in the A/P system are to be protected. This money would pay for state and local programs to control pollution, monitor water quality, protect habitat, and educate people. The goal would be to make sure water pollution does not get worse and habitat remains the same. Would you and your household be willing to pay **(RANDOMLY ASSIGNED VALUE BETWEEN $5 AND $100)** each year, in higher taxes, for these programs, if you knew the money would be used to protect the A/P system?"

Each respondent was randomly assigned a dollar value. Depending on whether a respondent said "yes" or "no" to the random start value, a bidding process ensued to reach the maximum value that a person would be willing to pay. More details on the methodology and analysis are presented in Appendix D.

The major result of statistical analysis of the data is a linear equation that shows the determinants of annual willingness to pay (WTP) for environmental quality. More thorough discussion about CV and complete documentation of data analysis are presented in Appendix D. A summary of this equation, emphasizing statistically significant determinants of WTP, is:

$$WTP = -0.12\,(PRICE) + 6.4\times10^{-4}\,(INCOME) - 0.49\,(AGE) - 7.66\,(GENDER) + 5.53\,(CONCERN) + 12.75\,(BELIEFS) + 4.28\,(ACTIVISM)$$ where

PRICE	=	travel and time costs of a trip to the A/P system,
INCOME	=	annual household income (in dollars),
AGE	=	age of the respondent (in years),
GENDER	=	equal to 1 (0) if the respondent is female (male),
CONCERN	=	a scale which measures increasing concern about water pollution and damage to habitat in the A/P system,
BELIEFS	=	a scale which increases with positive attitudes toward the environment,
ACTIVISM	=	a scale which increases with activities related to positive attitudes toward the environment.

The magnitude of the coefficients in the equation measure the dollar increase in WTP from a unit change in the independent variable. The sign of the coefficient indicates the direction of the relationship. For example, an increase in AGE of 1 year would lead to a decrease in WTP by $.49. Likewise, an one unit increase in CONCERN would increase WTP by $5.53.

Economic variables which influence WTP are PRICE and INCOME. As the travel and time costs of access to (PRICE) the A/P resources increases, WTP falls as predicted by theory. Willingness to pay is an income constrained statement of intended behavior since WTP increases with income. Demographic variables that influence WTP are AGE and GENDER. Results show that younger people and men are more willing to pay. Also, WTP increases with an increase in the three attitudinal variables (CONCERN, BELIEFS, and ACTIVISM). People who are more concerned about water pollution and habitat loss in the A/P system are willing to pay more for protection programs. Likewise, respondents with more strongly held environmental beliefs or who have engaged in more environmentally active behavior expressed a greater willingness to pay.

The overall sample mean WTP, estimated according to procedures specified in Appendix D, is $22.17 (95% confidence interval is; upper bound = $24.78, lower bound = $19.56). Mean WTP is fairly consistent across regions. Mean WTP is $19.16 in the Mountain region, $22.25 in the Piedmont region, $24.10 in the Coastal region, $22.72 in the Tidewater region, and $22.87 in Southeastern Virginia. The median WTP is $10.02 which suggests that 50% of the respondents would be willing to pay $10 per year to maintain water quality and wildlife habitat in the A/P system.

The Table below illustrates how WTP differs for different groups of respondents based on their age and income levels (sample size of each group can be found in Appendix D):

INCOME / AGE	Less than $25,000	Between $26,000 and $40,000	Greater than $40,000
Less Than 35	$23	$29	$37
Between 36 & 50	$18	$23	$33
Older than 50	$8	$12	$24

The largest monetary support for the environmental quality program comes from the relatively young and affluent. The least amount of support comes from older respondents with lower incomes. The negative relationship with AGE suggests that younger respondents will be more willing to pay for protecting the A/P resources. The positive relationship with family INCOME demonstrates that respondents who have more money will be willing to pay more for protecting the system.

The overall WTP estimate can be used to predict the outcome of an actual referendum vote. Replacing $A by $10 (median WTP) in the valuation question above would generate 50 percent "yes" and 50 percent "no" votes to an actual referendum. By lowering the $A presented in the referendum the percentage of yes votes will increase. Inferring from predicted referendum results, a majority of North Carolina and southeastern Virginia households (7,442,684 people/2.54 people per household) would support a water quality and habitat protection program with a cost of $29,301,910. This assumes a median willingness to pay about $10.00 a year for each of the 2,930,190 households. Full details are provided in Appendix D.

The WTP estimate can also be used to estimate the aggregate benefits of water quality and wildlife habitat improvements in the A/P system. Multiplying the mean annual WTP by the number of households in the sample area yields an annual benefit of $64,962,325 (upper bound = $72,610,133, lower bound = $57,314,536). Environmental protection efforts are economically efficient if annual economic benefits are greater than annual protection costs.

SUMMARY AND CONCLUSIONS

Results of this research should help inform public officials, scientists, interest groups, and others about public education needs and policy options for natural resource management in the Albemarle-Pamlico Estuarine (A/P) system. In this final chapter, we summarize some of the key findings and discuss the implications for education and public policies. We continue to highlight some of the significant differences among groups of respondents, particularly those between public officials and the general public.

Awareness and Beliefs

The results show only moderate awareness about the resources and problems of the A/P system. Proactive and strategic educational programs need to be developed and implemented. Such programs should target groups that expressed the least awareness. For example, people living farther from the A/P system may need special attention because they had heard or read less about the A/P system. Younger people expressed less awareness and represent an important target audience, especially for future programs. These patterns were similar for the public officials, as well as the general public.

Our results show the important role that mass media communication plays in educational efforts (especially for the general public). Television appears to be the universal source of information for respondents. However, the wide coverage and use of this medium needs to be balanced with the relatively narrow amount of information that television can provide (except through documentaries). In-depth educational programs should be developed and more widely used. Public officials rely on many more sources of information than the general public. In particular, they tend to receive quite a lot of information from environmental groups and government agencies.

Almost all respondents place a high value on the resources of the A/P system. In fact, non-economic values were reported to be more important than economic values, especially for the general public. The general public attached greater value than public officials to knowing that other people could enjoy the resources, as well as to passive recreational uses. This implies that educational efforts should focus on both the noneconomic and economic benefits and costs. Public officials, on the other hand, saw economic uses (such as commercial and recreational fishing) as more important than did the general public. Educational efforts should focus on people who live farther from the A/P system and other groups who rated the values as less important.

Results from all three surveys indicate that a majority of respondents hold strong environmental beliefs (as measured by the New Environmental Paradigm scale). While public officials were less likely than the general public to hold many of these beliefs, most did express favorable environmental beliefs. Among the general public, certain groups tend to hold the beliefs more strongly: women, whites, younger people, and more highly educated individuals. On the other hand, no demographic factors influenced the environmental beliefs of the public officials. Given that such environmental beliefs have a major influence on support for alternative management efforts, educational efforts aimed at promoting general environmental beliefs could be as important as education specifically focused on the A/P system.

Problem Recognition and Concern

The results clearly show considerable concern over water pollution problems. Concerns about water pollution were greater at the state or local level, than for the A/P system. Such concerns tend to be even greater for the loss of fish and wildlife habitat in the A/P system, especially among the general public. Concern for pollution and habitat loss was highest among women, older respondents, and those living closer to the A/P system. This suggests the need to stress the relevance of the A/P system problems, as well as the importance of habitat, to the values and environmental beliefs respondents hold.

Responses to the questions about the causes of pollution problems in the A/P system point to considerable confusion and a general lack of understanding. Both groups tend to see point sources as much more serious than nonpoint sources. Factories were seen as the most serious problem, which is likely due to their highly visible nature and a tendency by both groups to blame industry for the pollution problems. There are some differences between the general public and public officials regarding the relative effect of different sources of pollution on the A/P system. The general public is much more likely to report that litter or garbage (which is also highly visible), as well as home and garden chemicals, have a major effect on water quality in the A/P system. Public officials, on the other hand, are much more likely to see cropland runoff as a major cause of water pollution.

It appears that public perceptions are not in line with the technical data about causes of pollution in the A/P system. Educational programs clearly need to inform the general public, and to a lesser degree public officials, about the relative severity and consequences of all types of pollution. This will be particularly important for nonpoint source pollution which is less dramatic, but generally contributes more to pollution problems in the A/P system. The causes and solutions to nonpoint source pollution involve the actions of many individual land owners, further reinforcing the need for greater education.

Respondents from both groups were likely to feel that government is doing too little to control water pollution from all the various sources. The general public was more likely to feel this way than public officials. Again, it is interesting to note that the general public saw the least amount of control over industrial waste, shoreline development, and municipal sewage. These areas are already, in fact, the most heavily regulated sources of pollution. Public officials were more likely to rate agricultural nonpoint sources as needing relatively more control. Most respondents saw the need for greater enforcement of existing water quality regulations.

Support for Management Alternatives

Results of this research show considerable support for a wide range of alternative strategies for managing water quality and natural resources in the A/P system. There is very strong support for research, monitoring, and educational programs aimed at improving the A/P system. Further research and monitoring would increase our understanding of the physical, biological, and social conditions of the A/P system. Enhanced educational programs would help maintain and build public support for management of the A/P system. This will be particularly true in light of the need to raise funding for stronger and more effective management strategies.

In light of the results discussed earlier, it is not surprising that enforcement of existing regulations, especially those dealing with point source pollution, are among the most highly supported alternatives. In fact, four of the next five most popular alternatives (after those on research, monitoring, and education) had to do with controlling point source pollution. There is clear support for tougher enforcement of existing laws on industry and municipal point sources, even if this means higher personal and social costs. Strong support also exists for regulations on septic tanks and tougher enforcement of existing development laws.

Given the relatively low recognition of more subtle, but significant impacts of nonpoint source pollution, it is not surprising that the alternatives for controlling agricultural pollution received somewhat less support than those related to point sources. Cost sharing for farmers was more popular than tougher regulations, especially among the general public. Strategies for managing the impacts of fishing practices on the A/P system were relatively low in terms of overall support. However, a majority still favored even the least popular management alternatives.

The results also show that certain factors can have an important influence on overall acceptance of new management strategies. Among the general public, formal educational level was the only demographic characteristic that had any influence on support for the management alternatives. Most of the influence was due to the beliefs and attitudes. Our most consistent finding is that respondents who hold stronger environmental beliefs also tend to support the management alternatives. Support is

also highest among citizens who are most concerned about pollution and habitat problems, as well as those who perceive the various causes of pollution as more severe. The pattern is similar for the public officials. However, public officials who were younger and lived farther from the A/P system were more likely to support the management alternatives. For the public officials, all five intervening attitudes and beliefs had an important influence on support.

Willingness to Pay for Management

Results of the contingent valuation analysis indicate a considerable willingness to pay for new or improved programs for managing the A/P system. Even with the relatively conservative estimates of this research, support levels ($29 million) should help fund new and existing management efforts. It is important to realize that what people say on a survey may not translate directly into behavior. Ultimately, willingness to pay for management efforts depends upon a number of factors, including educational efforts, political considerations, and the nature of a proposed program (e.g., the payment mechanism). In addition, it is important to realize that public willingness to pay is based upon the premise that such money would, in fact, be used to manage the A/P system (rather than simply go to the general revenue fund).

Among the general public, certain respondents appear most willing to pay. As expected, respondents with higher income levels were more willing to pay higher amounts. Younger respondents were also more willing to pay than older persons. Men also expressed a greater willingness to pay. Environmental beliefs and reported environmental behavior (activism) were also among the strongest predictors of willingness to pay. It is also interesting to note that certain factors did not have an influence on willingness to pay for managing the A/P system. We found no significant differences based on respondents' educational level or race. Furthermore, willingness to pay was fairly consistent across all geographic regions.

Results show that certain payment mechanisms would be more acceptable to both the general public and public officials. In general, various forms of user fees are most acceptable because they presumably would be fairer than various types of taxes. Clearly, there is a strong sentiment that groups who benefit from and/or degrade the resources of the A/P system should pay the most for protecting the system. There was overwhelming support for higher pollution fines. Support was also high from both groups for raising fees charged to sportsmen and users of various public facilities, as well as for raising building fees and water/sewer rates. Public officials were even more likely than the general public to support the various user fees. The only form of tax that appears acceptable to most respondents involves raising luxury taxes. Raising business taxes was relatively more acceptable to the general public than the public officials. There is relatively low support for raising three more general types of taxes (i.e., sales taxes, property taxes, or income taxes).

Overall, certain groups appear most likely to support the various payment mechanisms. Among the general public, younger people, those with more formal education, and those living farther from the A/P system were most likely to support most of the payment mechanisms. For the public officials, we find that men and people with more formal education were most likely to support most payment alternatives. Once again, environmental beliefs and attitudes play the most important role in the overall support for the payment mechanisms. Respondents from both groups were more likely to support the payment mechanisms if they: expressed greater concern for pollution and habitat problems; perceived the various causes of pollution more severe; and held stronger environmental beliefs.

An effort was made to better understand how respondents to both surveys ranked the importance of protecting the A/P system relative to other programs. Both groups rated protection of the A/P system as more important than four of the six other programs used for comparison (highway construction, economic development, welfare and public assistance, and agricultural programs). Two programs (crime control and public school education) were considered more important than protecting the A/P system. These results demonstrate once again the high level of support that exists for protecting the resources of the A/P system.

