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**CITIZEN OPINIONS ABOUT
THE DELAWARE ESTUARY:
RESULTS OF A
PUBLIC OPINION SURVEY**

University of Delaware

SEA GRANT



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by

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TABLE OF CONTENTS

LIST OF TABLES	iv
LIST OF FIGURES	v
EXECUTIVE SUMMARY	vi
ACKNOWLEDGMENTS	ix
INTRODUCTION	1
RELATED STUDIES	3
METHODS	5
SURVEY RESULTS	8
Profile of Respondents	8
Uses of the Estuary	11
Environmental Perceptions and Awareness	13
Residents' Attitudes	19
Management Perceptions	21
DISCUSSION AND IMPLICATIONS	26
REFERENCES	31
APPENDIX A--DELAWARE ESTUARY ATTITUDE SURVEY	32
APPENDIX B--DELAWARE TELEPHONE EXCHANGES	36
APPENDIX C--PENNSYLVANIA TELEPHONE EXCHANGES	37
APPENDIX D--NEW JERSEY TELEPHONE EXCHANGES	38

LIST OF TABLES

Table 1.	Number of interviews completed by each state region	7
Table 2.	Respondents' demographic characteristics by region of home residence	9
Table 3.	Respondents' residential patterns by region of home residence	11
Table 4.	Respondents' uses of the Delaware Estuary by region of home residence	12
Table 5.	Respondents' uses of the Delaware Estuary by length of time they have lived in their home county	12
Table 6.	Respondents' perceptions of the environmental quality of the Delaware Estuary by region of home residence	14
Table 7.	Respondents' perceptions of changes in the quality of the Delaware River and Bay over the past 15 years by region of home residence	15
Table 8.	Respondents' perceptions of changes in the quality of the Delaware River and Bay over the past 15 years by income level	15
Table 9.	Respondents' perceptions of changes in the quality of the Delaware River and Bay over the past 15 years by length of time they have lived in their home county	16
Table 10.	Respondents' perceived importance of problems in the Delaware Estuary	17
Table 11.	Respondents' perceived importance of problems in the Delaware Estuary by region of home residence (% responding "Very Important")	18
Table 12.	Respondents' ratings of Delaware Estuary concerns (% of residents responding)	20
Table 13.	Respondents' opinions of state government's efforts to protect and manage the Delaware Estuary by region of home residence	21
Table 14.	Respondents' willingness to pay more taxes or higher prices to protect and improve the quality of the Delaware River and Bay by region of home residence	23
Table 15.	Percent of all respondents who support paying more taxes or higher prices to protect and improve the quality of the Delaware River and Bay by income level	23
Table 16.	Percent of all respondents willing to support various revenue sources to protect and improve the quality of the Delaware River and Bay	24
Table 17.	Respondents' perceived importance of problems in the Delaware Estuary by their willingness to participate in the estuary planning and management process (% responding "Very Important")	25

LIST OF FIGURES

Figure 1.	Delaware Estuary boundaries and geographic sampling area . . .	2
Figure 2.	Respondents' rating of Delaware Estuary environmental quality	13
Figure 3.	Respondents' opinions about changes in the quality of the Delaware River and Bay	14
Figure 4.	Respondents' opinions of state government's efforts to protect and manage the Delaware Estuary	22

EXECUTIVE SUMMARY

This study examined a sample of residents living within a defined geographic zone bordering the Delaware Estuary, in the states of Delaware, New Jersey, and Pennsylvania. The intent of the telephone survey was to acquire attitudinal information and solicit opinions on estuary issues from a broad segment of the population residing within close proximity to the Delaware Estuary. Telephone interviews began in early March 1989 and were concluded in mid-April 1989. A total of 918 interviews were completed.

Survey respondents reported using the Delaware Estuary in a variety of ways. Visiting waterfront areas was the most popular use of the estuary (73%), followed by recreational fishing (39%) and boating (39%). Other uses of the estuary included swimming or sunbathing, camping, and hunting.

Most residents living near the estuary rated the environmental quality of the river and bay quite low. About 85 percent rated it either "poor" (31%) or "fair" (54%). Respondents were also asked how the quality of the Delaware River and Bay had changed over the past 15 years (or as long as they had lived in the area if less than 15 years). Overall, 44 percent indicated the quality had declined, while 26 percent felt it had improved and 31 percent felt it had remained the same. The longer people had lived in the county in which they presently reside, the more likely they were to report that the health of the Delaware Estuary had improved over the past 15 years. Those who had lived in the area for the shortest time were most likely to state that the quality had remained the same.

Respondents were also asked to rate the importance of certain problems currently facing the estuary. Chemical/oil spills and toxic wastes were considered "very important" problems by virtually all respondents. Contamination of drinking water, water quality in general, contamination of fish and shellfish resources, and the direct discharge of treated wastes followed closely as "very important" problems in the minds of residents.

Nearly all of the respondents "strongly agreed" that developers, industries, and municipalities that discharge dangerous substances into the

estuary should be held financially and legally responsible for any damages that result. The vast majority also agreed that everyone shares the responsibility for protecting the natural environment and that increasing economic development would contribute to the decline in environmental quality. Nearly everyone (95%) recognized that estuaries play an important role in the life cycle of many marine animals, and 91 percent of all respondents "agreed" or "strongly agreed" that more research should be conducted to give resource managers enough information to manage the Delaware River and Bay.

When residents were asked to rate their state government's efforts to protect and manage the Delaware Estuary, they were three times as likely (35%) to rate the efforts "poor" than to rate them "good" (12%), with 53% rating their state's efforts "adequate." Respondents were also quite divided in their opinion of the media's performance in providing the public with information about the estuary. About one-half had the opinion that the media had not done a good job of providing information about estuary issues to the public.

Study subjects were also asked whether they would participate in a program to help plan the estuary's future. Fifty-nine percent reported that they were willing to participate in such a program. The willingness to participate increased with the perceived importance of environmental problems facing the estuary. Those willing to participate were more likely to believe that the estuary was both in poor condition and that its environmental quality had declined in recent years.

Sixty-two percent of the respondents indicated that they would support paying more taxes or higher prices to protect and improve the quality of the Delaware River and Bay. The higher the income of respondents, the more inclined they were to support paying more taxes or higher prices.

Individuals living near the Delaware River part of the estuary tended to consider the estuary to be in worse condition than those living near the bay, but they also were more likely to think that its condition had improved over the past 15 years. Bay area residents were more concerned with shoreline

erosion and population growth around the estuary. They also tended to give more favorable ratings to their state government's efforts to protect and manage the estuary, and were more supportive of further research to adequately manage the resource.

Residents with a college education were more likely to consider water quality to be an important problem facing the estuary, while those without a college degree were more concerned about discharge of treated wastes and recreational development around the estuary. Respondents with a college degree were more aware of the role estuaries play in the life cycle of marine animals and were more likely to feel that everyone has a responsibility for protecting the quality of the natural environment. Similar differences were found in comparisons of those with different levels of household income.

Many of the results of this telephone survey parallel the concerns of citizens and groups who are currently active in public involvement programs for the Delaware Estuary. This suggests that management decisions which are supported by these active special interest groups are also likely to be accepted by the broader population that will ultimately be affected by the decisions.

ACKNOWLEDGMENTS

This study was initiated by the University of Delaware Sea Grant Marine Advisory Service, with contract assistance provided by the survey research firms, DataBase, located in State College, Pennsylvania; and Survey Sampling, Inc. of Fairfield, Connecticut.

A number of individuals deserve mention for their assistance and contributions to this report. We would first like to acknowledge Andrew Manus, former executive director of the University of Delaware Sea Grant College Program (currently deputy director, Division of Soil and Water Conservation, Delaware Department of Natural Resources and Environmental Control), for it was his original idea and support that served as the impetus for the study.

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Finally, we would like to thank the citizens surrounding the Delaware Estuary who took the time to respond to the public opinion poll. Their responses should help resource managers and elected officials better appreciate the public's concern in seeking viable solutions for a cleaner and healthier Delaware Estuary.

INTRODUCTION

In 1987, Congress amended the Clean Water Act with the Water Quality Act, which formally established the National Estuary Program. The purpose of the program is to identify nationally significant estuaries, protect and improve their water quality, and enhance their living resources.

