Coastal Zone
Information
Center

11123

Virginia Water Resources Research Center Bulletin 101

Interest Group Perceptions of Development Issues in Tidewater Virginia

Kenard E. Smith
Larry M. Springer
John D. Stephens

COASTAL ZONE
INFORMATION CENTER

Virginia Water Resources Research Center

TD
201
.V57
no.101

11123

Bulletin 101
March 1977

OCT 20 1977

Interest Group Perceptions of Development Issues in Tidewater Virginia

COASTAL ZONE
INFORMATION CENTER

Kenard E. Smith
Larry M. Springer
John D. Stephens

Department of Geography
Virginia Polytechnic Institute and State University

The work upon which this report is based was supported by funds provided by the United States Department of the Interior Office of Water Research and Technology, as authorized by the Water Resources Research Act of 1964 (P.L. 88-379).

OWRT Project A-060-VA
VPI-VWRRC-BULL 101

Property of CSC Library

A publication of
Virginia Water Resources Research Center
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

U. S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413

Virginia Polytechnic Institute. Virginia Water Resources Research Center
TD 201 .V57 no.101
337460
AUG 14 1985

PREFACE

COASTAL ZONE
INFORMATION CENTER

This report describes OWRT Project A-060-VA, sponsored by the United States Department of the Interior, Office of Water Resources Research, Virginia Water Resources Research Center, and the Department of Geography, Virginia Polytechnic Institute and State University.

The research reported herein describes an approach for analyzing the manner in which interest groups perceive critical issues affecting residential growth in a coastal area of Virginia. The Middlesex County study area is ecologically fragile and subject to water pollution problems if residential growth is unregulated. One specific problem concerns the inability of much of the region's soils to accommodate wastes from septic tank systems.

The sanitation issue can be remedied by building central sewage treatment systems. Yet, this could open up an area for rapid and uncontrolled growth. This study is an analysis of one community's perception of its situation. A Delphi panel (see chapter entitled "A Tool for Grass Roots Participation") was selected and given four questionnaires which asked the following five basic questions: (1) Is growth desirable? (2) Should growth be regulated, and if so, how? (3) What factors are retarding growth? (4) What role does inadequate waste treatment play in the development of the region? and (5) Is new technology in the form of central sewage systems the optimum solution in lieu of the area's distinct economic, social, and political characteristics?

Several individuals from Virginia Polytechnic Institute and State University and Middlesex County, Virginia deserve special recognition for their time and contributions to this research. We are indebted to Charles M. Good and Robert W. Morrill of the Department of Geography for comments and suggestions in the field and during the course of this study. The administrative support generously given to us by the Virginia Water Resources Research Center, directed by William R. Walker, has been a great aid to our work. Special thanks also go to the Middle Peninsula District Planning District Commission, especially Dale Burton and Neal Barber who generously provided information and personal insights during the course of this study. Frank H. Thomas, Staff Specialist for the United States Water Resources Council, and Arnold R. Alanen, Department of Landscape Architecture, University of Wisconsin-Madison, also were invaluable for their critical evaluations of the manuscript.

We also acknowledge the conscientious support of student research assistants who helped in many ways, especially with the coding of data and preparation of maps. Dennis R. Aaron has been invaluable for his assistance with computer applications and graphics. Blanche B. Balzer and Arthur M. Noll have provided a variety of services while serving as research assistants during the summer of 1975. Also, we wish to acknowledge the services of Vera G. Good as cartographer. Finally, we are grateful for the secretarial assistance provided by Reta Faris and Elaine Miller.

K.E.S.
L.M.S.
J.D. S.
March, 1977

TABLE OF CONTENTS

Preface iii

Abstract 1

Perspectives to a Regional Dilemma:
Lessons from Fairfax County
And Prospects for Middlesex County, Virginia 3

I. A Northern Virginia Scenario 3
II. Central Goals and Questions of this Study 7

Regional Growth Potential of Tidewater Virginia 9

I. Population Distribution in Tidewater, Virginia 9

A. The Urban Crescent 9
B. The Peninsular Tidewater Region 10

II. Urban and Rural Composition and Development 10
III. Population Characteristics and Growth in Coastal Counties ... 13

A. The Coastal Counties. 13
B. The Middle Peninsula 15

IV. Prospects for Future Growth in Middlesex County 20
V. A Physical Constraint on Growth 22

A Tool for Grass Roots Participation
The Delphi Method: Its Scope and Application. 25

Findings of the Questionnaire Surveys 35

I. Round One 35
II. Round Two. 38
III. Round Three. 44
IV. Round Four 47
V. Middlesex High School Questionnaire 49
VI. Summary. 53