In general, environmental beliefs and values have an important relationship with overall willingness to support and pay for new management alternatives. This again points to the need for more effective and proactive educational programs to develop such beliefs and values. Such programs need to clearly and convincingly explain the full range of values and benefits provided by the A/P system. Educational efforts also need to inform people about the causes of pollution and the roles of citizens and organizations in controlling such problems.

Policy Development and Implementation

Responses by public officials to the mail survey provide additional guidance in developing public policies and implementing programs for improving management of the natural resources in the A/P system. They rated a number of factors as to the extent to which each one limited the effectiveness of management efforts. Many of the most serious barriers can be classified as social or institutional (i.e., conflicts among special interests, low levels of public knowledge, inadequate enforcement of existing laws, lack of citizen participation, and complex regulations). These barriers point to the need for more proactive and innovative educational programs, as well as the need for more research and public policy analysis. Economic barriers (inadequate government funding and insufficient economic incentives) are often thought to be the most formidable barriers. However, these two barriers were rated as only moderately serious. Another common belief is that private property rights present an

insurmountable barrier to more effective public policies and programs. However, this was rated as the least significant barrier.

Public officials expressed the need to improve cooperation among the various government agencies and private groups involved with managing the A/P system. Most believe the agencies and groups work together poorly. They also recognize the need to enhance coordination of existing policies and programs. There was strong support among public officials for a regional planning and management organization. Membership for such a group should be broad based and include citizens groups, industry, local government, and other affected groups. Public officials felt that local government and property owners currently have too little influence over management of the A/P system. Several groups of resource users (e.g., fisherman) were seen as having the right amount of influence. Three groups (industry officials, the federal government, and developers/builders) were seen as having too much influence on decisions.

The general public was asked to rate many of the same groups as to the level of trust or confidence they had in the willingness and ability of each to effectively protect water quality and habitat in the A/P system. By far, the public reported the most confidence in environmental groups (which are generally seen as working to protect the public interest). This contrasts with the opinions of public officials, many of whom felt that environmental groups had too much influence. Other groups receiving a high vote of confidence from the general public included: fishermen, homeowners, and farmers. The general public gave the three main levels of government the same basic level of confidence (moderate). Public confidence in government policies and programs could be enhanced by educational efforts. Two groups were seen by the public as relatively untrustworthy when it comes to protecting the natural resources of the A/P system: developers/builders and industry officials. Public officials also tended to feel both these groups had too much influence over decisions.

Public officials have different views about the roles that different levels of government should play in programs to manage the A/P system. In terms of both setting policies and implementing programs, a majority felt the state government should play the lead role. Public officials also stated that county government should play a greater role than city or town government. Most felt the federal government should have a relatively small role in setting policies and implementing programs.

The public officials and general public both want citizens to have more opportunity to influence government decisions about management of the A/P system. However, only a minority of the public participates in public meetings and hearings. Apparently citizens are either unaware of or not interested in such formal channels. Meaningful public involvement can be facilitated by a variety of new and existing educational and involvement efforts. Certain groups (such as the Cooperative Extension Service) have the knowledge, expertise, and delivery system to play a

major role in public education and involvement. Other local organizations, (such as schools and churches) can also play a vital role in facilitating the types of long-term changes in public beliefs and behavior that should accompany any sustainable efforts at protecting and managing the A/P system.

Our results clearly demonstrate the need for a more integrated approach to managing the resources of the A/P system. In particular, public officials noted a lack of cooperation among agencies and other groups. The general public seems to not understand the complexity of the issues facing the A/P system. Public policies and programs need to be based on a clear recognition of the complexity and scale of the management challenges in an area as vast and diverse as the A/P system. Public officials felt that a regional governing body would help ensure that the needs of all parts of the watershed are addressed. Results suggest the importance of a longer time horizon that fully considers the benefits and costs of alternative uses for the A/P system, especially for future generations.

Overall, the results of this project show a high level of concern for the A/P system resources. Considerable support for all management alternatives and a high level of willingness to pay were also evident. However, more research is clearly needed to systematically evaluate specific strategies in terms of their potential social and economic impacts on different groups. New management strategies need to be perceived as both equitable and effective. Public policies and programs often have indirect impacts that are not easily foreseen. Greater emphasis on public education and involvement can help ensure that negative impacts are minimized.

APPENDIX A

TELEPHONE SURVEY INSTRUMENT

1991 PUBLIC ATTITUDES ABOUT WATER QUALITY

RESPONDENT NAME

(If needed for callbacks.)

ID (1-4)
SN (5)

CARD 1 (6)

INTERVIEW START TIME: : - INTERVIEW END TIME: :

CONTACT STATUS

TIME												
DATE												
STATUS												

STATUS CODES

AM	ANSWERING MACHINE	DL	DEAF/LANGUAGE	OS	OUT OF SERVICE
BG	BUSINESS / GOVERNMENT	HI	HOUSEHOLD INELIGIBLE	PC	PARTIALLY COMPLETED
BS	BUSY SIGNAL	IN	INSTITUTIONALIZED	RF	REFUSAL
CB	CALL BACK / APPOINTMENT SET	NA	NO ANSWER	TI	TERMINATED INTERVIEW
CI	COMPLETED INTERVIEW	NL	NO LISTING	WN	WRONG NUMBER
CL	CAN'T LOCATE / UNAVAIL.				

INTRODUCTION

Hello, my name is _____ and I'm calling from North Carolina State University. Have I reached (_VERIFY TELEPHONE NUMBER_)? We are conducting a survey to find out what citizens think about water quality and natural resources in the coastal areas.

Are you 18 years old or older?

Yes..... 1
No..... 2

(IF NO) May I please speak to someone who is over 18?
(THEN REPEAT INTRODUCTION)

Do you live in this home 6 or more months out of the year?

Yes **[GO TO START]**..... 1
No..... 2

(IF NO) Is there any other adult member who lives in this household 6 months or more out of the year?

Yes **[ASK TO SPEAK TO THAT ADULT AND REPEAT INTRODUCTION]**..... 1
No **[TERMINATE CALL]**..... 2

***START**
Your phone number was selected at random. All information you give us will be treated confidentially. This interview will take about 20 minutes. Would you have time now?

Yes **[CONTINUE WITH Q1]**..... 1
No **[SET UP A CALLBACK TIME]**..... 2

PUBLIC ATTITUDES ABOUT WATER QUALITY - 1991

1. Thinking about the entire state of North Carolina/Virginia, are you: very concerned, somewhat concerned, or not concerned about pollution of lakes and rivers?

VERY CONCERNED 3
SOMEWHAT CONCERNED 2
NOT CONCERNED 1

2. In your own area, are you very concerned, somewhat concerned, or not concerned about pollution of lakes and rivers?

VERY CONCERNED 3
SOMEWHAT CONCERNED 2
NOT CONCERNED 1

For most of this interview, I want you to think about the Albemarle and Pamlico Sounds, which are the large bodies of water in Eastern North Carolina inside the Outer Banks. Also think about the rivers that flow into these sounds (such as the Chowan, Roanoke, Neuse, Tar, and Alligator Rivers). Thirty-six North Carolina counties and 16 Virginia counties are in the area drained by these rivers and sounds. I will refer to this area as the "A-P system".

3. In general, how much have you heard or read about the resources, uses, and problems of the A-P system. Would you say:

A Lot 4
Some 3
A Little, or 2
Nothing 1

4. In this system of rivers and sounds, are you very concerned, somewhat concerned, or not concerned about water pollution?

VERY CONCERNED 3
SOMEWHAT CONCERNED 2
NOT CONCERNED 1

5. These rivers and sounds provide habitat for fish, birds, and other wildlife. Are you very concerned, somewhat concerned, or not concerned about damage to fish and wildlife habitat in the A-P system?

VERY CONCERNED 3
SOMEWHAT CONCERNED 2
NOT CONCERNED 1

6. During the past 12 months did you or anyone in your household use the A-P system for fishing, swimming, boating, or other purposes?

YES 1
NO (SKIP TO Q8) 0
DON'T KNOW 8

7. (IF YES): About how often did you use the A-P system? Would you say (READ RESPONSES)

Weekly, ... 4
Monthly, ... 3
Every few months, or 2
Once or twice a year? 1
DON'T KNOW 8

8. During the past 12 months did you or anyone in your household use any other bodies of water (including the ocean) for fishing, swimming, boating, or other purposes?

YES 1
NO (SKIP TO Q10) 0
DON'T KNOW 8

9. (IF YES) About how often did you use these areas? Would you say: (READ RESPONSES)

Weekly, ... 4
Monthly, ... 3
Every few months, or 2
Once or twice a year? 1
DON'T KNOW 8

10. People have different reasons for valuing the rivers and sounds of the A-P system. Is (READ ITEM) very important, somewhat important, or not important to you personally?

		VI	SI	NI
a.	Use of the A-P system for recreational fishing, boating, or swimming	3	2	1
b.	Use of the A-P system by commercial fishermen	3	2	1
c.	Use of water for city or town water supplies	3	2	1
d.	Use of areas near the rivers and sounds for picnicking, bird watching, or nature study	3	2	1
e.	Fish and wildlife habitat in the A-P system	3	2	1
f.	The economic benefits related to recreation and tourism in the A-P system	3	2	1
g.	Knowing that other people may use and enjoy the A-P system	3	2	1
h.	Knowing that the A-P system is protected for future generations	3	2	1

11. Now I would like to know how much you and your household value water quality and fish and wildlife habitat in the A-P system. This system provides a number of benefits, such as recreation, tourism, commercial fishing, food production, and wildlife habitat. Many people also like to know the rivers and sounds will be protected for future generations.

Would it be worth **(START WITH RANDOMLY ASSIGNED HIGHLIGHTED VALUE)** each year to you and your household to make sure water pollution does not get worse and wildlife habitat remains the same in the A-P system?

$5 $10 $15 $20 $30 $40 $50 $60 $70 $80 $90 $100

(IF YES, CONTINUE WITH NEXT HIGHEST VALUE UNTIL RESPONDENT SAYS "NO" OR YOU REACH $100.00)

(IF NO, CONTINUE WITH NEXT LOWEST VALUE UNTIL RESPONDENT SAYS "YES" OR YOU REACH $5.00)

	YES	NO
$5	1	0
$10	1	0
$15	1	0
$20	1	0
$30	1	0
$40	1	0
$50	1	0
$60	1	0
$70	1	0
$80	1	0
$90	1	0
$100	1	0

ASK Q12: IF YES TO $100 OR IF NO TO $5.

12. What is the most that protecting this system would be worth to you and your household each year?
(ROUND TO NEAREST WHOLE DOLLAR)

$___ ___ ___

13. There's disagreement about how much effect different sources of pollution have on water quality in the A-P system.
* Do you think (READ ITEM) has/have a lot (A), some (S), or almost no (N) effect on water quality in the A-P system?
(START WITH HIGHLIGHTED ITEM)

		A	S	N	DK
a.	City or county sewer systems*	3	2	1	8
b.	Household septic tanks*	3	2	1	8
c.	Factories or other industries*	3	2	1	8
d.	Building construction*	3	2	1	8
e.	Cropland runoff*	3	2	1	8
f.	Logging or forest practices*	3	2	1	8
g.	Runoff from streets and highways*	3	2	1	8
h.	Boating and marinas*	3	2	1	8
i.	Litter or garbage*	3	2	1	8
j.	Home lawn or garden chemicals*	3	2	1	8
k.	Livestock waste*	3	2	1	8

14. Some industries exceed legal limits on waste discharge which increases pollution in the A-P system. Tougher enforcement of existing laws and higher fines have been proposed. However, this could mean higher prices for products and/or lost jobs. Do you strongly support, support, oppose, or strongly oppose higher fines for industries?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

15. Another option would require industries to pay a tax on the pollution they discharge within legal limits. Do you strongly support, support, oppose, or strongly oppose this type of pollution tax?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

16. Some cities exceed legal limits on waste discharge which increases pollution in the A-P system. Tougher enforcement of existing laws and higher fines have been proposed. However, this could mean increased sewer fees and taxes for residents of those cities. Do you strongly support, support, oppose, or strongly oppose higher fines for cities?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

17. Do you strongly support, support, oppose, or strongly oppose using government money to help cities build new sewage treatment plants and other water pollution control facilities?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

18. Some chemicals, livestock waste, and soil erosion from farming pollute the A-P system. Tougher laws that would require farmers to control pollution have been proposed. However, this could mean higher food prices and/or some farmers going out of business. Do you strongly support, support, oppose, or strongly oppose tougher pollution control laws for farming practices?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

19. Do you strongly support, support, oppose, or strongly oppose using government money to help farmers install pollution control practices?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

20. Some fishing practices, such as trawling and mechanical harvesting, can damage fishing and fish habitat in the A-P system. Tougher laws to restrict such practices have been proposed. However, this could mean higher seafood prices and/or some fishermen going out of business. Do you strongly support, support, oppose, or strongly oppose tougher laws for fishing practices?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

21. Do you strongly support, support, oppose, or strongly oppose using government money to help fishermen buy new equipment to protect fishing and fish habitat?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

22. Some shoreline development, including houses, resorts, and marinas, pollutes water and damages habitat in the A-P system. Tougher enforcement of existing development laws have been proposed. However, this could increase housing costs and/or take away some land owners' options for using their property. Do you strongly support, support, oppose, or strongly oppose tougher enforcement of development laws?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

23. Do you strongly support, support, oppose, or strongly oppose using government money to buy undeveloped coastal land to keep it in its natural condition?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

24. Some household septic tanks pollute the A-P system. Tougher regulations for septic tank installation and maintenance have been proposed. However, this could mean increased costs for homeowners with septic tanks. Do you strongly support, support, oppose, or strongly oppose tougher pollution control laws for septic tanks?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

25. Wetlands include marshes, swamps and bogs. They provide habitat, improve water quality and reduce flooding. Stronger laws to prevent loss of wetlands have been proposed. However, this could take away some property owners' options for using their property. Do you strongly support, support, oppose, or strongly oppose stronger wetland protection laws?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

26. Do you strongly support, support, oppose, or strongly oppose government programs to educate people about water quality and habitat in the A-P system?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

27. Do you strongly support, support, oppose, or strongly oppose more research to better understand pollution and habitat needs in the A-P system?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

28. Do you strongly support, support, oppose, or strongly oppose increased water quality monitoring programs that would help regulate sources of water pollution?