In the spring of 1988, representatives of the states of Delaware, New Jersey, and Pennsylvania; the Environmental Protection Agency (EPA), Regions II and III; and the Delaware River Basin Commission formulated a nomination package for the Delaware Estuary. On May 31, 1988 at New Castle, Delaware, Governors Castle (DE), Kean (NJ), and Casey (PA) officially nominated the Delaware Estuary to the National Estuary Program. The nomination by the governors was favorably received by the administrator of the EPA who approved designation of the Delaware Estuary to the National Estuary Program on July 18, 1988. With this action, broad goals and objectives were set to preserve and enhance the environmental resources and water quality of the Delaware Estuary.

The Delaware Estuary is located in the mid-Atlantic region of the United States. The estuary is bordered by the states of Pennsylvania and Delaware to the west and New Jersey to the east. The riverine portion of the estuary starts at the fall line or head of tide, near Trenton, New Jersey, and Morrisville, Pennsylvania, and proceeds to Liston Point, Delaware, a distance of 85 miles. The bay runs from Liston Point, below Reedy Island, to the mouth between Cape May, New Jersey, and Cape Henlopen, Delaware, a distance of 48 miles within the estuary (Figure 1).

The Delaware Estuary Program has a broad public participation mandate as one of its key goals. In order to promote greater public participation in the program, the three states bordering the estuary held a series of seven public workshops in February 1989. Approximately 300 citizens attended the workshops to provide input on environmental issues facing the estuary. From these workshops, many concerns were identified which helped to formulate the issues and approaches that were addressed at a tri-state workshop held in April 1989

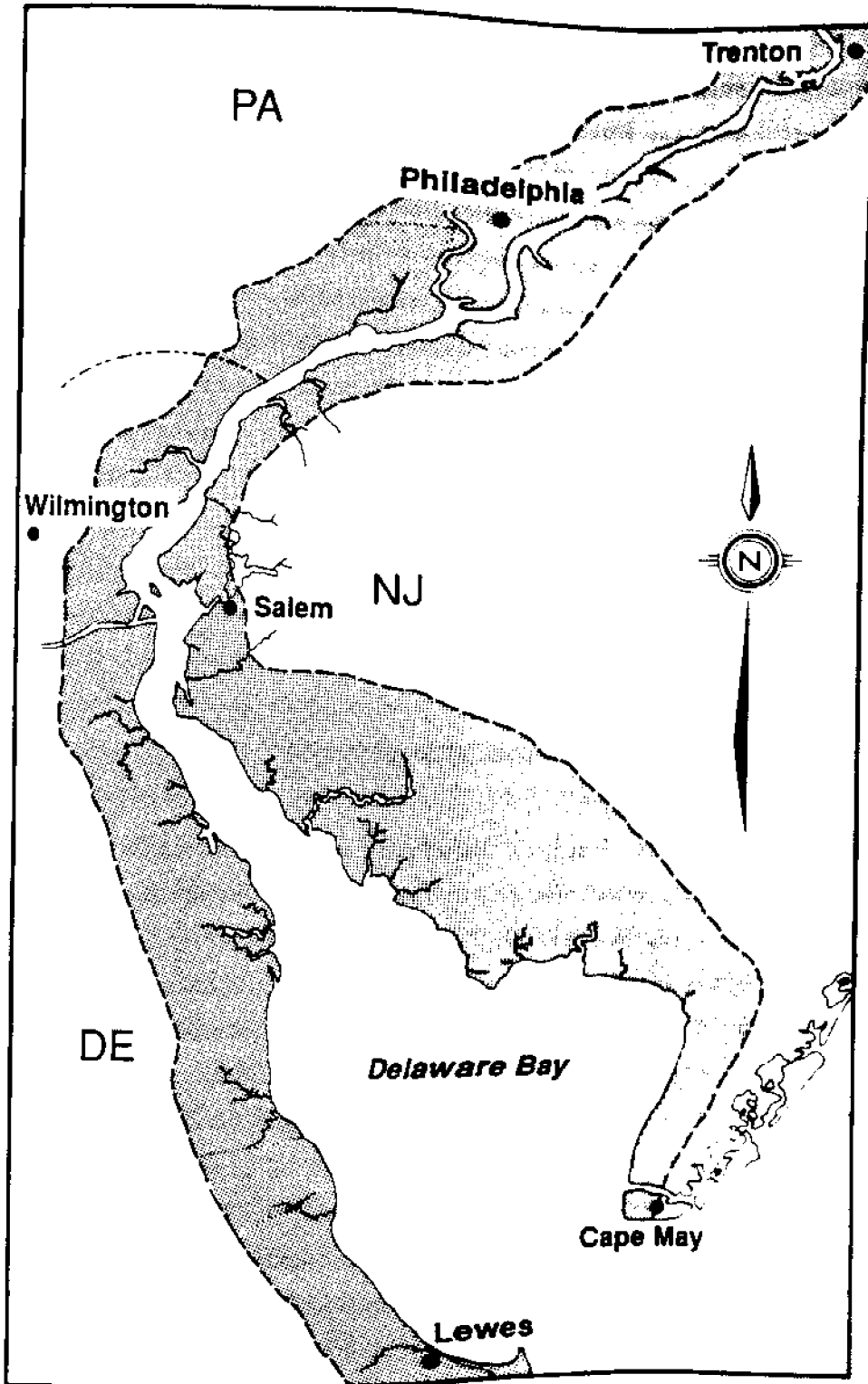


Figure 1. Delaware Estuary boundaries and geographic sampling area.

in Philadelphia. More than 150 individuals participated in this workshop that began discussions of key estuary issues identified earlier and also began to recommend committee formations, members, and goals.

To assist in responding to the charge of gaining public support and citizen input, the University of Delaware's Sea Grant Marine Advisory Service initiated a random telephone survey of individuals residing in the three states bordering the estuary. The intent of the survey was to acquire attitudinal information and solicit opinions on a variety of estuary matters from a much broader segment of the population than those already actively involved in the current Delaware Estuary Program.

The key objectives of the survey were to collect information from individuals that identified their uses of the estuary, their understanding of the estuary's resources and its importance, their sense of awareness about environmental problems, and their opinions on management issues.

RELATED STUDIES

Survey research for natural resource management issues has gained acceptance and support over the past few decades. Heberlein (1975) reports that questionnaires and surveys are one of the most effective ways of getting information from the public. Results generated from mail and telephone surveys have proved beneficial in profiling distinct user groups and alerting resource managers and decisionmakers to the fact that all groups are not homogeneous. There are often distinct differences that do not become apparent until survey analyses point out the uniqueness of certain users.

For example, concern over water pollution was greater among Wisconsin residents with higher incomes, women, and residents of small towns (David, 1971). Fishermen in New York State were more sensitive to factors related to the water surface, such as films of gas and oil, while owners of cottages and waterfront homes were most sensitive to shoreline problems, odors, colors, and taste (Kooyoomjian and Clesceri, 1974).

Several previous studies have measured the perceived seriousness of environmental problems (Florestano and Rathbun, 1980). Often this includes a comparative assessment of current conditions with conditions at some point in the past. Hines and Willeke (1974), for example, found that the majority of Atlanta area residents they surveyed felt the water quality problem facing the area was more severe than it had been two years earlier. This line of research also includes examining how people have learned about environmental issues (i.e., what is their source of information) and what they believe are the causes of the problems. Nearly half of the Atlanta residents surveyed by Hines and Willeke (1974) learned about water quality problems from television, followed by newspapers (25%), and personal observation (15%). Both industries and municipalities were considered to be major contributors to water pollution.

Several studies have included questions assessing respondents' levels of concern about environmental problems and their degree of commitment or willingness to contribute to solving these problems (Hines and Willeke, 1974; Florestano and Rathbun, 1980; Rothwell, 1988). Respondents are typically asked if they are willing to write to legislators, pay higher taxes, pay higher prices, or participate in the planning process. These studies also seek to identify how much money should be allocated to resource protection and where the money should come from. For example, Rothwell (1988) found that nearly two-thirds of Delaware residents would support higher taxes and/or higher prices to protect and improve environmental quality. Those individuals expressing this support were most likely to favor generating the additional revenue through corporate income taxes.

Finally, many studies have examined the relationship between recreational use of particular water bodies and public perceptions regarding environmental quality of the same water resources (Ditton and Goodale, 1974; Willeke, 1968). These studies generally suggest that those who are most isolated from the areas in question are also most tolerant of degraded conditions.