Continued

Prospects for a Coastal Region
Recommendations and Conclusions 57

References Cited 63

Tables 69

Appendix
Computer Program Documentation 95

LIST OF TABLES

1. Percentage Change in Tidewater Population from Preceding Census 11

2. Population Totals and Growth Rates for Six Coastal Counties ...12

3. The Peninsular Tidewater Population Classified by Urban and Rural Residence, 1970 14

4. Net Migration Rates for Six Coastal Counties 16

5. Selected Employment Characteristics for Middle Peninsula Counties, 1970.....17

6. Age Characteristics for Selected Counties in the Peninsular Tidewater, 1970.....18

7. Interests Represented by Delphi Panel 33

8. Most Significant Issues Affecting Development of Middlesex County: Round One.....39

9. Types of Development Desired for Middlesex County, Perceptions of Delphi Panel—Round Two.....40

10. Institutions Considered by Delphi Panel to be Most Effective in Regulating Growth in Region—Round Two.....41

11. Most Significant Issues Affecting Development of Middlesex County (1975)—Round Two 42

12. Most Significant Issues Affecting Development of Middlesex County (1975)—Round Three 44

13. Delphi Panel's Preferences for Regulating Future Growth in Middlesex County (1975)—Round Three 46

14. Correspondence Between Student Attitudes Toward Growth Regulations and Attitudes Toward New Industry 50

15. Most Critical Community Problems Rated by High School Seniors.....52

LIST OF FIGURES

1. Middlesex County, Virginia.....70

2. Rates of Population Change for Tidewater Virginia, 1930-1970 ...71

3. Gloucester County Total Population Pyramids, 1960 and 1970 ...72

4. Mathews County Total Population Pyramids, 1960 and 1970.....74

5. Middlesex County Total Population Pyramids, 1960 and 1970....76

6. Gloucester County White Population Pyramid, 1970 78

7. Mathews County White Population Pyramid, 1970.....79

8. Middlesex County White Population Pyramid, 1970.....80

9. Gloucester County Black Population Pyramid, 1970.....81

10. Mathews County Black Population Pyramid, 1970 82

11. Middlesex County Black Population Pyramid, 1970 83

12. Accessibility to Tidewater Virginia from Middlesex County 89

13. Middlesex County Elevation Map 90

14. Middlesex County Soil Characteristics. 91

15. Areas Preferred for Residential Development in Middlesex County 92

16. Areas Preferred for Industrial Development in Middlesex County . . 93

17. Middlesex County Residential Locations of All Survey Respondents 94

18. Middlesex County Areas of Perceived Pollution 95

19. Middlesex County Areas Favored for Recreation 96

20. Middlesex County Areas Favored by Blacks for Recreation. 97

21. Middlesex County Areas Favored by Whites for Recreation 98

ABSTRACT

Rural areas of coastal Virginia face increased exurban development as the appeal of "country" living, lower taxes, and better accessibility lead to rapid growth beyond the urban fringe. This study examined the potential social and environmental consequences of this trend in Middlesex County, Virginia. Since many portions of this county have high water tables and inefficient soils for wastewater treatment using conventional septic tank systems, future growth will create water pollution problems affecting not only the shellfishing industry but also human health. An alternative waste disposal method, such as centralized sewage systems, would likely lead to rapid population growth. A Delphi procedure is used to analyze interest group perceptions of local problems and prospects. Results indicate that most county representatives: (1) want regulated growth to preserve existing land uses; (2) show a wide range of understanding of wastewater treatment and its effects on future growth; and (3) prefer to postpone any plans for central sewage facilities until local authorities have instituted growth-control ordinances.

Key words: Coastal Zone Management, Middlesex County, Virginia, Tidewater Virginia, Chesapeake Bay, perceptions, Delphi techniques, exurbanization, interest groups, constraints to growth, waste-disposal problems, septic tanks, water pollution, demography, leadership assessment techniques, local perceptions of growth potential, community perceptions of environmental hazards.

PERSPECTIVES TO A REGIONAL DILEMMA:
Lessons From Fairfax County
And Prospects For Middlesex County, Virginia

I. A Northern Virginia Scenario

Many communities throughout the United States are beginning to question the notion that "growth is good" [Bosselman et al., 1973; Emanual, 1974; Hill, 1974; Scott et al., 1975; Southard, 1973; Warner, 1974; Wiener, 1973]. This is a radical change in American attitudes since the growth ethic has been a central theme in our value system. The growth ethic is found in our religious values and is central to our notions of economic progress. Nevertheless, citizens are beginning to recognize the costs of growth in terms of its unintended outcomes. Unpleasant side effects are reflected in the nation's rising divorce and crime rates, declining environmental quality, increasing visual blight, and the anxieties associated with a fast-paced and rapidly changing urban society [Boulding, et al., 1973; Packard, 1969; Tofler, 1971].

Nowhere are growth pressures more evident than in the rapidly suburbanizing and exurbanizing areas of the United States. Although little more than a modest four percent of the nation's land may be urbanized by 2000, most of the leapfrogging and visible sprawl is likely to occur in existing built-up areas. Thus, one might share the evaluation that urban encroachment will have a greater psychological than physical impact [Hart, 1976; p. 15-17]. The process of "growth mania" is well documented in an excellent case study of Fairfax County, Virginia [Stansbury, 1972]. It relates the rapid residential growth in that county to improved radial highways, federal home loan programs, real estate speculation, and especially the development and expansion of the county's central sewage systems.