STRONGLY SUPPORT 4
SUPPORT 3
OPPOSE 2
STRONGLY OPPOSE 1

BLANK

DUP ID

CARD 2

29. We already pay for the types of government programs we've just discussed through federal, state, and local taxes. However, government will need more money if water quality and fish and wildlife habitat in the A-P system are to be protected. This money would pay for state and local programs to control pollution, monitor water quality, protect habitat, and educate people. The goal would be to make sure water pollution does not get worse and habitat remains the same.
Would you and your household be willing to pay **(START WITH HIGHLIGHTED VALUE)** <u>each year</u>, in higher taxes, for these programs, if you knew the money would be used to protect the A-P system?

$5 $10 $15 $20 $30 $40 $50 $60 $70 $80 $90 $100

(IF YES, CONTINUE WITH NEXT <u>HIGHEST</u> VALUE UNTIL RESPONDENT SAYS "NO" OR YOU REACH $100.00)
(IF NO, CONTINUE WITH NEXT <u>LOWEST</u> VALUE UNTIL RESPONDENT SAYS "YES" OR YOU REACH $5.00)

	<u>YES</u>	<u>NO</u>
$5	1	0
$10	1	0
$15	1	0
$20	1	0
$30	1	0
$40	1	0
$50	1	0
$60	1	0
$70	1	0
$80	1	0
$90	1	0
$100	1	0

ASK Q30: IF YES TO $100 OR IF NO TO $5

30. What is the most that you and your household would be willing to pay each year for these programs? **(ROUND TO NEAREST WHOLE DOLLAR)**
IF ANY AMOUNT SKIP TO Q32 $__ __ __

31. **(IF NOT WILLING TO PAY ANYTHING)** Why would you not be willing to pay anything? **(DO NOT READ RESPONSES - CIRCLE <u>ALL</u> THAT ARE GIVEN)**

COST/AMOUNT TOO HIGH	1
POLLUTERS SHOULD PAY	1
GOVERNMENT NOT EFFECTIVE OR CORRUPT	1
DON'T TRUST	1
TAKE FROM EXISTING TAXES	1
ALREADY PAYING ENOUGH IN TAXES	1
CAN'T PUT DOLLAR VALUE ON RESOURCES	1
OPPOSE THIS TYPE OF QUESTION	1
ENVIRONMENT IS CLEAN ENOUGH	1
PROBLEMS NOT SERIOUS ENOUGH	1
SYSTEM RESOURCES NOT WORTH IT	1
SYSTEM RESOURCES NOT IMPORTANT	1
DON'T USE SYSTEM RESOURCES	1
OTHER (SPECIFY)	
_____	____

32. There are different ways government could raise money to pay for water quality and habitat protection programs. * Would you strongly support, support, oppose, or strongly oppose raising (READ ITEM) to protect the A-P system: (START WITH HIGHLIGHTED ITEM)

		SS	S	O	SO
a.	Business taxes	4	3	2	1
b.	Building permit fees	4	3	2	1
c.	Property taxes	4	3	2	1
d.	Water and sewer rates	4	3	2	1
e.	Sales tax	4	3	2	1
f.	Fishing and hunting license fees	4	3	2	1
g.	Income taxes	4	3	2	1
h.	User fees for public facilities	4	3	2	1
i.	Luxury taxes	4	3	2	1
j.	Fines for pollution	4	3	2	1

33. I'm going to read you a list of things that government does that I want you to compare with water quality and habitat protection programs. If new money were available, should it be spent on (READ ITEM) or protecting the A-P system?

(START WITH HIGHLIGHTED ITEM)

		Item	Water
a.	Crime control	1	2
b.	Highway construction	1	2
c.	Public school education	1	2
d.	Economic development	1	2
e.	Welfare and public assistance	1	2
f.	Agricultural programs	1	2

34. How much confidence or trust do you have in the willingness and ability of (READ ITEM) to effectively protect water quality and habitat in the A-P system.

* Do you have a lot (A), some (S), or almost no (N) trust in (READ ITEM)?

		A	S	N
a.	County government officials*	1	2	3
b.	State government officials*	1	2	3
c.	Federal government officials*	1	2	3
d.	Industry officials*	1	2	3
e.	Farmers*	1	2	3
f.	Fishermen*	1	2	3
g.	Home Owners*	1	2	3
h.	Developers and builders*	1	2	3
i.	Environmental groups	1	2	3

35. I'd like to read you a list of statements. For each statement I read, please tell me whether you Strongly Agree, Agree, Disagree or Strongly Disagree with the statement. The first statement is: **(START WITH HIGHLIGHTED STATEMENT)**
* Do you Strongly Agree, Agree, Disagree, or Strongly Disagree with this statement?

		SA	A	D	SD
a.	We are approaching the limit of the number of people the earth can support.*	4	3	2	1
b.	The balance of nature is very delicate and easily upset.*	4	3	2	1
c.	Humans have the right to modify the natural environment to suit their needs.*	4	3	2	1
d.	Mankind was created to rule over the rest of nature.*	4	3	2	1
e.	When humans interfere with nature it often produces disastrous consequences.*	4	3	2	1
f.	Plants and animals exist primarily to be used by humans.*	4	3	2	1
g.	To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.*	4	3	2	1
h.	Humans must live in harmony with nature in order to survive.*	4	3	2	1
i.	The earth is like a spaceship with only limited room and resources.*	4	3	2	1
j.	Humans need not adapt to the natural environment because they can make it suit their needs.*	4	3	2	1
k.	There are limits to growth beyond which our industrial society cannot expand.*	4	3	2	1
l.	Mankind is severely abusing the environment.*	4	3	2	1

36. During the past 12 months have you (READ ITEM):

		Yes	No
a.	Recycled newspapers, glass, or other items	1	0
b.	Reduced water use by conservation	1	0
c.	Reduced use of lawn and garden chemicals	1	0
d.	Contributed money or time to an environmental or wildlife conservation group	1	0
e.	Stopped buying a product because it caused environmental problems	1	0
f.	Attended a public hearing or meeting about the environment	1	0
g.	Contacted a government agency to get information or complain about an environmental problem	1	0
h.	Read a conservation or environmental magazine	1	0
i.	Watched a television special on the environment	1	0
j.	Voted for or against a political candidate, in part, because of his or her position on the environment	1	0

I just have a few more questions that I need to ask for statistical reasons. Remember that everything you say will be treated confidentially.

37. What county do you live in?_____
[RECORD COMPLETE RESPONSE FOR VIRGINIA)

EDITOR CODE ___ ___ ___

38. Is your home located in a rural area, a small town, a suburb or a city?

RURAL AREA 1
SMALL TOWN 2
SUBURB 3
CITY 4

39. Does your present home have central sewer service or a septic tank?

SEWER SERVICE 1
SEPTIC TANK 2
DON'T KNOW 8

40. Do you own or have part ownership in any property at or near the coast?

YES 1
NO 2
DON'T KNOW 8

41. Are you presently working, retired, going to school, keeping house, or something else?

WORKING / LOOKING FOR WORK (GO TO Q42)	1
RETIRED (GO TO Q43)	2
HOMEMAKER (GO TO Q44)	3
GOING TO SCHOOL (GO TO Q45)	4
UNABLE TO WORK-LONG TERM ILLNESS/DISABILITY (GO TO Q45)	5

42. What kind of work do/did you normally do on your main job? (PROBE: What are/were some of your main duties?)

_____

_____ EDITOR CODE ___ ___

SKIP TO Q45

43. **(IF RETIRED)** What did you do on your most recent job?

_____

_____ EDITOR CODE ___ ___

SKIP TO Q45

44. **(IF HOMEMAKER):** What is (was) the occupation of the main provider in your household?

_____

_____ EDITOR CODE ___ ___

45. Do you or anyone else in your family own or operate a farm?

YES	1
NO	0

46. What is the highest grade of school you have completed? **(PROBE TO CIRCLE ONLY ONE)**

ONE	01	1 YEAR ASSOCIATE	13
TWO	02	2 YEAR ASSOCIATE	14
THREE	03	1 YEAR COLLEGE, NO DEGREE	15
FOUR	04	2 YEAR COLLEGE, NO DEGREE	16
FIVE	05	3 YEAR COLLEGE, NO DEGREE	17
SIX	06	BACHELOR'S (BA, BS, AB)	18
SEVEN	07	SOME GRADUATE-NO DEGREE	19
EIGHT	08	MASTER'S (MS, MA, MSW, MBA, MEd, MEng)	20
NINE	09		
TEN	10	PROFESSIONAL (MD, DDS, DVM, LLB, JD)	21
ELEVEN	11		
HIGH SCHOOL (Diploma/GED)	12	DOCTORATE (Ph.D, EdD)	22

47. In what year were you born? YEAR 19 _____

48. Which of the following categories best represents your family's 1990 total income before taxes? Please include all income sources such as wages, salaries, pension dividends, net farm income, and government payments. **(READ CATEGORIES)**

Less than $5,000	01
Between $5,001 and $10,000	02
Between $10,001 and $20,000	03
Between $20,001 and $30,000	04
Between $30,001 and $40,000	05
Between $40,001 and $50,000	06
Between $50,001 and $60,000	07
Between $60,001 and $80,000	08
Between $80,001 and $100,000	09
Between $100,001 and $200,000	10
More than $200,000	11

49. Are you white, black, American Indian, or some other race?

WHITE	1
BLACK	2
AMERICAN INDIAN	3
OTHER_____	4

50. CODE RESPONDENT'S GENDER **(DO NOT ASK UNLESS UNSURE)**:

MALE	1
FEMALE	2

51. If you would like to receive a **free** newsletter from the Albemarle-Pamlico Estuarine Study, I can give you a number to call. This newsletter will include results of this study and other studies.

YES	1
NO **(GO TO END)**	0

* **IF RESPONDENT SAYS YES OR OK:**

The number is 919-946-6481.

* **END** This completes the interview. Thank you very much for your time and cooperation.

APPENDIX B

MAIL SURVEY INSTRUMENT

We want you to respond to this survey in your capacity as a public official, rather than as a private citizen. Your insights and advice will be extremely important for future management of our state's vital natural resources. Because the Albemarle and Pamlico Sounds are important to North Carolina, this survey is being sent to a sample of public officials from across the entire state.

For many questions, we are asking for your opinion. There are no right or wrong answers. For most questions, you should circle the number of the response that most closely matches your opinion.

All the information you give us will be treated confidentially. Your name will never be associated with any of your answers. We have an identification number on the questionnaire so we can keep track of who has returned the survey. That number will be removed from the form once it has been recorded.

After you have completed all questions, simply tape or staple this booklet closed. No postage is required. If you have questions, you may contact the researchers at N.C. State University who are conducting this project: Dr. Tom Hoban at (919) 515-2670 or Dr. Bill Clifford at (919) 515-2702.

Thank you in advance for your careful attention to this matter.

_____ (1-5)

CARD 1 (6)

1. Thinking about the entire state of North Carolina, how concerned are you about pollution of lakes and rivers?

   Not Concerned.....1
   Somewhat Concerned.....2
   Very Concerned.....3

   (7)

2. In your own area, how concerned are you about pollution of lakes and rivers?

   Not Concerned.....1
   Somewhat Concerned.....2
   Very Concerned.....3

   (8)

3. How much information have you received about water pollution from each of the following sources?

(Circle one answer for each of the following.)	None	Some	A Lot	
a. Newspapers	*1*	*2*	*3*	(9)
b. Books	*1*	*2*	*3*	(10)
c. Magazines	*1*	*2*	*3*	(11)
d. Television	*1*	*2*	*3*	(12)
e. Radio	*1*	*2*	*3*	(13)
f. Conversations with people	*1*	*2*	*3*	(14)
g. Government publications or agencies	*1*	*2*	*3*	(15)
h. Environmental groups	*1*	*2*	*3*	(16)
i. Elected officials	*1*	*2*	*3*	(17)

ALBEMARLE-PAMLICO ESTUARINE SYSTEM

For most of this questionnaire, please focus on the Albemarle and Pamlico Sounds, which are the large bodies of water in Eastern North Carolina inside the Outer Banks. Also, think about the rivers that flow into these sounds (such as the Chowan, Roanoke, Neuse, Tar, and Alligator Rivers). Thirty-six North Carolina counties and 16 Virginia counties are in the area drained by these rivers and sounds. This questionnaire will refer to this area as the "A-P system" (see cover map).