This survey builds on the previous studies by addressing many of these same issues in the context of the Delaware Estuary. Understanding public perceptions relative to such issues can provide useful input to the development of a comprehensive conservation and management plan for the estuary.

METHODS

The survey methodology consisted of conducting telephone interviews with a sample of individuals residing within a specified geographic area surrounding the Delaware Estuary (from the Delaware River area near Trenton, New Jersey, to the mouth of Delaware Bay). The three states of Delaware, New Jersey, and Pennsylvania were included in the sampling scheme. The sampling area was selected by following major transportation corridors through the three states, making sure that major cities and towns, as well as rural communities, were included within the area. Care was taken to ensure that the sampling area extended no more than about 25 miles from the river or bay shoreline (Figure 1).

The private research firm of Survey Sampling, Inc. (located in Fairfield, Connecticut) was contracted to generate random telephone numbers for individuals residing in the three-state geographic sampling area. Telephone area codes for the three states, as well as the three-digit exchanges for communities within the study boundaries, were provided to the survey research firm. A total of 3,600 randomly generated telephone numbers were then selected (1,200 in each state).

In each state, two distinct samples were drawn. In Delaware, a set of Wilmington telephone numbers was identified (600 selected) and a series of non-Wilmington telephone numbers was drawn (600 selected). (See Appendix B for a listing of Delaware telephone exchanges that were drawn in the 302 area code.) The intent in drawing two distinct samples in Delaware was to have one set of individuals who were residents of the major Delaware city of

Wilmington, and living along the river, to share their views on water quality and environmental conditions of the estuary. The other set of residents was composed of individuals who lived from Wilmington southward to Lewes, Delaware, and who reside in close proximity to the Delaware Bay portion of the estuary.

In Pennsylvania, 600 city-of-Philadelphia telephone numbers were drawn, and 600 non-Philadelphia (Pennsylvania towns and cities bordering the Delaware River) numbers were selected. (See Appendix C for a listing of Pennsylvania telephone exchanges that were selected within the 215 area code.) All of the Pennsylvania residents live along the Delaware River portion of the estuary. However, a decision was made to stratify the Pennsylvania sample and select residents of the city of Philadelphia, as well as residents living in the towns and communities northward to Yardley and south of the city to the Delaware border.

In New Jersey, 1,200 telephone numbers were selected, again from two distinct geographic areas. The first sample consisted of telephone numbers for residents living within the geographic boundary bordering the Delaware Bay shoreline (600 selected). This area extended from Cape May northward to Salem. The second sample included a random drawing of telephone numbers of individuals who reside in the geographic area bordering the Delaware River (600 selected). This area stretched from Salem northward to Trenton. (See Appendix D for a listing of New Jersey telephone exchanges that were selected within the 609 area code.) The selection of the New Jersey sample was based on having two distinct groups that represented residents who both lived along the Delaware Bay and along the Delaware River.

Once the entire set of 3,600 telephone numbers was received, it was forwarded to the survey research firm, DataBase (located in State College, Pennsylvania), which was contracted to conduct the telephone interviews. DataBase was instructed to conduct 150 telephone interviews from residents in each state region, totaling approximately 900 for the three-state study area.

While the telephone numbers were being generated, a survey instrument was being developed to be administered by the interviewers. (See Appendix A.) The final instrument was a survey that could be easily administered in less than 15 minutes. The telephone interviews began in early March 1989 and were concluded by mid-April 1989. DataBase interviewers conducted 918 interviews (Table 1).

Table 1. Number of interviews completed by each state region.

Delaware		Pennsylvania		New Jersey	
Wilmington	(n=156)	Philadelphia	(n=154)	Bay	(n=150)
Non-Wilmington	(n=159)	Non-Philadelphia	(n=149)	River	(n=150)
Total =	315	Total =	303	Total =	300

The data from the telephone interviews were analyzed in several different ways. Initially, frequency distributions for all questions were prepared. These frequencies summarize the responses for the entire survey sample. Since the sample was stratified according to six regions (two regions in each state), survey results were also tabulated separately for each region. Additional cross-tabulations were performed to see the extent to which survey responses varied across selected segments of the population. Variables used to segment the population for these analyses included length of residence in the county in which the respondent currently lives, level of education, income, and willingness to participate in the Delaware Estuary planning process. Statistical comparisons between various segments of the sample were made using chi-square and one-way analysis of variance. Comparisons resulting in statistically significant differences are noted in the following discussion of results. In some instances, table totals do not equal 100% due to rounding.

As in any public opinion poll, the results presented in this document describe the sample of residents selected for the study and thus represent estimates of how the entire population in the study area might respond to such a survey. To understand the accuracy of these results, it is necessary to

consider the number of cases upon which the findings are based. In general, the larger the sample, the more likely it is that the results are a true representation of the population from which the sample was selected. An approximate margin of error for results based on the overall sample of 918 cases would be 3 to 4 percent above or below the figures presented here. Estimates based on regional subsamples of approximately 150 surveys have a slightly higher margin of error (about 7 to 8 percent).

SURVEY RESULTS

Profile of Respondents

The telephone survey reached a complete cross-section of the population living in the area surrounding the Delaware Estuary (Table 2). Overall, one-third of the sample had completed a college education. The proportion of respondents with a college degree ranged from 22 percent in the New Jersey bay region to 49 percent in the Wilmington region.

Study subjects reported a wide variety of occupations. While only 3 percent were unemployed, 10 percent were retired and another 5 percent indicated they were students. The Wilmington area showed the highest proportion of professionals, while the New Jersey bay region included the largest number of retired individuals. The age of the respondents ranged from an average of 38 years in the non-Philadelphia region to an average of 44 years in the New Jersey bay area.

Incomes were nearly evenly distributed across the five income levels shown in Table 2. Wilmington area residents tended to report the highest income levels, while Philadelphia residents reported the lowest annual household incomes.

The ethnic background of respondents varied significantly across regions. The proportion of black respondents ranged from a low of 7 percent in the non-Philadelphia and New Jersey bay regions to a high of 28 percent in Philadelphia.

Table 2. Respondents' demographic characteristics by region of home residence.

	Home Residence Region						
	Delaware		Pennsylvania		New Jersey		
	All	Wilm.	Non-Wilm.	Phil.	Non-Phil.	Bay	River
(n=918)	(n=156)	(n=159)	(n=154)	(n=149)	(n=150)	(n=150)	
Education (%)*							
Less than High School	10	8	11	10	4	15	9
High School Diploma	37	22	42	39	35	43	45
Some College	21	20	22	20	24	20	19
Completed College	22	31	17	21	29	17	20
More than College	10	18	8	10	7	5	8
Occupation (%)*							
Professional	11	17	12	9	10	11	6
Managerial	14	13	10	17	15	16	17
Technical	12	13	9	15	16	8	13
Sales	4	3	4	3	10	3	3
Clerical	8	11	12	10	8	1	5
Semi-Skilled	7	6	10	7	7	6	7
Laborer	14	11	13	13	11	17	21
Homemaker	11	7	13	7	11	14	11
Student	5	4	5	6	5	4	7
Retired	10	10	9	11	5	16	9
Unemployed	3	5	3	2	1	3	1
Age (Average)**	41	42	41	40	38	44	40
Income (%)*							
Under \$15,000	15	16	12	24	11	15	7
\$15,000-\$24,999	23	16	24	29	15	31	22
\$25,000-\$34,999	22	18	22	21	29	19	24
\$35,000-\$49,999	21	24	26	15	24	17	21
\$50,000 and above	19	26	16	11	21	18	26
Race (%)*							
White	84	77	88	71	89	90	87
Black	14	20	11	28	7	7	10
Other	2	3	1	1	4	3	3

* Difference between regions significant at .01 level.

** Difference between regions significant at .05 level.

Relatively small segments of the sample were active environmentalists with regard to clean water. Only 8 percent reported that they were members of an environmental organization that supports cleanup measures of our nation's marine and coastal waters. This response did not differ by state. Twelve percent indicated that they subscribe to conservation or environmental magazines that discuss the need to clean up our nation's waterways. Again, there were no significant differences observed by state. Twenty-one percent of the survey respondents indicated that they were aware that the states bordering the Delaware Estuary had received funding from the Environmental Protection Agency as part of the National Estuary Program to conserve and manage the estuary. Slightly more Delaware (24%) and Pennsylvania (22%) residents were aware of this program than residents of New Jersey (17%).

Table 3 summarizes information relative to respondents' residential situations, including the proximity of their homes to the river or bay, the length of time they have lived in the county in which they currently live, and whether or not they own property adjacent to the Delaware River and Bay. The majority of respondents (52%) live within five miles of the Delaware Estuary, and one-fifth live within a mile. Those living in the regions bordering the Delaware River in all three states generally lived closer to the estuary than those living in the regions bordering the Delaware Bay.

About three-fourths (74%) of the respondents in this study had lived in the county in which they now live for more than ten years, and 52 percent had resided in their current county for more than 20 years. Residents in the New Jersey bay region tended to report the longest tenure within the county, while those in the Wilmington and non-Philadelphia regions had the highest proportions of people who were relatively new to the area.

Only 5 percent of the total sample reported owning property directly adjacent to the Delaware River or Bay. Respondents in Delaware and New Jersey were much more likely than those living in Pennsylvania to own property along the estuary.

Table 3. Respondents' residential patterns by region of home residence.

	Home Residence Region (%)						
	Delaware		Pennsylvania		New Jersey		
	All	Wilm.	Non-Wilm.	Phil.	Non-Phil.	Bay	
(n=918)	(n=156)	(n=139)	(n=154)	(n=149)	(n=150)	(n=150)	
Distance from Delaware Estuary*							
1 mile or less	20	27	12	17	9	13	41
2-5 miles	32	42	24	39	35	16	33
6-10 miles	18	14	26	17	25	15	13
11-20 miles	13	6	16	11	16	24	8
more than 20 miles	17	11	22	16	15	32	5
Years Lived in Current County*							
10 years or less	26	31	26	23	34	21	25
11-20 years	22	23	26	18	22	17	23
21-30 years	20	16	21	20	26	17	23
31-40 years	16	15	14	19	14	17	15
more than 40 years	16	15	13	21	5	28	13
Own Property along the Estuary*							
Yes	5	9	8	0	1	9	4
No	95	91	92	100	99	91	96

* Differences between regions significant at the .01 level.

Uses of the Estuary

Respondents participated in a variety of uses of the Delaware Estuary (Table 4). Overall, visiting waterfront areas was rated as the top use of the estuary with 73 percent of the sample reporting that they participate in this activity. Recreational fishing (39%) and recreational boating (30%) ranked as the next most popular uses.

Use patterns varied somewhat by place of residence. Non-Philadelphia residents were the least likely group to visit waterfront areas (62%). Residents of the two regions bordering Delaware Bay (non-Wilmington and New Jersey bay) were more likely to participate in recreational boating than residents from other regions. Also, these same two segments (non-Wilmington, 50%; New Jersey bay, 51%) were more likely to participate in recreational fishing opportunities than the other groups.

Table 4. Respondents' uses of the Delaware Estuary by region of home residence.

	Home Residence Region (%)						
	All	Delaware		Pennsylvania		New Jersey	
		Wilm.	Non-Wilm.	Phil.	Non-Phil.	Bay	River
	(n=918)	(n=156)	(n=159)	(n=154)	(n=149)	(n=150)	(n=150)
Visiting Waterfront Areas**	73	73	73	76	62	75	79
Recreational Fishing*	39	40	50	33	27	51	33
Recreational Boating*	33	28	37	28	26	47	32
Swimming or Sunbathing*	30	31	42	26	24	37	21
Camping	11	9	15	12	10	13	7
Hunting*	8	6	13	3	4	15	7
Commercial Fishing*	2	1	1	2	1	7	2
Other	4	4	4	6	2	1	5

* Difference between regions significant at .01 level.

** Difference between regions significant at .05 level.

Uses of the estuary also differed according to how long respondents have resided in their home county (Table 5). Those who had lived in the county longer tended to be more active users of the Delaware Estuary. For example, 42 percent of those who had lived in the area for more than 40 years reported using the estuary for recreational boating, compared to only 24 percent of those who had lived in the county for ten years or less.

Table 5. Respondents' uses of the Delaware Estuary by length of time they have lived in their home county.

	Number of Years Lived in County (%)				
	0-10	11-20	21-30	31-40	>40
	(n=242)	(n=197)	(n=185)	(n=142)	(n=144)
Visiting Waterfront Areas	72	67	71	81	75
Recreational Fishing*	30	42	40	44	44
Recreational Boating*	24	31	35	40	42
Swimming or Sunbathing*	24	28	32	32	38
Camping	9	11	12	15	10
Hunting**	4	7	10	10	13
Commercial Fishing	0	3	3	3	4
Other	3	4	2	5	6

* Difference between groups significant at the .01 level.

** Difference between groups significant at the .05 level.

Environmental Perceptions and Awareness

Respondents were asked to rate the environmental quality of the Delaware Estuary. Overall, they rated the environmental quality of the river and bay quite low (Figure 2). Eighty-five percent rated it either "poor" or only "fair." Pennsylvania residents in both the Philadelphia (38%) and non-Philadelphia (43%) regions were most likely to rate the estuary's quality "poor" (Table 6). In contrast, non-Wilmington (17%) residents and New Jersey bay (20%) residents were more likely to rate the environmental quality of the estuary "good." Only 1 percent of the respondents from any region rated the quality "outstanding."

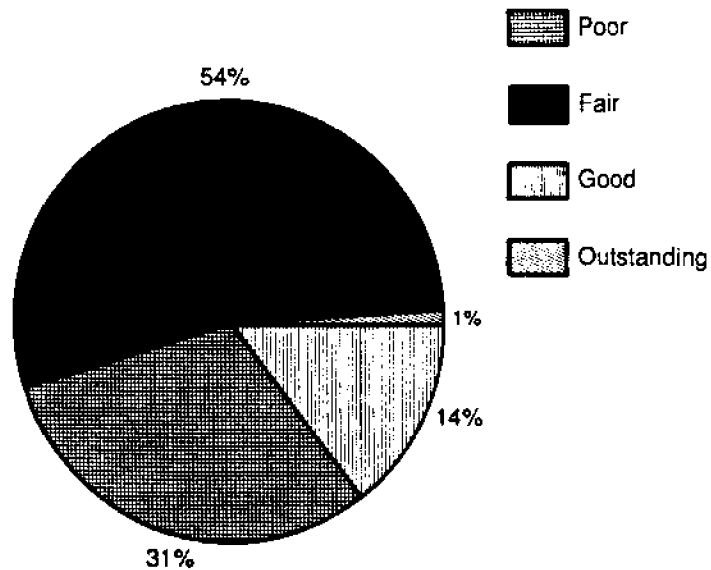


Figure 2. Respondents' rating of Delaware Estuary environmental quality.

Residents were also asked how the quality of the Delaware River and Bay has changed over the past 15 years (or as long as they had lived in the area if less than 15 years). Overall, about 43 percent of the respondents indicated the quality had "declined" (Figure 3). Another 31 percent indicated

Table 6. Respondents' perceptions of the environmental quality of the Delaware Estuary by region of home residence.

	Home Residence Region (%)*					
	Delaware		Pennsylvania		New Jersey	
	Wilm. (n=156)	Non-Wilm. (n=159)	Phil. (n=154)	Non-Phil. (n=149)	Bay (n=150)	River (n=150)
Poor	30	22	38	43	24	30
Fair	59	59	48	45	55	58
Good	11	17	11	11	20	11
Outstanding	--	1	1	--	1	1

* Difference between regions significant at the .01 level.

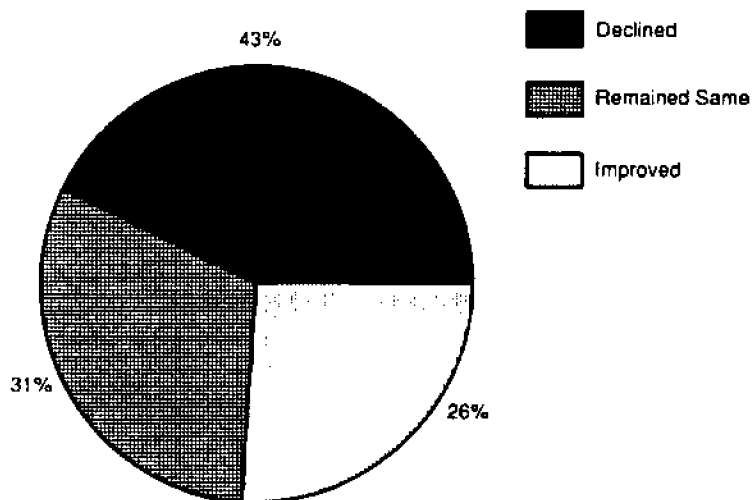


Figure 3. Respondents' opinions about changes in the quality of the Delaware River and Bay.

the quality had "remained the same." The remaining 26 percent felt the quality of the river and bay had "improved." Non-Wilmington (48%) residents and New Jersey bay (56%) residents were most likely to feel that the estuary had "declined" in quality over the past 15 years (Table 7).