4. In general, how much have you heard or read about the resources, uses, and problems of the A-P system?

Nothing.....1
A Little.....2
Some,or.....3
A Lot.....4 (18)

5. In this system of rivers and sounds, how concerned are you about water pollution?

Not Concerned.....1
Somewhat Concerned.....2
Very Concerned.....3 (19)

6. These rivers and sounds provide habitat for fish and other wildlife. How concerned are you about damage to fish and wildlife habitat in the A-P system?

Not Concerned.....1
Somewhat Concerned.....2
Very Concerned.....3 (20)

7. How important are each of the following reasons for valuing the rivers and sounds of the A-P system?

(Circle one answer for each of the following.)	Not Important	Somewhat Important	Very Important	
a. Use of the A-P system for recreational fishing, boating, or swimming	1	2	3	(21)
b. Use of the A-P system by commercial fishermen	1	2	3	(22)
c. Use of water from the A-P system for city or town water supplies	1	2	3	(23)
d. Use of areas in the A-P system for picnicking, bird watching, or nature study	1	2	3	(24)
e. Fish and wildlife habitat in the A-P system	1	2	3	(25)
f. The economic benefits related to recreation and tourism in the A-P system	1	2	3	(26)
g. Knowing that other people may use and enjoy the A-P system	1	2	3	(27)
h. Knowing that the A-P system is protected for future generations	1	2	3	(28)

8. There's disagreement about how much effect different sources of pollution have on water quality in the A-P system. How much effect do you think each of the following has on water quality in the A-P system?

(Circle one answer for each of the following.)	None	Some	A Lot	
a. City or county sewer systems	1	2	3	(29)
b. Household septic tanks	1	2	3	(30)
c. Factories or other industries	1	2	3	(31)
d. Building construction	1	2	3	(32)
e. Cropland runoff	1	2	3	(33)
f. Logging or forest practices	1	2	3	(34)
g. Runoff from streets and highways	1	2	3	(35)
h. Boating and marinas	1	2	3	(36)
i. Litter or garbage	1	2	3	(37)
j. Home lawn or garden chemicals	1	2	3	(38)
k. Landfills	1	2	3	(39)
l. Livestock waste	1	2	3	(40)

RESOURCE MANAGEMENT ALTERNATIVES

9. Some industries exceed legal limits on waste discharge which increases pollution in the A-P system. Tougher enforcement of existing laws and higher fines have been proposed. However, this could mean higher prices for products and/or lost jobs. Do you strongly oppose, oppose, support, or strongly support higher fines for industries?

Strongly Oppose.....1 (41)
Oppose.....2
Support.....3
Strongly Support.....4

10. Another option would require industries to pay a tax on the pollution they discharge within legal limits. Do you strongly oppose, oppose, support, or strongly support this type of pollution tax?

Strongly Oppose.....1 (42)
Oppose.....2
Support.....3
Strongly Support.....4

11. Some cities exceed legal limits on waste discharge which increases pollution in the A-P system. Tougher enforcement of existing laws and higher fines have been proposed. However, this could mean increased sewer fees and taxes for residents of those cities. Do you strongly oppose, oppose, support, or strongly support higher fines for cities?

Strongly Oppose.....1 (43)
Oppose.....2
Support.....3
Strongly Support.....4

12. Do you strongly oppose, oppose, support, or strongly support using federal or state government money to help cities build new sewage treatment plants and other water pollution control facilities?

Strongly Oppose.....1 (44)
Oppose.....2
Support.....3
Strongly Support.....4

13. Some chemicals, livestock waste, and soil erosion from farming pollute the A-P system. Tougher laws that would require farmers to control pollution have been proposed. However, this could mean higher food prices and/or some farmers going out of business. Do you strongly oppose, oppose, support, or strongly support tougher pollution control laws for farming practices?

Strongly Oppose.....1 (45)
Oppose.....2
Support.....3
Strongly Support.....4

14 Do you strongly oppose, oppose, support, or strongly support using government money to help farmers install pollution control practices?

Strongly Oppose.....1 (46)
Oppose.....2
Support.....3
Strongly Support.....4

15. Some fishing practices, such as trawling and mechanical harvesting, can damage fishing and fish habitat in the A-P system. Tougher laws to restrict such practices have been proposed. However, this could mean higher seafood prices and/or some fishermen going out of business. Do you strongly oppose, oppose, support, or strongly support tougher laws for fishing practices?

Strongly Oppose.....1 (47)
Oppose.....2
Support.....3
Strongly Support.....4

16. Do you strongly oppose, oppose, support, or strongly support using government money to help fishermen buy new equipment to protect fishing and fish habitat?

Strongly Oppose.....1 (48)
Oppose.....2
Support.....3
Strongly Support.....4

17. Some shoreline development, including houses, resorts, and marinas, pollutes water and damages habitat in the A-P system. Tougher enforcement of existing development laws have been proposed. However, this could increase housing costs and/or take away some land owners' options for using their property. Do you strongly oppose, oppose, support, or strongly support tougher enforcement of development laws?

Strongly Oppose.....1 (4
Oppose.....2
Support.....3
Strongly Support.....4

18. Do you strongly oppose, oppose, support, or strongly support using government money to buy undeveloped coastal land to keep it in its natural condition?

Strongly Oppose.....1 (5
Oppose.....2
Support.....3
Strongly Support.....4

19. Some household septic tanks pollute the A-P system. Tougher regulations for septic tank installation and maintenance have been proposed. However, this could mean increased costs for homeowners with septic tanks. Do you strongly oppose, oppose, support, or strongly support tougher pollution control laws for septic tanks?

Strongly Oppose.....1 (5
Oppose.....2
Support.....3
Strongly Support.....4

20. Wetlands include marshes, swamps and bogs. They provide habitat, improve water quality and reduce flooding. Stronger laws to prevent loss of wetlands have been proposed. However, this could take away some property owners' options for using their property. Do you strongly oppose, oppose, support, or strongly support stronger wetland protection laws?

Strongly Oppose.....1 (5
Oppose.....2
Support.....3
Strongly Support.....4

21. Do you strongly oppose, oppose, support, or strongly support government programs to educate people about water quality and habitat in the A-P system?

Strongly Oppose.....1 (53)
Oppose.....2
Support.....3
Strongly Support.....4

22. Do you strongly oppose, oppose, support, or strongly support more research to better understand pollution and habitat needs in the A-P system?

Strongly Oppose.....1 (54)
Oppose.....2
Support.....3
Strongly Support.....4

23. Do you strongly oppose, oppose, support, or strongly support increased water quality monitoring programs that would help regulate sources of water pollution?

Strongly Oppose.....1 (55)
Oppose.....2
Support.....3
Strongly Support.....4

24. Would you strongly oppose, oppose, support, or strongly support the creation of a regional planning organization for all counties in the A-P system?

Strongly Oppose.....1 (56)
Oppose.....2
Support.....3
Strongly Support.....4

FUNDING ALTERNATIVES AND PRIORITIES

25. People already pay for these types of government programs through federal, state, and local taxes. However, government will need more money if water quality and fish and wildlife habitat in the A-P system are to be protected. This money would pay for state and local programs to control pollution, monitor water quality, protect habitat, and educate people. The goal would be to make sure water pollution does not get worse and habitat remains the same. What is the most that you think the average household in North Carolina would be willing to pay each year for these programs?

RECORD AMOUNT $_____ (57-60)

26. If new public funds were available, should they be spent on:

(Circle one answer for each of the following.)

1	Crime control	OR	2 Protecting the A-P System	(61)
1	Highway construction	OR	2 Protecting the A-P System	(62)
1	Public school education	OR	2 Protecting the A-P System	(63)
1	Economic development	OR	2 Protecting the A-P System	(64)
1	Welfare and public assistance	OR	2 Protecting the A-P System	(65)
1	Agricultural programs	OR	2 Protecting the A-P System	(66)

27. There are different ways government could raise money to pay for water quality and habitat protection programs. Would you strongly oppose, oppose, support, or strongly support raising each of the following to protect the A-P system:

(Circle one answer for each of the following.)	Strongly Oppose	Oppose	Support	Strongly Support	
a. Business taxes	1	2	3	4	(67)
b. Building permit fees	1	2	3	4	(68)
c. Property taxes	1	2	3	4	(69)
d. Water and sewer rates	1	2	3	4	(70)
e. Sales taxes	1	2	3	4	(71)
f. Fishing and hunting license fees	1	2	3	4	(72)
g. Income taxes	1	2	3	4	(73)
h. User fees for public facilities	1	2	3	4	(74)
i. Luxury taxes	1	2	3	4	(75)
j. Fines for pollution	1	2	3	4	(76)

BLANK (77-80)
DUPD (1-5)
CARD2 (6)

INSTITUTIONAL RESPONSE

28. Is government doing too little, the right amount, or too much to control water pollution from each of the following:

(Circle one answer for each of the following.)	Too Little	Right Amount	Too Much	
a. Shoreline development	1	2	3	(7)
b. Agricultural cropland	1	2	3	(8)
c. Livestock waste	1	2	3	(9)
d. Forest land	1	2	3	(10)
e. Municipal sewage	1	2	3	(11)
f. Industrial waste	1	2	3	(12)
g. Household septic tanks	1	2	3	(13)

29. Is there too little, the right amount, or too much enforcement of existing water pollution regulations?

Too Little.....1 (14)
Right Amount.....2
Too Much.....3

30. Do average citizens have too little, the right amount, or too much opportunity to influence government decisions about the environment?

Too Little.....1 (15)
Right Amount.....2
Too Much.....3

31. How much influence do each of the following groups have over management of the A-P system?

(Circle one answer for each of the following.)	Too Little	Right Amount	Too Much	
a. City/town government officials	1	2	3	(16)
b. County government officials	1	2	3	(17)
c. State government officials	1	2	3	(18)
d. Federal government officials	1	2	3	(19)
e. Industry officials	1	2	3	(20)
f. Farmers	1	2	3	(21)
g. Commercial fishermen	1	2	3	(22)
h. Sport fishermen or recreational users	1	2	3	(23)
i. Property owners	1	2	3	(24)
j. Developers and builders	1	2	3	(25)
k. Environmental groups	1	2	3	(26)
l. University scientists	1	2	3	(27)

32. How much responsibility should each of the following levels of government have for <u>setting policies</u> to protect water quality and habitat in the A-P system?

(Circle one answer for each of the following.)	None	Some	A Lot	
a. City/town government	1	2	3	(28)
b. County government	1	2	3	(29)
c. State government	1	2	3	(30)
d. Federal government	1	2	3	(31)

33. How much responsibility should each of the following levels of government have for <u>implementing programs</u> to protect water quality and habitat in the A-P system?

(Circle one answer for each of the following.)	None	Some	A Lot	
a. City/town government	1	2	3	(32)
b. County government	1	2	3	(33)
c. State government	1	2	3	(34)
d. Federal government	1	2	3	(35)

34. Different government agencies at the federal, state, and local level have responsibility for protecting water quality and habitat in the A-P system. In your opinion, how do these agencies work together?

Poorly 1 (36)
Adequately 2
Well 3

35. A number of nongovernmental groups have a role in protecting water quality and habitat in the A-P system. These include environmental, fishing, farming, and business interests. In your opinion, how do these groups work together?

Poorly 1 (37)
Adequately 2
Well 3

36. How do these nongovernmental groups work with the government agencies responsible for protecting the A-P system?

Poorly 1 (38)
Adequately 2
Well 3

37. To what extent do each of the following limit the effectiveness of efforts to protect water quality and habitat in the A-P system?

(Circle one answer for each of the following.)	Not At All	Some Extent	Large Extent	
a. Inadequate technical information	1	2	3	(39)
b. Inadequate government funding	1	2	3	(40)
c. Inadequate enforcement of existing laws	1	2	3	(41)
d. Low levels of public knowledge	1	2	3	(42)
e. Lack of citizen participation	1	2	3	(43)
f. Complex regulations	1	2	3	(44)
g. Insufficient economic incentives	1	2	3	(45)
h. Private property rights	1	2	3	(46)
i. Conflicts among special interests	1	2	3	(47)
j. Inadequate cooperation among agencies	1	2	3	(48)
k. Management not based on scientific information	1	2	3	(49)

38 Do you strongly disagree, disagree, agree, or strongly agree with each of the following statements?

Circle one answer for each of the following.)	Strongly Disagree	Disagree	Agree	Strongly Agree	
a We are approaching the limit of the number of people the earth can support	1	2	3	4	(50)
b The balance of nature is very delicate and easily upset	1	2	3	4	(51)
c Humans have the right to modify the natural environment to suit their needs	1	2	3	4	(52)
d Mankind was created to rule over the rest of nature	1	2	3	4	(53)
e When humans interfere with nature it often produces disastrous consequences	1	2	3	4	(54)
f Plants and animals exist primarily to be used by humans	1	2	3	4	(55)
g To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled	1	2	3	4	(56)
h Humans must live in harmony with nature in order to survive	1	2	3	4	(57)
i The earth is like a spaceship with only limited room and resources	1	2	3	4	(58)
j Humans need not adapt to the natural environment because they can make it suit their needs	1	2	3	4	(59)
k There are limits to growth beyond which our industrial society cannot expand	1	2	3	4	(60)
l Mankind is severely abusing the environment	1	2	3	4	(61)

BACKGROUND INFORMATION

The following questions are for statistical reasons. Remember that all information will be treated confidentially.

39. In which county is your primary residence located?

_____ (62-6

40. What is the highest grade of school you have completed?

_____ (65-6

41. In what year were you born?

19 _____ (67-6

42. Are you male or female?

MALE 1 (6
FEMALE 2

43. What racial group are you a member of?

WHITE 1 (7
BLACK 2
AMERICAN INDIAN 3
OTHER 4

44. How many years have you been in your present public service position?

_____ (71-7

Thank you very much for your valuable time and insights!

APPENDIX C

STATISTICAL ANALYSIS

STATISTICAL ANALYSIS

This appendix presents tables that summarize the statistical anlysis used in this report. The goal of this analysis is to develop and test an empirical model that analyzes the factors that influence support for the management alternatives and payment mechanisms. More details on this model can be found in the main part of the report.

Multiple regression analysis is used to determine the statistical significance of the relationships among the variables in the model. The tables in this appendix present Beta (standardized regression) coefficients. A Beta coefficient shows the relative importance of a variable holding constant all other variables in the model. The sign of the coefficient shows the direction of the relationship between variables. For example, a positive coefficient suggests that as one variable (e.g., educational level) increases, another variable (e.g., awareness of problems) also increases. On the other hand, a negative relationship indicates that as one variable (e.g., age) increases another variable (concern for pollution) decreases. These coefficients also indicate the strength of the relationship (the larger the number, the stronger the relationship). Results are considered significant if there is a relatively low probability (.01 means a 1 in 100 chance) that an observed relationship could have occurred by chance.

Measurement of the major variables used in the multivariate analysis of the model are described below. This is followed by the tables reporting the results of the multiple regression analyses.

Distance from A/P System

For respondents living west of Edenton and Washington, the distances were measured in driving miles from the center of the respondents' home county to both Edenton and Washington because these represent the closest cities with water access to the A/P system. For respondents living east of Edenton and Washington, the distances were measured as the driving miles to the nearest towns with water access to each of the Sounds. The DISTANCE variable was then computed by averaging the distance from the respondent's home county to the access points for both the Albemarle and Pamlico Sounds.

Gender

Gender was determined from a response to the question: "Are you male or female?" Males were coded 0 and females 1.

Race

Race was measured by a direct question asking to which racial category the respondent belonged. Respondents other than white were coded 0 and whites were coded 1.

Age

Age was measured with a direct question asking for the respondents date of birth, and each respondent was assigned a score corresponding to his/her exact age. This was determined by subtracting date of birth from 1991.

Education

The respondents were asked to report their highest grade in school completed, and they were assigned scores for analysis purposes.

Awareness of the A/P System

This is a single item indicator based on the question: In general, how much have you heard or read about the resources, uses, and problems of the A/P system? Would you say a lot (4), some (3), a little (2), or nothing (1)?

Concern for Water Pollution and Habitat Problems

This is a four-item summated scale based on questions with the same response format: very concerned (3), somewhat concerned (2), or not concerned (1). The items are:

a. Thinking about the entire state of North Carolina (Virginia), how concerned are you about pollution of lakes and rivers?
b. In your own area, how concerned are you about pollution of lakes and rivers?
c. In this system of rivers and sounds, how concerned are you about water pollution?
d. These rivers and sounds provide habitat for fish and other wildlife. How concerned are you about damage to fish and wildlife habitat in the A/P system?

Perceived Severity of Water Pollution Causes

This is an eleven-item index based on the question: There's disagreement about how much effect different sources of pollution have on water quality in the A/P system. How much effect do you think each of the following has on water quality in the A/P system: a lot (3), some (2), or none (1)? The eleven sources of pollution forming the index are: city or county sewer systems; household septic tanks; factories or other industries; building construction; cropland runoff; logging or forest practices; runoff from streets and highways; boating and marinas; litter or garbage; home lawn or garden chemicals; and, livestock waste.

Perceived Values of the A/P System

This concept is measured by an eight-item summated scale based on the question: People have different reasons for valuing the rivers and sounds of the A/P system. Is (read item) very important (3), somewhat important (2), or not important (1)?

The eight values forming the scale are:

a. Use of the A/P system for recreational fishing, boating or swimming.
b. Use of the A/P system by commercial fishermen.
c. Use of water for city or town water supplies.
d. Use of area for picnicking, bird watching, or nature study
e. Fish and wildlife habitat in the A/P system.
f. The economic benefits related to recreation and tourism in the A/P system.
g. Knowing that other people may use and enjoy the A/P system.
h. Knowing that the A/P system is protected for future generations.

Strength of Environmental Beliefs

A well-established attitude scale known as the New Environmental Paradigm (NEP) scale was used to measure environmental beliefs. All twelve items are of the Likert scale format. Respondents were asked to respond to each statement in terms of their level of agreement (i.e., strongly agree (4), agree (3), disagree (2) or strongly disagree (1)). This measure is an additive index computed by weighing the individual responses to the 12 NEP items by their corresponding factor scores. The factor scores are generated using a confirmatory factor analytical model. The twelve items are:

a. We are approaching the limit of the number of people the earth can support.
b. The balance of nature is very delicate and easily upset.
c. Humans have the right to modify the natural environment to suit their needs.
d. Mankind was created to rule over the rest of nature.
e. When humans interfere with nature it often produces disastrous consequences.
f. Plants and animals exist primarily to be used by humans.
g. To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.
h. Humans must live in harmony with nature in order to survive.
i. The earth is like a spaceship with only limited room and resources.
j. Humans need not adapt to the natural environment because they can make it suit their needs.
k. There are limits to growth beyond which our industrial society cannot expand.
l. Mankind is severely abusing the environment.

Support for All Management Alternatives

This is a sixteen-item index based on a set of questions designed to measure support for various management alternatives. The respondents were asked to indicate whether they strongly support (4), support (3), oppose (2), or strongly oppose (1) the management alternatives. The sixteen management alternatives added to form the index include: higher fines for industry; pollution tax for industry; higher fines for cities that exceed legal limits on waste discharge; using government money to help cities build new sewage treatment facilities; tougher pollution control laws for farming practices; using government money to help farmers install pollution control practices; tougher laws for fishing practices; using government money to help fishermen buy new equipment to protect fishing and fish habitat; tougher enforcement of development laws; using government money to buy undeveloped coastal land to keep it in its natural condition.

Support for All Payment Mechanisms

This is a ten-item index based on a question designed to elicit the level of support for the different ways government could raise money to pay for water quality and habitat protection programs. The response format was strongly support (4), support (3), oppose (2) or strongly oppose (1). The specific payment mechanisms are:

a. Business taxes
b. Building permit fees
c. Property taxes
d. Water and sewer rates
e. Sales taxes
f. Fishing and hunting license fees
g. Income taxes
h. User fees for public facilities
i. Luxury taxes
j. Fines for pollution.

Table C-1. Standardized regression coefficients showing relationships between independent variables and reported awareness of the A/P system.

	General Public	Public Officials
Distance from A/P System	−.221***	−.362***
Gender (Female)	−.052	.012
Race (White)	.064*	.119***
Age	.143***	.117**
Education Level	.126***	.220***
R-Square Value	.080	.182

Table C-2. Standardized regression coefficients showing relationships between independent variables and concern for water pollution and habitat problems.

	General Public	Public Officials
Distance from A/P System	−.071*	−.119**
Gender (Female)	.076*	.098*
Race (White)	.038	−.085*
Age	.101***	.107**
Education Level	.080**	−.032
R-Square Value	.024	.048

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-3. Standardized regression coefficients showing relationships between independent variables and perceived severity of water pollution causes.

	General Public	Public Officials
Distance from A/P System	−.036	−.020
Gender (Female)	.254***	.133***
Race (White)	−.041	−.080*
Age	−.026	−.014
Education Level	.045	.025
R-Square Value	.071	.026

Table C-4. Standardized regression coefficients showing relationships between independent variables and perceived importance of the A/P system.

	General Public	Public Officials
Distance from A/P System	−.102***	−.172***
Gender (Female)	.034	.059
Race (White)	−.065*	−.016
Age	−.024	.116**
Education Level	.122***	.059
R-Square Value	.035	.048

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-5. Standardized regression coefficients showing relationships between independent variables and strength of environmental beliefs.

	General Public	Public Officials
Distance from A/P System	−.017	.033
Gender (Female)	.079**	.072
Race (White)	.122***	−.015
Age	−.097***	−.024
Education Level	.192***	−.011
R-Square Value	.074	.007

Table C-6. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for scale of all management strategies.

	General Public	Public Officials
Distance from A/P System	.050	.077*
Gender (Female)	.016	−.038
Race (White)	.008	.015
Age	.005	−.066*
Education Level	.124***	.091**
Awareness of A/P System	−.011	.125***
Concern for Problems	.190***	.135***
Severity of Causes	.107***	.252***
Values of A/P System	.016	.084*
Environmental Beliefs	.370***	.350***
R-Square Value	.293	.394

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-7. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for higher fines on industrial pollution.

	General Public	Public Officials
Distance from A/P System	.053	−.020
Gender (Female)	−.020	.019
Race (White)	.065*	.073*
Age	.006	−.146***
Education Level	.114***	−.010
Awareness of A/P System	.011	.046
Concern for Problems	.158***	.132**
Severity of Causes	.005	.140***
Values of A/P System	−.022	.023
Environmental Beliefs	.225***	.277***
R-Square Value	.128	.212

Table C-8. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for pollution taxes on industrial discharge.

	General Public	Public Officials
Distance from A/P System	.083**	.060
Gender (Female)	−.019	.030
Race (White)	−.024	−.023
Age	−.131***	−.022
Education Level	−.033	−.008
Awareness of A/P System	.042	.060
Concern for Problems	.027	.052
Severity of Causes	.114***	.199***
Values of A/P System	.054	.050
Environmental Beliefs	.205***	.098*
R-Square Value	.105	.097

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-9. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for higher fines on municipal sewage treatment plants.

	General Public	Public Officials
Distance from A/P System	.036	−.032
Gender (Female)	−.103***	−.001
Race (White)	.024	.152***
Age	.029	−.040
Education Level	.127***	.040
Awareness of A/P System	−.031	.048
Concern for Problems	.093**	.126**
Severity of Causes	.087**	.169***
Values of A/P System	.013	−.016
Environmental Beliefs	.243***	.182***
R-Square Value	.136	.137

Table C-10. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for cost sharing of municipal sewage treatment plants.

	General Public	Public Officials
Distance from A/P System	.010	−.029
Gender (Female)	.025	−.045
Race (White)	−.060*	.017
Age	−.073*	.003
Education Level	.056	−.024
Awareness of A/P System	−.048	.019
Concern for Problems	.120***	−.013
Severity of Causes	.001	.088*
Values of A/P System	−.006	.034
Environmental Beliefs	.157***	.138**
R-Square Value	.064	.039

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-11. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for tougher laws to control agricultural pollution.

	General Public	Public Officials
Distance from A/P System	−.049	−.084*
Gender (Female)	−.029	−.043
Race (White)	−.010	.043
Age	.120***	−.068
Education Level	.107***	.132***
Awareness of A/P System	−.042	.002
Concern for Problems	.144***	.070
Severity of Causes	.139***	.229***
Values of A/P System	.003	.032
Environmental Beliefs	.168***	.207***
R-Square Value	.125	.191

Table C-12. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for cost sharing of agricultural best management practices.

	General Public	Public Officials
Distance from A/P System	.020	.046
Gender (Female)	.106***	−.007
Race (White)	−.093**	−.095*
Age	−.072*	−.025
Education Level	.044	−.017
Awareness of A/P System	−.060	.121**
Concern for Problems	.055	.032
Severity of Causes	.018	.020
Values of A/P System	.041	.063
Environmental Beliefs	.191***	.106*
R-Square Value	.090	.050

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-13. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for tougher laws to control fishing practices.

	General Public	Public Officials
Distance from A/P System	.045	.005
Gender (Female)	−.078**	−.032
Race (White)	−.001	.066
Age	.109***	−.043
Education Level	.149***	.068
Awareness of A/P System	.021	.118**
Concern for Problems	.101**	−.007
Severity of Causes	.101***	.145***
Values of A/P System	.003	.020
Environmental Beliefs	.174***	.272***
R-Square Value	.115	.158

Table C-14. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for cost sharing of fishing equipment.

	General Public	Public Officials
Distance from A/P System	.031	.014
Gender (Female)	.131***	−.103**
Race (White)	−.045	−.044
Age	−.127***	.013
Education Level	.025	.026
Awareness of A/P System	−.017	.052
Concern for Problems	.025	.059
Severity of Causes	.071*	.062
Values of A/P System	.076*	.076
Environmental Beliefs	.153***	.132**
R-Square Value	.101	.067

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-15. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for tougher enforcement of shoreline development laws.

	General Public	Public Officials
Distance from A/P System	−.030	.120**
Gender (Female)	−.057*	.003
Race (White)	.135***	.055
Age	.060*	−.041
Education Level	.186***	.086*
Awareness of A/P System	.005	.098*
Concern for Problems	.097**	.062
Severity of Causes	.046	.254***
Values of A/P System	−.015	−.028
Environmental Beliefs	.194***	.228***
R-Square Value	.144	.210

Table C-16. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for government purchase of undeveloped coastal land.