Table 7. Respondents' perceptions of changes in the quality of the Delaware River and Bay over the past 15 years by region of home residence.

	Home Residence Region (%)*					
	Delaware		Pennsylvania		New Jersey	
	Wilm.	Non-Wilm.	Phil.	Non-Phil.	Bay	River
	(n=156)	(n=159)	(n=154)	(n=149)	(n=150)	(n=150)
Improved	30	21	31	25	18	31
Declined	41	48	42	40	56	35
Remained the Same	29	31	28	36	27	35

* Difference between regions significant at the .01 level.

People's perceptions of changes in the quality of the estuary varied in relation to their income level (Table 8). The higher one's income, the more likely he or she was to report that the quality of the Delaware River and Bay had improved over the past 15 years. Those with the lowest incomes were most likely to state that the quality of the estuary had remained the same.

Table 8. Respondents' perceptions of changes in the quality of the Delaware River and Bay over the past 15 years by income level.

	Income Level (%)*				
	Less than \$15,000	\$15,000-\$24,999	\$25,000-\$34,999	\$35,000-\$49,999	\$50,000 and above
	(n=108)	(n=174)	(n=171)	(n=164)	(n=151)
Improved	17	25	28	29	33
Declined	44	44	46	48	37
Remained the Same	40	31	26	24	31

* Differences between income levels significant at the .01 level.

Another interesting way to determine residents' perceived changes in environmental quality was to examine their responses in relation to the number of years they had lived in the county in which they currently reside. Residents' likelihood to perceive that the quality of the estuary had improved over time increased with the number of years that they had lived in the area (Table 9). Overall, those respondents residing in the county for more than 40 years were most likely to report that the quality had improved. Conversely, those residing in the county for ten years or less were significantly more likely to respond that the quality had remained the same (56%) over the years.

Table 9. Respondents' perceptions of changes in the quality of the Delaware River and Bay over the past 15 years by length of time they have lived in their home county.

	Number of Years Lived in County (%)*				
	0-10 (n=234)	11-20 (n=191)	21-30 (n=181)	31-40 (n=140)	>40 (n=143)
Improved	15	24	24	34	40
Declined	29	49	50	51	45
Remained the Same	56	27	25	15	15

* Differences between groups significant at the .01 level.

Respondents were given the opportunity to rate the importance of certain problems currently facing the Delaware Estuary (Table 10). Chemical/oil spills (91%) and toxic wastes (90%) were mentioned as "very important" problems by nearly all the respondents. Contamination of drinking water (88%), water quality in general (87%), contamination of fish/shellfish (87%), and the direct discharge of treated wastes (83%) followed closely as "very important" problems mentioned by respondents. The problems that received the least support as being "very important" were rising sea level (40%), dredging/sedimentation (44%), recreational development (44%), and urban development around the estuary (46%).

Table 10. Respondents' perceived importance of problems in the Delaware Estuary.

	Importance of Problem (%)		
	Very Important	Somewhat Important	Not Important
Chemical/Oil Spills	91	8	1
Toxic Wastes	90	9	1
Drinking Water Contamination	88	10	2
Water Quality	87	12	1
Contamination of Fish/Shellfish	87	12	1
Direct Discharge of Treated Wastes	83	15	2
Declining Fisheries Resources	67	29	4
Agricultural Runoff or Other Non-Point Source Pollution	62	30	8
Loss of Wetlands	61	34	5
Shoreline Erosion	55	39	6
Population Growth around Estuary	50	38	12
Hot Water Discharges	48	41	11
Urban Development	46	43	11
Dredging/Sedimentation	44	46	10
Recreational Development	44	43	13
Rising Sea Level	40	44	16

When problems in the estuary were examined by region of home residence, a few significant differences became evident (Table 11). For example, the problem of loss of wetlands was identified as "very important" by 61 percent of all the respondents. However, upon examining responses by region, Delawareans--both Wilmington residents (67%) and non-Wilmington residents (69%)--rated this problem higher in importance than residents in other regions. The problem of agricultural runoff or other non-point sources of pollution was also rated as more important by Wilmington residents (68%) and non-Wilmington residents (72%) than by any other regional segment. Population growth around the estuary was rated a "very important" problem by 50% of the total respondents. However, 64 percent of non-Wilmington residents rated it

as a "very important" problem. This response was significantly higher than any other resident segment.

Table 11. Respondents' perceived importance of problems in the Delaware Estuary by region of home residence (% responding "Very Important").

	Home Residence Region						
	All	Delaware		Pennsylvania		New Jersey	
		(n=918)	Wilm. (n=156)	Non- Wilm. (n=159)	Phil. (n=154)	Non- Phil. (n=149)	Bay (n=150)
Chemical/Oil Spills	91	94	93	92	93	85	92
Toxic Wastes	90	92	92	93	91	85	89
Drinking Water Contamination	88	90	89	91	91	81	90
Water Quality	87	89	87	85	89	80	90
Fish/Shellfish Contamination	87	92	89	88	85	80	87
Direct Discharge of Treated Wastes	83	85	85	83	84	79	81
Declining Fisheries Resources	67	67	69	70	61	71	60
Agricultural Runoff or Other Non-Point Source Pollution**	62	68	72	61	59	57	54
Loss of Wetlands*	61	67	69	57	61	58	52
Shoreline Erosion	55	56	67	53	50	56	50
Population Growth around Estuary**	50	49	64	44	48	45	47
Hot Water Discharges	48	57	43	45	49	48	45
Urban Development	46	43	52	53	45	44	43
Dredging/Sedimentation	44	43	47	43	43	46	45
Recreational Development	44	42	50	47	43	40	42
Rising Sea Level	40	38	39	41	40	41	44

* Difference between regions significant at .01 level.

** Difference between regions significant at .05 level.

Residents' Attitudes

A series of attitudinal questions was asked of residents to obtain their opinions on a variety of issues related to the Delaware Estuary (Table 12). Of the eight questions asked, respondents felt the most strongly about making individuals and groups financially and legally responsible for damages resulting from discharging toxic or potentially dangerous substances into the estuary. Seventy-four percent "strongly agreed" with this issue, and 24 percent "agreed" with it. Fifty-one percent of all respondents "strongly agreed" that everyone is responsible for protecting the natural environment and improving it, if possible, for future generations. An additional 46 percent of all respondents "agreed" with this issue.

The majority of survey respondents (51%) "agreed" that increasing economic development near the Delaware River and Bay would contribute to the decline in environmental quality, and 26 percent "strongly agreed" with this statement. Similarly, most "agreed" (62%) that you could not have an environment without some degree of environmental pollution and health hazard, although only 10 percent "strongly agreed" with this notion and 26 percent "strongly disagreed" or "disagreed." Nearly everyone "agreed" or "strongly agreed" that estuaries play an important role in the life cycle of many marine animals (95%) and that more research should be conducted in order to give agencies enough information to manage the Delaware River and Bay (91%).

From a negative standpoint, many respondents either "strongly disagreed" (10%) or "disagreed" (38%) that the media had done a good job of providing the public with information about issues related to the Delaware Estuary. Also, more than one-third of all respondents "strongly disagreed" or "disagreed" that elected officials support the environmental cleanup of our waterways.

Table 12. Respondents' ratings of Delaware Estuary concerns (% of residents responding).