	General Public	Public Officials
Distance from A/P System	.031	.069
Gender (Female)	.013	−.051
Race (White)	.060*	−.017
Age	−.040	−.064
Education Level	.037	.048
Awareness of A/P System	−.020	.103**
Concern for Problems	.143***	.073
Severity of Causes	.088**	.117**
Values of A/P System	.021	.111**
Environmental Beliefs	.248***	.254***
R-Square Value	.146	.179

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-17. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for tougher pollution control laws on septic tanks.

	General Public	Public Officials
Distance from A/P System	.058*	.163***
Gender (Female)	.026	−.008
Race (White)	.001	.010
Age	.005	−.071
Education Level	.119***	.131***
Awareness of A/P System	−.060	.096*
Concern for Problems	.119***	−.080
Severity of Causes	.158***	.220***
Values of A/P System	.030	.010
Environmental Beliefs	.236***	.195***
R-Square Value	.172	.202

Table C-18. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for stronger wetland protection laws.

	General Public	Public Officials
Distance from A/P System	−.014	.142***
Gender (Female)	−.031	−.009
Race (White)	.112***	.020
Age	.041	.001
Education Level	.129***	.123***
Awareness of A/P System	−.024	−.001
Concern for Problems	.173***	.128**
Severity of Causes	.108***	.156***
Values of A/P System	−.031	.027
Environmental Beliefs	.232***	.278***
R-Square Value	.176	.217

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-19. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for government education programs.

	General Public	Public Officials
Distance from A/P System	.069*	.091*
Gender (Female)	.008	–.071
Race (White)	–.073*	–.078*
Age	–.152***	–.049
Education Level	.084**	.033
Awareness of A/P System	–.005	.136***
Concern for Problems	.145***	.127**
Severity of Causes	.091**	.066
Values of A/P System	.034	.096*
Environmental Beliefs	.200***	.170***
R-Square Value	.160	.142

Table C-20. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for more research to understand the A/P system.

	General Public	Public Officials
Distance from A/P System	.057	.044
Gender (Female)	–.035	–.020
Race (White)	–.053	–.036
Age	–.150***	.021
Education Level	.050	.082*
Awareness of A/P System	–.009	.086*
Concern for Problems	.181***	.094*
Severity of Causes	.056	.061
Values of A/P System	.037	.130**
Environmental Beliefs	.179***	.166***
R-Square Value	.138	.123

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-21. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for increased water quality monitoring.

	General Public	Public Officials
Distance from A/P System	.063*	.037
Gender (Female)	.003	.040
Race (White)	−.018	−.061
Age	−.057*	−.005
Education Level	.130***	.053
Awareness of A/P System	−.021	.094*
Concern for Problems	.130***	.153***
Severity of Causes	.040	.104**
Values of A/P System	.074*	.112**
Environmental Beliefs	.235***	.192***
R-Square Value	.158	.186

Table C-22. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for scale of all payment vehicles.

	General Public	Public Officials
Distance from A/P System	.120***	−.061
Gender (Female)	.044	−.079*
Race (White)	.030	.017
Age	−.164***	−.020
Education Level	.135***	.109**
Awareness of A/P System	.015	−.022
Concern for Problems	.090**	.079*
Severity of Causes	.100***	.222***
Values of A/P System	.037	.001
Environmental Beliefs	.255***	.281***
R-Square Value	.217	.210

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-23. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising business taxes.

	General Public	Public Officials
Distance from A/P System	.109***	.013
Gender (Female)	.065*	−.033
Race (White)	−.040	−.014
Age	−.156***	.028
Education Level	−.008	.055
Awareness of A/P System	.006	−.044
Concern for Problems	.019	.064
Severity of Causes	.117***	.133**
Values of A/P System	.077*	−.026
Environmental Beliefs	.206***	.274***
R-Square Value	.135	.132

Table C-24. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising building permit fees.

	General Public	Public Officials
Distance from A/P System	.063*	−.011
Gender (Female)	.017	−.052
Race (White)	−.012	.065
Age	−.110***	−.061
Education Level	.091**	.112**
Awareness of A/P System	.011	.019
Concern for Problems	.058	.049
Severity of Causes	.112***	.191***
Values of A/P System	.037	−.055
Environmental Beliefs	.161***	.202***
R-Square Value	.104	.132

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-25. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising property taxes.

	General Public	Public Officials
Distance from A/P System	.048	−.017
Gender (Female)	.025	−.080*
Race (White)	.035	.104**
Age	−.129***	.009
Education Level	.069*	.158***
Awareness of A/P System	−.007	.039
Concern for Problems	.056	−.003
Severity of Causes	.101***	.191***
Values of A/P System	.013	−.031
Environmental Beliefs	.212***	.112**
R-Square Value	.123	.099

Table C-26. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising water and sewer rates.

	General Public	Public Officials
Distance from A/P System	.102***	−.043
Gender (Female)	−.030	−.153***
Race (White)	.062*	.061
Age	−.184***	−.081*
Education Level	.114***	.135***
Awareness of A/P System	.021	.061
Concern for Problems	.099**	.092*
Severity of Causes	.039	.129**
Values of A/P System	.022	−.018
Environmental Beliefs	.124***	.153***
R-Square Value	.122	.134

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-27. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising sales taxes.

	General Public	Public Officials
Distance from A/P System	.102***	−.063
Gender (Female)	.041	−.055
Race (White)	.005	−.033
Age	−.115***	.023
Education Level	.056	.033
Awareness of A/P System	.033	−.078
Concern for Problems	.023	.069
Severity of Causes	.048	.042
Values of A/P System	.058	.011
Environmental Beliefs	.109***	.129**
R-Square Value	.064	.039

Table C-28. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising fishing and hunting license fees.

	General Public	Public Officials
Distance from A/P System	.005	−.122**
Gender (Female)	.080**	.072
Race (White)	.014	−.058
Age	−.040	.025
Education Level	.149***	.045
Awareness of A/P System	−.054	−.034
Concern for Problems	.051	−.075
Severity of Causes	.001	.136**
Values of A/P System	−.020	−.053
Environmental Beliefs	.175***	.114**
R-Square Value	.082	.059

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-29. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising income taxes.

	General Public	Public Officials
Distance from A/P System	−.008	−.017
Gender (Female)	.045	−.144***
Race (White)	.018	.079*
Age	−.110***	.021
Education Level	.103***	.115**
Awareness of A/P System	.030	.060
Concern for Problems	.043	.046
Severity of Causes	.070*	.118**
Values of A/P System	−.020	.060
Environmental Beliefs	.127***	.066
R-Square Value	.073	.082

Table C-30. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising user fees for public facilities.

	General Public	Public Officials
Distance from A/P System	.116***	−.097*
Gender (Female)	−.036	.033
Race (White)	.095**	.015
Age	.003	.016
Education Level	.119***	.060
Awareness of A/P System	.017	−.037
Concern for Problems	.050	.010
Severity of Causes	.053	.126**
Values of A/P System	−.011	−.012
Environmental Beliefs	.106***	.085*
R-Square Value	.071	.042

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

Table C-31. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising luxury taxes.

	General Public	Public Officials
Distance from A/P System	.100***	.058
Gender (Female)	.051	.016
Race (White)	−.008	−.079*
Age	−.078**	−.010
Education Level	.066*	−.078*
Awareness of A/P System	.010	−.050
Concern for Problems	.058	.028
Severity of Causes	.070*	.136***
Values of A/P System	−.017	.083*
Environmental Beliefs	.216***	.188***
R-Square Value	.102	.113

Table C-32. Standardized regression coefficients showing relationships between independent variables, intervening attitudes, and support for raising fines for pollution.

	General Public	Public Officials
Distance from A/P System	.085**	−.027
Gender (Female)	−.017	.000
Race (White)	.050	−.072
Age	−.080**	−.163***
Education Level	.144***	−.009
Awareness of A/P System	−.002	.041
Concern for Problems	.179***	.134**
Severity of Causes	.002	.085*
Values of A/P System	.065*	.030
Environmental Beliefs	.228***	.220***
R-Square Value	.188	.158

* coefficient significant at $p < .05$
** coefficient significant at $p < .01$
*** coefficient significant at $p < .001$

APPENDIX D

CONTINGENT VALUATION TECHNICAL ANALYSIS

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CONTINGENT VALUATION ANALYSIS

The purpose of this appendix is to document procedures for estimating the economic benefits (willingness to pay) for environmental quality improvement in the Albemarle-Pamlico (A-P) estuarine system. Details of empirical estimation and empirical results are presented.

The Willingness to Pay Theoretical Construct

Utility (u) is the happiness or satisfaction a consumer gets from consumption of market and non-market goods. Suppose consumers have the utility function $U(\mathbf{Z},x,q)$, where **Z** represents a composite of all market goods, x represents use of the A-P system (such as recreational fishing trips) and q is environmental quality in the A-P system. The expenditure function e(p,q,u) is found by solving the consumer problem: minimize $\mathbf{Z} + p \cdot x$ subject to $u = u(x,q)$ where p is the access price of use of the A-P system and assuming the price of **Z** is equal to \$1. The expenditure function measures the minimum amount of money a consumer must spend to achieve a fixed utility level and is increasing in p and u and decreasing in q (Varian 1984).

Survey respondents are assumed to know their true willingness to pay to improve and protect environmental quality. Willingness to pay is the maximum amount of money the respondent would give up in order to enjoy the environmental quality change. A formal definition of willingness to pay is

$$WTP = e(p,q^{\circ},u) - e(p,q',u). \tag{1}$$

where q° is a degraded level of quality and q' is a higher level of quality (previous status quo). Expenditures to maintain a utility level decrease with a increase in environmental quality (q° to q') so that $WTP \geq 0$. Willingness to pay is the compensating surplus measure of welfare (Bergstrom 1990).

Total, Use, and Nonuse Value

WTP is the total economic value of the quality change. Total economic value can be decomposed into use and nonuse value components. Use value is the portion of WTP for the quality change motivated by the desire to use the A-P resource for recreation, etc. Nonuse value is the portion of WTP for the quality change motivated by reasons other than direct use of the resource. These reasons can take the form of bequests to future generations, altruism towards other people who use the resource, or a desire for ecological integrity.

WTP can theoretically be decomposed into use and nonuse components (Smith 1987). Suppose households face the choke price for use of the A-P resource. The choke price is the price that drives all recreational use of the resource to zero $\{p^*: x(p^*,q,u)=0\}$, where $x(p,q,u)$ is the compensated demand function for use of the resource (Varian, 1984). Use value (UV) is the WTP to avoid imposition of the choke price with the improved environmental quality level

$$UV = e(p^*,q',u) - e(p,q',u) \tag{2}$$

where expenditures with imposition of the choke price are greater than without the choke price so that $UV \geq 0$.

Assuming that the degraded environmental quality level precludes use of the resource, $\{q^\circ: x(p,q^\circ,u)=0\}$ so that $e(p^*,q^\circ,u)=e(p,q^\circ,u)$, nonuse value (NUV) is the difference between total and use value: WTP-UV=NUV. Nonuse value is the WTP for the environmental improvement with imposition of the choke price in both situations

$$NUV = e(p^*,q^\circ,u) - e(p^*,q',u) \tag{3}$$

where expenditures are less with the improvement so that $NUV \geq 0$.

Effects of Changes in Price and Income on WTP

Economic-theoretic relationships between WTP and elements of the expenditure function can be found using comparative static analyses. Assume households perceive the original level of environmental quality as the level of quality they are entitled to. They also feel that without a management program quality will get worse. The reference level of utility is $u = v(p,q',y)$, where y is income and $v(\cdot)$ is the indirect utility function found by solving the problem: maximize $u(\cdot)$ subject to $y = \mathbf{Z} + px$. Substitution of the indirect utility function into equation (1) yields

$$\begin{aligned} WTP &= e(p,q^\circ,v(p,q',y)) - e(p,q',v(p,q',y)) \\ &= e(p,q^\circ,v(p,q',y)) - y. \end{aligned} \tag{4}$$

McConnell (1990) has shown the theoretical properties of WTP functions. Extending McConnell's analysis to equation (4) several properties can be shown.

The effect of income on WTP is

$$\frac{\partial WTP}{\partial y}=\frac{\partial e(q^0)}{\partial v}\frac{\partial v}{\partial y}-1.$$

Since $\frac{\partial v}{\partial y}=\frac{1}{\partial e/\partial v}$,

$$\frac{\partial WTP}{\partial y}=\frac{\partial e(q^0)}{\partial v}/\frac{\partial e(q')}{\partial v}-1.$$

If q is a normal good then

$$\frac{\partial e(q^0)}{\partial v}>\frac{\partial e(q')}{\partial v}$$

and $\partial WTP/\partial y>0$. Willingness to pay is increasing in y for normal goods. Demand increases with income for normal goods, accordingly willingness to pay increases with income if environmental quality is a normal good.

The effect of access price on WTP is

$$\frac{\partial WTP}{\partial p}=\frac{\partial e}{\partial p}+\frac{\partial e}{\partial v}\frac{\partial v}{\partial p}.$$

Since

$$\frac{\partial e}{\partial v}=\frac{1}{\partial v/\partial y}$$

$$\frac{\partial WTP}{\partial p}=x^h(p,q^0,u)-x^m(p,q^1,y)$$

where $x^h(\bullet)$ is the compensated Hicksian demand function and $x^m(\bullet)$ is the uncompensated Marshallian demand function (Varian, 1984). Since $y = e(p,q,u)$ and $x^m(p,q,e(p,q,u))= x^h(p,q,u)$,

$$\frac{\partial WTP}{\partial P} = x^h(p,q^0,u) - x^h(p,q^1,u) < 0.$$

WTP increases (decreases) with decreases (increases) in the access price because recreation demand is higher with higher environmental quality. The higher the cost of access to the A-P system the lower the willingness to pay for environmental quality improvements.

Contingent Market Behavior

Contingent valuation is a method developed to reveal behavioral intentions (statements of WTP = WTP^S) which can be used to generate order of magnitude estimates of the economic value (WTP) of non-market goods, such as environmental quality (see Mitchell and Carson 1989 for an extensive treatment of the contingent valuation method). The wording of the contingent valuation question in the 1991 APES survey is in the form of an iterative political market (Hoehn and Randall 1987; Mitchell and Carson 1989). The constructed political market presents survey respondents with a simulated referendum vote. Policy referendum, or dichotomous choice, questions are thought to be easier to answer by survey respondents. This may be especially true in telephone or personal interviews where the pressure to answer quickly is higher than in self-administered mail questionnaires.

Survey respondents are presented with the policy referendum question: Would you and your household be willing to pay $A each year in higher taxes, for these programs (to control pollution, monitor water quality, protect habitat, and educate people), if you knew the money would be used to protect the A-P system?" where $A is a randomly chosen dollar amount. The dollar amount variable took on twelve values with a random start ranging from $5 to $100 (5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, and 100). Respondents will answer "yes" to the policy referendum valuation question if the individual benefit of the policy (WTP to gain the environmental quality improvement) is greater than the individual cost of the policy (the dollar amount variable $A). Respondents will answer "no" if the individual benefit of the policy is less than the individual cost of the policy.

Once initial yes or no responses are revealed, respondents are asked follow up questions to narrow the range of stated WTP. If the respondent answers yes, the valuation question was asked again with the next highest dollar amount. This process continued until the respondent answered no or $100 is reached. If the respondent answers no, the valuation question was asked again with the next lowest dollar amount. This process continued until the respondent answered yes or $5 is reached. For respondents reaching $5 or $100, the open ended question: "What is the most

that you and your household would be willing to pay each year for these programs?" is presented.

With open-ended WTP questions, WTP is explicitly revealed (e.g., a survey respondent may answer "$150" in response to this question). Contingent political markets, while often easier to answer, generate less information about WTP than contingent economic markets. The iterative form of the contingent market allows WTP to be bounded within a $5 to $10 dollar range. The midpoint of this range is used to proxy for an open-ended WTP statement.

Initial yes or no answers give a preliminary indication of WTP which can be inferred using discrete choice regression analysis (Cameron, 1988). Use of this method to estimate WTP with the 1991 APES survey data was unsuccessful, in that WTP estimates were much larger than means of the WTP interval data.

Data Summary

In Table 1 we present descriptions, means, and standard deviations of variables used in the contingent valuation analysis. Missing values for demographic variables, except income, were imputed with the unconditional mean of the item distribution. Missing income values were imputed with a regression approach that estimates the conditional mean of the income distribution for each missing case. For attitudinal variables, the individual item unconditional mean was substituted for missing item values into the attitudinal equation.

The benefit of imputation is the increased information gained from inclusion of incomplete cases. The cost of this approach is the reduction in the standard deviation of variables with missing cases. See Little and Rubin (1989) for a discussion of these, and other, imputation methods. Using imputation, complete data is obtained for 992 cases.

Willingness to Pay Data

Willingness to pay frequencies for the raw and trimmed data are presented in Table 2. Trimmed data does not include protest responses, information transfer responses, and nonresponses (explained below). Frequencies for both raw and trimmed data are fairly uniform except for four spikes which occur at $0, $11-$20, $51-60, and $91-100. Trimmed data frequencies are equal except for fewer $0, $91-$100, and over $100 WTP responses. The data takes the form of payment card interval data with a continuous upper limit (Mitchell and Carson 1989).

Protest responses

Protest responses result when the survey respondent rejects the notion of valuing a non-market resource or the hypothetical market institution. Respondents may protest by answering $0, $1,000,000, or "priceless" in response to an open-ended valuation question when their true WTP may be in the specified dollar amount range ($5-$100). It is common practice to identify protest responses by follow-up questions to the valuation question and delete the answers thought to be protests from CV data.

This study identifies zero dollar protests through the question: "Why would you not be willing to pay anything?" Respondents who answer "polluters should pay", "can't put dollar value on resources" or "oppose this type of question" are considered to reject the contingent market institution. Respondents who answer "government not effective or corrupt" or "don't trust" are felt to reject existing governmental institutions. These cases are deleted from the data. Other reasons, which reflect rejection of the payment vehicle (taxes), are "on fixed income," "A-P users should pay," "should be voluntary," and "need state lottery" are also deleted. Outlying protest responses include those who answer "priceless" or "greater than $995" to the open-ended valuation question and are deleted.

Starting Point Bias

Starting point bias results when respondents consider the initial dollar amount offered as an implied "correct" WTP. Regressions of the form WTP = a + bA are typically used to test for starting point bias. Several studies have detected the presence of starting point bias (Boyle, Bishop, and Welsh, 1985). Pretests of the data reveal that b is positive and significantly different from zero ($p>.001$) indicating that starting point bias is present. Starting points above (below) respondents' true WTP will increase (decrease) stated WTP. No general adjustment procedure for starting point bias has been found. In order to minimize starting point bias we delete cases which exhibit "information transfer" where $WTP^S = A$ as suggested by Samples (1985). We further address this problem in later sections.

Analysis of Nonresponse

An examination of WTP nonresponse is presented in Table 3. The dependent variable is discrete (WTP nonresponse=1, WTP response=0) so the model is estimated using the logistic regression procedure (Amemiya, 1981). Nonresponse is found to increase with the dollar amount variable (Tax), increase with age, non-white race, and male.

Weighted Least Squares Estimates

The interval data is estimated using least squares regression. Since the upper limit is continuous a maximum likelihood procedure, as suggested in Cameron and Huppert (1989), is not necessary although future research should explore the sensitivity of results to estimation method. The data is weighted by region to give the more reliable observation, or that observation that represents a greater proportion of the population, more weight to correct for sample stratification (Judge, et al., 1980). Models are estimated using the weighted least squares option in the SAS REG procedure (SAS Institute, 1985).

Model Specification

Four regression equations are specified. Each model builds on the others in terms of types of variables included. The first two models specify economic-theoretic relationships. The first model tests for the effects of starting point and the economic variables price and income

$$WTP = \alpha_0 + \alpha_1 A + \alpha_2 A^2 + \alpha_3 p + \alpha_4 y + \varepsilon \quad (5)$$

where the starting point enters the model as a quadratic to account for nonlinear effects. Starting point bias exists if α_1 or $\alpha_2 \neq 0$. The second model includes demographic characteristics that account for differences in tastes and preferences

$$WTP = \alpha_0 + \alpha_1 A + \alpha_2 A^2 + \alpha_3 p + \alpha_4 y + \underline{\beta}'\underline{D} + \varepsilon \quad (6)$$

where $\underline{\beta}$ is a vector of coefficients and $\underline{D}$ is a vector of demographic variables including education level, age, ethnic group, gender, owner of coastal property, and urban/rural dweller.

Attitudes about the A-P resource and the environment may have a causal relationship with the behavioral intention of WTP (Mitchell and Carson, 1989, p. 182, Bishop and Heberlein 1986, Heberlein 1986). The third and fourth models test this type of relationship. The third model includes attitudinal variables specifically related to the A-P system

$$WTP = \alpha_0 + \alpha_1 A + \alpha_2 A^2 + \alpha_3 p + \alpha_4 y + \underline{\beta}'\underline{D} + \underline{\gamma}'\underline{S} + \varepsilon \quad (7)$$

where $\underline{\gamma}$ is a vector of coefficients and $\underline{S}$ is a vector of A-P system (S) attitudes such as knowledge, concern, and values for the estuarine system. The fourth model includes general attitudinal variables

$$WTP = \alpha_0 + \alpha_1 A + \alpha_2 A^2 + \alpha_3 p + \alpha_4 y + \underline{\beta}'\underline{D} + \underline{\gamma}'\underline{S} + \underline{\delta}'\underline{G} + \varepsilon \quad (8)$$

where $\underline{\delta}$ is a vector of coefficients and $\underline{G}$ is a vector of general (G) attitudes such as trust in government, environmental beliefs, and environmental activism.

Model Results

The results of models 1-4 are presented in Tables 4-7. All models have significant F-statistics, which tests significance of the model as a whole, and adequate adjusted R^2 statistics. In each model WTP increases at a decreasing rate with the starting point dollar amount which requires that WTP estimates must be adjusted to account for starting point bias. The adjustment will be addressed in the next section.

Models 1 and 2 tests the economic-theoretic validity of the WTP construct. APES price and household income are of the correct sign and significance level to support the economic theory (Table 4). These results hold up through models 2-4 as well. This test lends theoretical validity to the measure of WTP elicited from survey respondents. Model 2 includes household characteristics that proxy for tastes as determinants of WTP (Table 5). Only education and age of the respondent have significant effects. WTP increases with education level and decreases with age of the respondent. Each result holds for all models tested with one exception. Education becomes statistically insignificant in Model 4.

Models 3 and 4 tests the social psychological validity of the WTP behavioral intention by including attitudinal variables. Model 3 includes variables specifically related to the A-P system: knowledge, concern, and value (Table 6). Statistical results show that as concern for the A-P system resources increase WTP increases as predicted by theory. Knowledge and value coefficient estimates are statistically insignificant from zero. Model 4 includes general attitudes towards the environment. As the environmental beliefs and activism scale variables increase WTP also increases as predicted by theory. Trust in government has no significant effect on WTP.

Attitudes, Behavioral Intentions, and Actual Behavior

Mitchell and Carson (1989, Ch. 5) and Bishop and Heberlein (1986) discuss factors which determine whether the attitude-behavioral intention link can predict actual behavior. Contingent valuation questions are designed to increase the correspondence between actual behavior and behavioral intention by specifying targets, actions, context, and timing. The contingent market in this study targets water quality and wildlife habitat in the Albemarle-Pamlico system rather that these natural resources in general. The payment obligation of annual taxes specifies the action, context, and timing of willingness to pay. Increased correspondence increases the ability to predict actual behavior from behavioral intentions. Evidence of social psychological theoretical validity, such as the statistical significance of concern,

environmental beliefs, and environmental activism in Model 4, increases our confidence that the stated behavioral intention of WTP is a good predictor of actual behavior of households if they are placed in the payment situation.

Another test of the attitude-behavioral intention link can be conducted by exploiting the similarities and differences of the Worth (described in Table 1) and WTP variables. The Worth variable is an attitudinal statement relative to the behavioral intention of WTP. We expect Worth and WTP to be highly correlated. Willingness to pay should be a better predictor of actual behavior since it has more correspondence and proximity to actual behavior than Worth. For example, WTP for water quality is income constrained whereas the Worth of water quality to a household is not.

Several comparisons of Worth and WTP are made. First, the mean of WTP is significantly lower than Worth (Difference = $12.00, t=6.87) which suggests respondents behaved with income constraints when reporting the WTP behavioral intention relative to the Worth attitude. Higher educated and white respondents, and those who report more reasons for valuing the A-P system stated WTP closer to Worth. Conversely, lower educated and non-white respondents, and those who report fewer reasons for valuing the A-P system have a greater difference in the abstract Worth and the specific WTP.

The positive Pearson correlation between WTP and Worth is significant (r=0.75, p=.0001) showing that the attitude and behavioral intention are related in the predicted way. This result is supported by an analysis of the determinants of Worth which are similar to the determinants of WTP (Table 8). Worth depends on the Tax (dollar amount with no nonlinear effects), price, income, age, concern, and environmental activism in the expected directed. Gender and environmental beliefs, which have significant effects on WTP, do not affect Worth. Overall, less of the variance of Worth can be explained relative to the variance of WTP explained suggesting increased reliability of WTP as a predictor of actual behavior.

An OLS regression of WTP on Worth, which is a combination of the first two tests, shows that for each dollar of Worth WTP increases by $0.60 (WTP = 14.61 + 0.601*Worth, R^2=.56) which leads to the same implications as the first two tests. This result also shows that the specificity of the payment obligation and institutional framework of the contingent market elicits WTP intentions that are better predictors of behavior than the abstract concept of Worth. The explicit payment obligation may cause respondents to reconsider their Worth position and respond with a more accurate (lower) behavioral intention.

Willingness to Pay Results

Starting Point Bias Adjustment

Starting point bias is not a problem if $\alpha_1=0$ and $\alpha_2=0$. Unfortunately we find that starting point bias is a problem that must be dealt with before unbiased benefit estimates of WTP can be presented. No accepted method for adjusting for starting point bias has been found. Only Thayer (1981) has offered a adjustment procedure. The Thayer method was attempted, but this estimate (with a mean WTP of $36) includes extremely large and negative estimates of WTP and was rejected as unreliable.