	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion
Developers, industries, and municipalities that discharge toxic or potentially dangerous substances in the estuary should be held financially and legally responsible for any damages that result.	74	24	1	1	1
Every person is responsible for protecting the quality of the natural environment and improving it, if possible, for future generations.	51	46	2	0	1
Estuaries play an important role in the life cycle of many marine animals.	45	50	2	0	3
More research should be conducted in order to give agencies enough information to manage the Delaware River and Bay.	30	61	5	1	2
Increasing economic development near the Delaware River and Bay will contribute to the decline in environmental quality.	26	51	16	1	6
You cannot have an environment without some degree of environmental pollution and health hazard. The public must accept some degree of risk if they choose to have the conveniences and pleasures of modern technology.	10	62	22	4	2
In general, our elected officials support the environmental cleanup of our waterways.	7	52	29	6	6
Television, radio, newspapers, and magazines have done a good job of providing the public with information about issues related to the Delaware Estuary.	7	42	38	10	3

There were some noteworthy differences in responses to the attitudinal questions among various segments of respondents. For example, respondents who live closer to the estuary were more likely to recognize the role estuaries play in the life cycles of marine animals and were more likely to "strongly agree" that more research is needed to help manage the estuary. Those with higher incomes tended to more "strongly agree" that estuaries play an important role in marine life cycles. Higher income respondents also felt

more strongly that everyone is responsible for protecting environmental quality, but also were more likely to "strongly agree" that polluters should be held legally and financially responsible for any damages that result from their discharge of dangerous substances into the estuary.

Respondents from Delaware were more likely to "agree" that increasing economic development will lead to a decline in environmental quality, but were also more likely to "agree" that you cannot have an environment without some degree of environmental pollution and health hazard. Residents of New Jersey were the least likely to "strongly agree" that everyone is responsible for protecting the quality of the natural environment.

Management Perceptions

When residents were asked to rate their state government's efforts to protect and manage the Delaware Estuary, 35 percent gave a "poor" rating, 53 percent rated the efforts "adequate," and only 12 percent said their state was doing a "good" job. Most residents from each region polled felt officials were doing an "adequate" job of protecting and managing the resource (Table 13). Philadelphia residents (43%) and New Jersey river residents (42%) were most likely to feel that officials were doing a "poor" job.

Table 13. Respondents' opinions of state government's efforts to protect and manage the Delaware Estuary by region of home residence.

	Home Residence Region (%)*					
	Delaware		Pennsylvania		New Jersey	
	Wilm. (n=156)	Non- Wilm. (n=159)	Phil. (n=154)	Non- Phil. (n=149)	Bay (n=150)	River (n=150)
Poor	31	27	43	35	36	42
Adequate	56	54	48	59	50	49
Good	14	19	9	6	14	10

* Difference between regions significant at the .01 level.

In general, Delawareans felt state officials were doing a better job of protecting and managing the estuary than their counterparts in Pennsylvania or New Jersey (Figure 4). Sixteen percent of all Delaware residents responded that state officials were doing a "good" job, as compared to 8 percent for Pennsylvania residents and 12 percent for New Jersey residents.

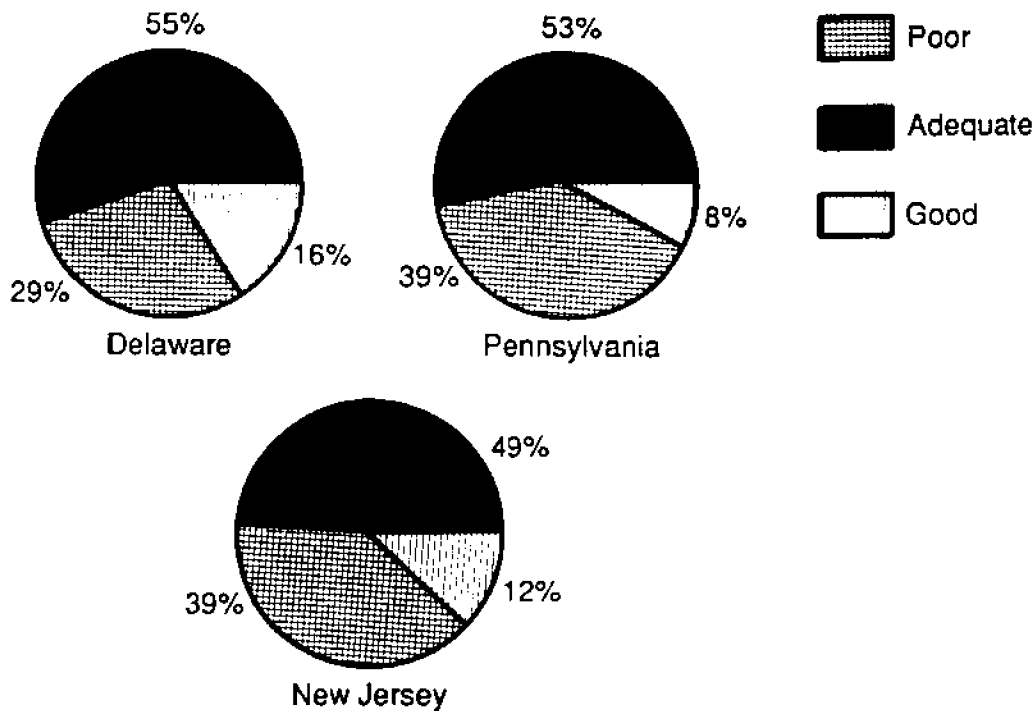


Figure 4. Respondents' opinions of state government's efforts to protect and manage the Delaware Estuary.

Study subjects were asked if they would support paying more taxes or higher prices to protect and improve the quality of the Delaware River and Bay. Overall, 63 percent of residents supported paying more to protect and improve the quality of the estuary. Residents of Delaware, especially those living in the Wilmington area, were more likely to support higher taxes or prices than residents of other regions (Table 14).

Table 14. Respondents' willingness to pay more taxes or higher prices to protect and improve the quality of the Delaware River and Bay by region of home residence.

	Home Residence Region (%)*						
	Delaware		Pennsylvania		New Jersey		
	All	Wilm.	Non-Wilm.	Phil.	Non-Phil.	Bay	
Willing to Pay More	63	65	74	63	58	57	57
Not Willing to Pay More	37	35	26	37	42	43	43

* Difference between regions significant at the .05 level.

Not surprisingly, the higher the income of respondents, the more inclined they were to support paying more taxes or higher prices (Table 15). It is noteworthy, however, that a majority of respondents from all income levels endorsed paying a greater price to ensure a higher environmental quality of the estuary.

Table 15. Percent of all respondents who support paying more taxes or higher prices to protect and improve the quality of the Delaware River and Bay by income level.

Income	% Responding "Yes"
Under \$15,000	57
\$15,000 - \$24,999	61
\$25,000 - \$34,999	62
\$35,000 - \$49,999	73
\$50,000 and above	73

When various potential revenue sources were presented to these individuals, only two options received a majority of "yes" responses--voluntary donations (59%) and increasing corporate income taxes (56%) (Table 16). Property transfer taxes (25%) and sales taxes (25%) received the least support. The only potential source of revenue that evoked a differing regional response was a sales tax. Although Delawareans were most likely to endorse the concept of paying more to protect the estuary, they were least

likely to support the use of a sales taxes to generate this revenue, which probably reflects the fact that there is no state sales tax in Delaware.

Table 16. Percent of all respondents willing to support various revenue sources to protect and improve the quality of the Delaware River and Bay.

Revenue Source	% Responding "Yes"
Voluntary Private Donations	59
Corporate Income Taxes	56
Business License Revenue	49
Higher User Fees	47
Personal Income Taxes	31
Property Transfer Taxes	25
Sales Taxes	25

Study subjects were also asked whether or not they would be willing to participate in the planning and management process for the Delaware Estuary. The majority of respondents (59%) indicated they would participate in such a program. Individuals who reported that they were willing to participate in such a public involvement program differed from those unwilling to take part in such a program in a number of respects. The willingness to participate increased with the perceived importance of environmental problems facing the estuary (Table 17). Those respondents willing to participate in the planning and management of the estuary were significantly more likely than those unwilling to participate to rate loss of wetlands, shoreline erosion, rising sea level, population growth around the estuary, recreational development, water quality, declining fisheries resources, and contamination of fish and shellfish as "very important" problems. Forty-seven percent of those willing to participate felt that the quality of the estuary had declined over the past 15 years, compared to 38 percent of those not willing to participate. Those willing to participate were more likely to feel that the media have not done a good job of providing the public with information about issues related to the

estuary. They also rated their state government's efforts to protect and manage the Delaware Estuary more negatively than respondents who were unwilling to participate.