A conservative approach which adjusts only for upward bias is used. Justification for a conservative WTP estimate is found in Hoehn and Randall (1987) who emphasize the need for "satisfactory benefit-cost indicators" which are WTP estimates that do not overstate true WTP. WTP is adjusted for starting point bias by netting out the starting point effects. Household willingness to pay is equal to

$$\hat{WTP}_i = WTP_i^S - 1.416*A + 0.00835*A^2$$

where $\hat{WTP}_i$ represents predicted WTP, WTP_i^S is the stated willingness to pay, and the coefficient estimates are found from the ordinary least squares (OLS) regression of WTP_i^S on the dollar amount and dollar amount squared, i=1,...,n households. Negative predicted WTP values are set equal to zero since negative values are implausible and would not be permitted in the iterative political market.

Two interpretations of this procedure are available. The first interpretation is that the OLS coefficient estimates are set equal to zero, simulating no starting point bias. The negative quadratic coefficient term outweighs the positive linear term on the starting points for all starting points. Netting out the starting point will reduce all stated WTP estimates. The second interpretation is that A is set equal to zero as if the initial starting point is zero. This approach is conservative and can be expected to generate estimates of WTP which are less than true WTP. When starting point bias is present stated WTP is lower than true WTP if the starting point is lower than true WTP (such as A=0) because of implied value cues, tiring respondents, etc.

Mean WTP and Confidence Intervals

Ninety-five percent confidence intervals are constructed for the stated and adjusted WTP estimates using the OLS starting point coefficients. These results are found after deleting 30 outliers which were detected using the regression diagnostic of Belsley, Kuh, and Welsch (1980). The DFBETA statistics on the price and income coefficients were calculated for each observation from pretest runs of Model 1. The recommended rule-of-thumb cutoff level for the DFBETA statistic is followed (Thomson

1991). Any observation which deviated from the cutoff level is deemed a statistical outlier and deleted from the WTP sample. A similar procedure has been used by Desvousges, Smith, and Fisher (1987) to detect outliers.

The mean of the unadjusted WTP estimates is found in the middle column of Table 9. Mean (unadjusted) WTP is $53 with a 95% confidence level that ranges from $50 to $56. The mean of the corrected WTP estimates is found in the right-hand column of Table 9. Adjusted WTP is $22 with a 95% confidence range of $20 to $25. Since setting adjusted WTP predictions less than zero equal to zero decreases the variance of WTP, the 95% confidence interval is found using the standard error of the WTP distribution before negative WTP values are replaced.

The adjusted WTP estimate is less than 50% of the unadjusted WTP estimate. This large difference can be accounted for by the approach to starting point bias adjustment used. This approach finds a lower bound WTP estimate assuming that starting points only upwardly bias WTP.

WTP by Use, Region, Age and Income

WTP can be partitioned according to various groups of respondents in order to infer where the support for protection programs can be found. Two comparisons that may be of interest is the variability of WTP for users and nonusers of the resource for the five sampled regions and for different age and income categories. These particular comparisons are made as a result of statistically significant regression results. The negative coefficient on the A-P resource access price variable suggests that households living closer to the resource and who use the resource will have higher WTP values. Regression results show that age and income have significant effects on WTP.

Smith and Palmquist (1989) suggest measurement of nonuse values for the A-P resource. Resource user households are those who reported visiting the A-P system within the past year for the purpose of recreational boating, fishing, swimming, or other purposes. Users of the A-P resource state WTP which is their total economic value containing both use and nonuse values. Nonusers of the A-P resource state WTP which is their total economic value containing only nonuse values. WTP by nonusers approximates the theoretical construct of nonuse value while WTP by users may include both use and nonuse values. For all sampled regions except the mountain region WTP by resource user households is greater than WTP by nonuser households by $4 to $12 although these differences are insignificantly different from zero at the 95% confidence level. In the mountain region nonusers report a slightly higher WTP than users ($1). Overall WTP by users ($28) is significantly greater from WTP by nonusers ($21) at the 99% confidence level. WTP is similar for regions, again except for the mountain region which reports lower WTP by users.

Age and income categories are constructed to minimize size differences in each subsample. Age is divided into three groups: (1) those households 35 years and younger, (2) between 36 and 50 years old, and (3) those 50 years and older. Income is also divided into three groups: (1) households with less than a $25,000 annual income, (2) those who earn between $26,000 and $40,000, and (3) those who earn greater than $40,000. Subsample sizes range from 67 to 153. WTP decreases by about $5 and $10 as age increases through the two categories. WTP increases by about $5 and $10 as income increases through the two categories.

Table 1: Descriptions of Variables

Variable	Description
Tax ($A)	The dollar value ($A) in the willingness to pay question: "Would you and your household be willing to pay $A in higher taxes, for these programs, if you knew they would be used to protect the A-P system?"
WTP	Iterated response to the question: "Would you and your household be willing to pay $A each year in higher taxes, for these programs, if you knew the would be used to protest the A-P system?"
Worth	Iterated response to the question: "Would it by worth $A each year to you and your household to make sure water pollution does not get worse and wildlife habitat remains the same in the A-P system?"
Price	The dollar and time costs of a trip to the Albemarle-Pamlico Estuarine System (APES) = $.12*(round trip distance) + (.33*hourly wage)*(round trip distance/40 mph).
Income	Response to the question: "Which of the following categories best represents your family's 1990 total income before taxes? Please include all income sources such as wages, salaries, pension dividends, net farm income, and government payments."
Education	Response to the question: "What is the highest grade of school you have completed?"
Age	Ninety-one minus the response to the question: "In what year were you born?"
Race	Equal to 0 if respondent answers other than white to the question "Are you white, black, American Indian, or some other race?" Equal to 1 if respondent is white.
Gender	Equal to 0 if the respondent is male, 1 if the respondent if female.

Property	Equal to 1 if the respondent answers "yes" to the question: "Do you own or have part ownership in any property at or near the coast?" Equal to 0 otherwise.
Urban	A four point scale based on the question: "Is your home located in a rural area (1), a small town (2), a suburb (3) or a city (4)?"
Knowledge	Knowledge about the APES. Equal to 4 if "A Lot," to 3 if "Some," to 2 if "A Little," and 1 if "Nothing."
Concern	A scale variable covering two questions of concern about water pollution and damage to fish and wildlife habitat in the APES. The scale variable increases with more concern.
Value	Reasons for valuing rivers and sounds of the A-P system. The scale variable increases as reasons increase in importance.
Trust	Scale variable which increases with trust in county, state, and Federal governmental officials to protect water quality and wildlife habitat in the A-P system.
Beliefs	A weighted scale variable which increases with positive attitudes toward the environment in general.
Activism	Scale variable which increases with activities related to positive attitudes toward the environment

Table 2: WTP Frequencies

WTP	Raw Data Frequency	Raw Data Percent	Trimmed Data[a] Frequency	Trimmed Data[a] Percent
$0	188	17.3	132	13.3
$1 - $10	49	4.5	49	4.9
$11 - $20	110	10.1	110	11.1
$21 - $30	94	8.6	94	9.5
$31 - $40	61	5.6	61	6.1
$41 - $50	56	5.1	56	5.6
$51 - $60	111	10.2	111	11.2
$61 - $70	54	5.0	54	5.4
$71 - $80	46	4.2	46	4.6
$81 - $90	36	3.3	36	3.6
$91 - $100	231	21.2	190	19.2
Over $100	53	4.9	53	5.3
Sample Size	1089		992	

[a]Trimmed data does not include (1) protest zero responses, (2) information transfer responses, and (3) nonresponses.

Table 3: Determinants of WTP Nonresponse
Dependent Variable: Nonresponse = 1, WTP Response = 0

Variable	Coefficient	t - Value
Intercept	-4.32**	-3.20
Tax	0.03***	7.98
Price	-0.001	-0.68
Income	1.04×10^{-6}	0.22
Education	0.04	1.28
Age	0.01*	2.15
Ethnic	0.67*	2.15
Gender	-0.52**	-2.63
Property	0.41	1.66
Urban	-0.34	-1.36
Knowledge	-0.07	-0.69
Concern	-0.08	-0.65
Value	-0.009	-0.26
Trust	0.11	1.90
Beliefs	-0.28	-1.32
Activism	0.09	1.76
Sample Size	1133	
Model Chi-Square	116.27 (15 d.f.)	
McFadden's R-Square	.137	

***, **, * indicates significance at the .1%, 1%, and 5% levels.

Table 4: WLS Coefficient Estimates of WTP for APES Protection: Model 1

Variable	Coefficient	t - Value
Intercept	2.83**	0.49
Tax	1.39***	5.36
Tax^2	-0.008**	-3.12
Price	-0.13***	-3.54
Income	$8.2x10^{-4}$***	9.46
F value	49.71	
Adjusted R^2	0.164	
Sample Size	992	

***, **, * indicates significance at the .1%, 1%, and 5% levels.

Table 5: WLS Coefficient Estimates of WTP for APES Protection: Model 2

Variable	Coefficient	t - Value
Intercept	4.17	0.34
Tax	1.34***	5.23
Tax^2	$7.5x10^{-3}$**	-2.95
Price	-0.12**	-3.12
Income	$6.3x10^{-4}$***	6.71
Education	1.66**	2.77
Age	-0.52***	-4.25
Race	8.08	1.65
Gender	-6.24	-1.63
Property	3.62	0.63
Urban	3.83	0.87
F value	24.38	
Adjusted R^2	0.191	
Sample Size	992	

***, **, * indicates significance at the .1%, 1%, and 5% levels.

Table 6: WLS Coefficient Estimates of WTP for APES Protection: Model 3

Variable	Coefficient	t - Value
Intercept	-26.27	-1.47
Tax	1.33***	5.28
Tax^2	$-7.3x10^{-3}$**	-2.88
Price	-0.11**	-2.80
Income	$6.4x10^{-4}$***	6.70
Education	1.51*	2.50
Age	-0.58***	-4.67
Race	6.95	1.42
Gender	-6.56	-1.71
Property	2.52	0.44
Urban	3.88	0.88
Knowledge	0.89	0.42
Concern	8.24***	3.48
Value	-0.52	-0.75
F value	20.06	
Adjusted R^2	0.200	
Sample Size	992	

***, **, * indicates significance at the .1%, 1%, and 5% levels.

Table 7: WLS Coefficient Estimates of WTP for APES Protection: Model 4

Variable	Coefficient	t - Value
Intercept	-71.89**	-2.64
Tax	1.29***	5.16
Tax^2	$-6.7x10^{-3}$**	-2.71
Price	-0.12**	-3.06
Income	$6.4x10^{-4}$***	6.80
Education	0.69	1.12
Age	-0.49***	-4.02
Race	2.14	0.43
Gender	-7.66*	-2.02
Property	1.19	0.21
Urban	4.40	1.02
Knowledge	0.98	0.45
Concern	5.53*	2.31
Value	-0.99	-1.43
Trust	-0.26	-0.25
Beliefs	12.75**	3.04
Activism	4.28***	4.18
F value	18.93	
Adjusted R^2	0.225	
Sample Size	992	

***, **, * indicates significance at the .1%, 1%, and 5% levels.

Table 8: WLS Coefficient Estimates of Worth of APES Protection

Variable	Coefficient	t - Value
Intercept	-27.88	-0.76
Tax	0.79***	9.00
Price	-0.12*	-2.22
Income	$6.9x10^{-4}$***	5.24
Education	-1.25	-1.46
Age	-0.59**	-3.25
Race	-12.54	-1.81
Gender	-9.13	-1.75
Property	6.84	0.88
Urban	1.91.40	0.32
Knowledge	3.07	1.03
Concern	7.70*	2.38
Value	0.72	0.76
Trust	-0.66	-0.46
Beliefs	5.57	0.99
Activism	3.93**	2.76
F Value	12.34	
Adjusted R^2	0.163	
Sample Size[a]	873	

***, **, * indicates significance at the .1%, 1%, and 5% levels.
[a]Sample size does not include outliers or information transfer responses.

Table 9: Mean and 95 Percent Confidence Intervals on Willingness to Pay

Statistic	Trimmed Data[a]	
	Reported WTP	Adjusted WTP
Upper Bound	$55.98	$24.78
Mean	53.19	22.17
Lower Bound	50.40	19.56
Sample Size	962	962

[a]Trimmed data does not include outliers, protest responses, nonresponses, or information transfer responses.

Table 10: WTP Estimates by Recreation Participation and Region

Region	Recreation Participation	
	Use	Nonuse
Mountain	$17.49 (19.27, 22)[a]	$19.38 (27.59, 162)
Piedmont	$25.20 (33.36, 65)	$21.07 (29.17, 162)
Coastal	$30.74 (51.02, 70)	$19.04 (29.13, 92)
Tidewater	$26.53 (32.05, 67)	$20.99 (37.51, 147)
Virginia	$29.21 (40.11, 53)	$20.12 (37.65, 122)

[a]Standard deviation and sample size in parentheses.

Table 11: WTP Estimates by Age and Income Categories

	INCOME		
Age	Less than $25,000	Between $26,000 and $40,000	Greater than $40,000
35 years and younger	$22.85 (35.10, 72)[a]	$28.95 (39.64, 142)	$37.40 (54.13, 69)
Between 36 years & 50 years	$18.15 (26.58, 67)	$22.62 (26.04, 140)	$32.94 (42.35, 125)
50 years and older	$8.00 (15.29, 153)	$11.84 (18.94, 114)	$24.19 (36.89, 80)

[a]Standard deviation and sample size in parentheses.

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