The willing-to-participate group also reported greater use of the resource, particularly for recreational fishing, swimming, and visiting waterfront areas. The willing group felt more strongly that estuaries play an important role in the life cycles of marine animals and that increasing economic development would contribute to the decline in the environmental quality of the estuary. They also were more likely to agree that more research is needed and that every person is responsible for protecting the quality of the natural environment.

Table 17. Respondents' perceived importance of problems in the Delaware Estuary by their willingness to participate in the estuary planning and management process (% responding "Very Important").

	Group Willing to Participate (n=538)	Group Not Willing to Participate (n=361)
Chemical/Oil Spills	93	89
Drinking Water Contamination	90	86
Toxic Wastes	91	88
Fish/Shellfish Contamination**	89	84
Water Quality*	89	83
Direct Discharge of Treated Wastes	83	82
Declining Fisheries Resources*	70	61
Loss of Wetlands*	65	54
Agricultural Runoff or Other Non-Point Source Pollution	64	59
Shoreline Erosion*	59	48
Population Growth around Estuary*	53	44
Urban Development	49	43
Hot Water Discharges	49	45
Recreational Development**	47	39
Dredging/Sedimentation	46	41
Rising Sea Level	44	34

* Difference between groups significant at the .01 level.

** Difference between groups significant at the .05 level.

While there was no difference between these groups in their awareness of the National Estuary Program, those who said they would participate in the planning and management of the estuary were much more likely to be members of environmental organizations (11.5% versus 3.3%), to subscribe to conservation or environmental magazines (16.0% versus 7.8%), and to support paying more taxes or higher prices to protect the quality of the Delaware River and Bay (68% versus 53%). Those willing to participate tended to be better educated (36% college graduates compared to 27%) and younger (average age of 39 versus 44) than their unwilling counterparts. Males (63%) were slightly more likely than females (57%) in the survey to report that they would participate in the planning and management of the Delaware Estuary.

DISCUSSION AND IMPLICATIONS

In interpreting the results of this survey, it is helpful to focus on areas showing a high degree of consensus among the population as well as issues that evoke more mixed responses. In the former category, it is noteworthy that most of the people in the sample consider the environmental quality of the estuary to be quite low. The vast majority of respondents considered many of the environmental issues examined to be very important problems facing the Delaware Estuary. In short, most citizens in the immediate area surrounding the estuary are concerned about the environmental quality of the resource.

Additionally, most residents showed some awareness of the importance of estuaries to marine life. Over 90 percent favored conducting more research in support of management of the estuary. Nearly all respondents agreed that everyone is responsible for protecting the quality of the natural environment and that polluters who discharge dangerous substances into the estuary should be held responsible for any damages that may result.

Estuary residents were more evenly divided regarding the performance of the media in providing information to the public and the performance of state government in protecting and managing the estuary. About one-third rated government efforts as "poor," compared to only 12 percent who gave a rating of "good." Clearly there is room, in the eyes of the public, for improvement in the government's efforts to manage this resource.

The population was also divided in its willingness to play a role in the planning and management of the estuary and its willingness to pay for environmental improvements (either through higher taxes or other price increases). About three-fifths of those surveyed indicated they would be willing to both participate in the planning process and pay more to improve the environmental quality of the resource. As noted earlier, this willingness was associated with the degree to which residents perceived the estuary to be in trouble.

It is also useful to compare the results of this survey with other similar studies that have been conducted. Florestano and Rathbun (1980) surveyed Maryland residents about issues related to the Chesapeake Bay. The Delaware Estuary survey included several questions from Florestano and Rathbun's study. In both surveys, most residents believed further economic development would contribute to the decline in environmental quality, and most also felt that polluters should be held responsible for their damages. The one notable difference between the two studies was that respondents to the Delaware Estuary survey tended to feel even more strongly about these issues than did their counterparts in Maryland.

The Delaware Estuary survey results can also be compared with a recent survey conducted as part of Delaware's Environmental Legacy Program (the program was created by Governor Castle in April 1986). The University of Delaware's College of Urban Affairs and Public Policy administered the telephone survey to gauge the general public's concerns about the most pressing environmental issues in Delaware (Rothwell, 1988). Respondents in both surveys tended to agree with the attitudinal statements that everyone is

responsible for protecting the environment and that you cannot have an environment without some degree of environmental risk. Both studies also found about two-thirds of the population willing to pay more to protect the quality of the environment.

The major difference between these two data sets was that respondents to the Delaware Estuary survey were even more concerned about the environmental quality of the estuary. While most respondents to Delaware's Environmental Legacy survey rated the quality of Delaware's air, water, coastal areas, and natural areas "good" to "outstanding," 85 percent of the Delaware respondents in the Delaware Estuary survey rated the quality of the river and bay to be only "fair" or "poor." Similarly, Delaware respondents to the estuary survey were much less likely (16%) to rate state government efforts in environmental protection "good" than respondents to the earlier Environmental Legacy survey (35%). These results suggest that Delaware Estuary residents may be more concerned about the environmental quality of the resource than previous studies would suggest.

When survey respondents' views were compared with those of participants who attended statewide Delaware Estuary workshops, there is striking similarity. When asked what the most important uses and values were of the estuary, workshop participants believed that the Delaware Estuary was most important as a habitat to sustain fish and wildlife. They also felt that the resource was very important for recreation, as a water supply for the entire region, and for other commercial uses. Survey respondents reported that they used the estuary for a variety of recreational uses. They voiced concerns about contamination of drinking water supplies. The loss of wetlands and the safety of fish and shellfish resources were also important. A majority of respondents also were aware that estuaries are valuable resources in the life cycle of many marine animals.

Poor water quality, resulting from point and non-point sources, was seen as the most serious environmental problem facing the estuary, according to workshop participants. The destruction of habitat, especially wetlands, and

poor land-use practices due to increased population and development were also mentioned. Survey respondents also noted that incidents and substances affecting water quality, especially chemical/oil spills, toxic wastes, and direct discharge of treated wastes, were major problems. Contamination of drinking water and fish and shellfish resources were also considered serious problems. Survey respondents were least concerned about population growth and urban and recreational development around the estuary.

When asked what factors they thought contributed to the environmental problems, the workshop participants rated the inadequacy of existing laws and regulations (and their enforcement), other institutional and management problems, and poor land-use practices. They also believed that a low level of public awareness was a serious factor and that increased population and development demands, as well as pollution, were contributing factors. Survey respondents concurred that state government officials were not doing enough to protect and manage the estuary. They also felt that economic development was contributing to the environmental decline of the river and bay.

When asked what they believed needed to be done to improve the Delaware Estuary, the workshop participants wanted improved laws and enforceable regulations, a region-wide management program for land and water use, and more public education. Nearly all survey respondents agreed that anyone that discharged toxic or potentially dangerous substances into the estuary should be held financially and legally responsible for damages that result. There was also strong support that more research is needed to give agencies enough information to manage the estuary. A majority felt that everyone is responsible for the health of the estuary and that paying higher taxes and becoming involved in the process would help attain the program's goals.

This comparison clearly indicates that estuary issues, concerns, and possible solutions identified by workshop participants and telephone survey respondents are similar. Even though the methods of obtaining the opinions and perspectives may differ, the results are comparable. This observation can be useful to decisionmakers, since it appears those individuals who attend

environmental workshops and forums do indeed represent similar views as the general public as a whole. Florestano and Rathbun (1980) provide further support to this notion since they concluded that there was substantial similarity in the attitudes and perceptions of the general public and the special interest groups that they surveyed. These findings indicate it is likely that any management decisions that are supported by interest groups, who are most active and vocal, will also be accepted by the broader population of citizens that will ultimately be affected by the decisions.

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APPENDIX A

DELAWARE ESTUARY ATTITUDE SURVEY

HELLO: This is _____ from DataBase in State College, PA. We are conducting a public opinion survey for the University of Delaware, College of Marine Studies about the Delaware River and Bay. Would you be willing to answer a few questions?

The river and bay that we are concerned about are the Delaware Bay and the part of the Delaware River that is affected by the tides. This includes the mouth of the bay where it meets the Atlantic Ocean, to the rapids north of Trenton. The entire river and bay are called the Delaware Estuary.

1. How would you rate the environmental quality of the Delaware Estuary?
0 - Poor 1 - Fair 2 - Good 3 - Outstanding

2. How far do you live from the Delaware River or Bay? _____ miles.

3. How long have you lived in the county you live in now? _____ years.

4. In your opinion, has the quality of the Delaware River and Bay:

0 - Improved 1 - Declined 2 - Remained Same

over the past 15 years? (Or as long as you have lived in the area if less than 15 years.)

Next we have some questions about your use of the Delaware Estuary.

5. Please tell me if you use the Delaware Estuary for any of the following things.

Recreational Boating	0 - No	1 - Yes
Recreational Fishing	0 - No	1 - Yes
Commercial Fishing	0 - No	1 - Yes
Hunting	0 - No	1 - Yes
Swimming or Sunbathing	0 - No	1 - Yes
Visiting Waterfront Areas on the River or Bay	0 - No	1 - Yes
Camping	0 - No	1 - Yes
Any Other Activities	0 - No	1 - Yes

If yes, specify _____

6. Do you own property along the Delaware Bay or River? 0 - No 1 - Yes

7. Do you vacation along the Delaware Bay or River? 0 - No 1 - Yes

If yes, what places do you visit? _____

8. What do you consider to be the most important environmental issue facing the Delaware Bay and River? _____

9. Please tell us if you think the following problems are very important, somewhat important, or not very important in the Delaware River and Bay.

	<u>How Important</u>		
Water Quality	0 - Not	1 - Somewhat	2 - Very
Chemical and Oil Spills	0 - Not	1 - Somewhat	2 - Very
Declining Fisheries Resources	0 - Not	1 - Somewhat	2 - Very
Toxic Wastes	0 - Not	1 - Somewhat	2 - Very
Contamination of Fish and Shellfish	0 - Not	1 - Somewhat	2 - Very
Contamination of Drinking Water	0 - Not	1 - Somewhat	2 - Very
Loss of Wetlands	0 - Not	1 - Somewhat	2 - Very
Shoreline Erosion	0 - Not	1 - Somewhat	2 - Very
Dredging/Sedimentation	0 - Not	1 - Somewhat	2 - Very
Rising Sea Level	0 - Not	1 - Somewhat	2 - Very
Direct Discharge of Treated Wastes	0 - Not	1 - Somewhat	2 - Very
Hot Water Discharges	0 - Not	1 - Somewhat	2 - Very
Agricultural Run-Off or Any Other Non-Point Source Pollution	0 - Not	1 - Somewhat	2 - Very
Population Growth Around the Estuary	0 - Not	1 - Somewhat	2 - Very
Urban Development	0 - Not	1 - Somewhat	2 - Very
Recreational Development	0 - Not	1 - Somewhat	2 - Very

Next I will read you a list of statements. For each of them, please tell me if you strongly agree, agree, disagree, or strongly disagree.

10. In general, our elected officials support the environmental cleanup of our waterways?
0-Strongly Disagree 1-Disagree 4-No Opinion 2-Agree 3-Strongly Agree
11. Estuaries play an important role in the life cycle of many marine animals.
0-Strongly Disagree 1-Disagree 4-No Opinion 2-Agree 3-Strongly Agree
12. Increasing economic development near the Delaware River and Bay will contribute to the decline in environmental quality.
0-Strongly Disagree 1-Disagree 4-No Opinion 2-Agree 3-Strongly Agree
13. Television, radio, newspapers, and magazines have done a good job of providing the public with information about issues related to the Delaware Estuary.
0-Strongly Disagree 1-Disagree 4-No Opinion 2-Agree 3-Strongly Agree
14. Developers, industries, and municipalities that discharge toxic or potentially dangerous substances in the Estuary should be held financially and legally responsible for any damages that result.
0-Strongly Disagree 1-Disagree 4-No Opinion 2-Agree 3-Strongly Agree

And now a few more statements and I'll ask you again to tell me if you agree or disagree.

15. More research should be conducted in order to give agencies enough information to manage the Delaware River and Bay.
0-Strongly Disagree 1-Disagree 4-No Opinion 2-Agree 3-Strongly Agree
16. Every person is responsible for protecting the quality of the natural environment and improving it, if possible, for future generations.
0-Strongly Disagree 1-Disagree 4-No Opinion 2-Agree 3-Strongly Agree
17. You cannot have an environment without some degree of environmental pollution and health hazard. The public must accept some degree of risk if they choose to have the conveniences and pleasures of modern technology.
0-Strongly Disagree 1-Disagree 4-No Opinion 2-Agree 3-Strongly Agree
18. How would you rate your state government's efforts to protect and manage the Delaware Estuary?
0 - Poor 1 - Adequate 2 - Good

The next few questions need just a yes or no answer.

19. Before talking to me, did you know that the states bordering the Delaware Estuary have received funding from the EPA (or federal Environmental Protection Agency), as part of the National Estuary Program to conserve and manage the River and Bay?
0 - No 1 - Yes If Yes, how did you know?

20. Are you a member of an environmental organization that supports cleanup measures of our nation's marine and coastal waters?
0 - No 1 - Yes If Yes, what organization(s)?

21. Do you subscribe to any conservation or environmental magazines that discuss the need to cleanup our nation's waterways?
0 - No 1 - Yes If Yes, what magazines?

22. Would you participate in a program that would encourage the public to participate in the planning and management of the Delaware Estuary?
0 - No 1 - Yes

23. Would you support paying more taxes or higher prices to protect and improve the quality of the Delaware River and Bay?

0 - No 1 - Yes

If yes, what type of revenue source should support these actions?

Personal Income Taxes	0 - No	1 - Yes
Corporate Income Taxes	0 - No	1 - Yes
Business License Revenue	0 - No	1 - Yes
Property Transfer Taxes	0 - No	1 - Yes
Sales Taxes	0 - No	1 - Yes
Higher User Fees	0 - No	1 - Yes
Voluntary Private Donations	0 - No	1 - Yes

Now I would like to ask you just a few questions about yourself. Remember that your phone number was chosen at random and that all of your answers will be confidential.

24. What is your highest level of education? (Read if necessary.)

1 - Less than high school diploma.
2 - High school diploma.
3 - Some college.
4 - Completed college.
5 - More than college.

25. What is your occupation? (Get job title.) _____

26. How old are you? _____

27. What is your ethnic background?

0 - White/Caucasian 1 - Black 2 - Hispanic 3 - Asian
4 - American Indian 5 - Other

28. And finally, please stop me when I have read the category that best fits your annual household income.

Under \$5,000	0
\$ 5,000 - \$ 9,999	1
\$10,000 - \$14,999	2
\$15,000 - \$19,999	3
\$20,000 - \$24,999	4
\$25,000 - \$34,999	5
\$35,000 - \$49,999	6
\$50,000 and above	7
(Won't answer)	8

29. FOR INTERVIEWER: CODE GENERAL 0 - Male 1 - Female

Thank you very much for your time and cooperation.

APPENDIX B

**DELAWARE TELEPHONE EXCHANGES
(302 Area Code)**

322-	653-
324-	674-
328-	678-
335-	695-
421-	735-
422-	736-
424-	761-
478-	762-
479-	764-
530-	772-
571-	773-
573-	774-
575-	834-
594-	836-
645-	888-
651-	950-
652-	984-

APPENDIX C

PENNSYLVANIA TELEPHONE EXCHANGES
(215 Area Code)

221-	471-	671-
223-	472-	677-
224-	473-	697-
227-	476-	722-
228-	483-	725-
229-	487-	726-
235-	492-	729-
236-	496-	732-
237-	521-	734-
238-	522-	735-
243-	532-	739-
244-	533-	743-
245-	534-	748-
247-	537-	753-
271-	545-	763-
276-	552-	765-
284-	561-	769-
291-	563-	824-
299-	569-	829-
324-	574-	835-
331-	577-	841-
332-	581-	842-
335-	583-	848-
338-	586-	849-
339-	595-	851-
351-	597-	870-
352-	620-	875-
365-	622-	878-
386-	623-	893-
389-	626-	894-
424-	632-	897-
425-	634-	898-
426-	636-	925-
427-	637-	927-
452-	638-	928-
455-	639-	937-
457-	662-	969-
461-	664-	972-
464-	665-	977-
465-	667-	978-
466-	668-	988-

APPENDIX D

**NEW JERSEY TELEPHONE EXCHANGES
(609 Area Code)**

291-	540-
293-	541-
298-	678-
327-	742-
338-	756-
339-	757-
342-	764-
365-	785-
386-	786-
387-	825-
420-	829-
423-	835-
447-	871-
451-	877-
453-	935-
455-	962-
456-	963-
461-	964-
465-	966-
499-	