Residential growth in Fairfax County has been remarkable. Between 1950 and 1970, Fairfax County's population skyrocketed from 98,557 to 476,991 residents, a four-fold increase in 20 years. More than one-half of this influx were new residents, most being young couples with children seeking single-family homes.

This surge in population has strongly affected the quality of life in the area. For example, rapid residential growth occurs long before the com-

munity can provide sufficient services. New subdivisions have led to drastically over-crowded schools, shopping centers, and public parks, and have increased the demand for fire and police protection. To finance these services during the 1960's, Fairfax County property taxes jumped 137 percent while the cost of living rose a modest 28 percent [Stansbury, 1972; p. 25]. This situation is characteristic of other American metropolitan areas [Downie, 1974; Smith and Hiltner, 1975].

The negative consequences of suburbanization are difficult to prevent. Although it may seem expensive for taxpayers, suburbanization is very profitable for those who are actively involved with development. Urban sprawl begins when land speculators go into the agricultural countryside near the urban fringe and offer farmers prices for their land based upon market rather than land use values. Many farmers are willing to sell their land at these prices since most farmland is valued much lower on the normal real estate market. The speculator then proceeds to have the land rezoned so that it can be used for housing, appartments, and shopping centers.

Land rezoning, however, is not always done in the best interest of the entire communtiy. Special interests such as large landowners and speculators, public utility executives, and bankers often exert tremendous influence upon local government and planning commissions. These beneficiaries attain power by being appointed or elected to decisionmaking agencies such as the Board of Supervisors, or by making large campaign contributions and cash offers to public officials [Downie, 1974; Stansbury, 1974]. Even without this type of influence, local planning agencies willingly make zoning changes, thinking that increased land values (from rezoning) will create larger tax revenues and increased spending power for local government.

When rezoning has been accomplished, the speculator generally sells a large tract of land to a developer, who does the actual building. The builder is usually required to install access roads but is seldom required to provide any additional public services. The builder makes substantial profits in passing the true costs of the development to the home buyers and other residents in the administrative district.

Bankers and money lenders also realize huge profits from suburban sprawl. Savings and loan associations, the biggest lenders, earn most of their interest income from mortgages on new homes. Therefore, it seems

inevitable that urban expansion will continue because it is indeed profitable to farmers, speculators, planners, developers, bankers, and even homeowners whose property values soon increase [Downie, 1974; p. 84-104].

Residential development in Fairfax County also is influenced by decisions of the Fairfax County Division of Sanitary Engineering (DSE). Without previous installation of public sewage systems, growth would have been prevented by state health authorities because such alternative forms of waste treatment as septic tanks are not suited to the physical environment in the county. Inadequate soils, high water tables, and low-lying land all contribute to septic tank failures at suburban densities. For these reasons, the DSE is catalytic to any growth that occurs in the county. Indeed, the cooperative alliance between the Board of Supervisors and the DSE in the 1960's cemented the future directions of Fairfax County.

This alliance is certainly not unusual or surprising, since profits and progress are commonly believed to be the result of residential development. In addition, the alliance is shaped by the structure of Fairfax County's government. Unfortunately, the decisions of this alliance are difficult if not impossible to monitor at the grass roots level. Each agency perceives that it is functioning in accordance with American values and meeting its legal responsibilities.

One reason DSE decisions are difficult to regulate is that once a trunk sewer line is installed, subsequent branch lines are necessary to pay for previous construction. Stansbury describes the process very well:

> Since the sewerage system is financed through a bond issue, and since the bond issue is repaid through user charges, the Supervisors wield every land-use weapon they can to assure that the necessary residential developments and sewer hook-ups will take place as rapidly as possible.
>
> By this engineering-economic-political process, then, population projections become at least partially self-fulfilling. But the process does not stop there. The typical sewer bond issue is paid off well before the new trunk line is filled to capacity. Undaunted, the Supervisors still seek to guarantee the predicted tap-ins. Why? To gain surplus revenues. What for? Among other things, to expand the sewerage system. [Stansbury, 1974; p. 14]

In practice, however, the process operates far less successfully than stated above. For example, in the mid-1950's, Fairfax County sold bonds to finance a $20 million integrated sewage system. These bonds were to be retired by payments from users of the system. However, new hookups to the system were insufficient to meet the existing bond debts. Rather than raise property taxes to offset sewer bond deficits, the county was forced to sell additional bonds to enlarge the system further and thereby generate new user revenues. The additional revenues were then used to retire portions of the original $20 million bond debt. This situation is analogous to the organizational adage that, once established, an organization's primary reason for existence is self-perpetuation.

Through this brief introduction, we have tried to demonstrate that suburbanization is related to the provision of sanitation services and that an understanding of both is central to the regulation of residential development. Many areas are on the verge of a similar kind of experience. Most would agree that the northern Virginia predicament is to be avoided. We must ask, therefore, is growth desirable? If so, how can the negative consequences of growth be minimized? Indeed, many of the rural areas facing the prospects of growth have even fewer regulatory mechanisms at their disposal than did Fairfax County in the 1950's and 1960's. How can local governments anticipate the need for growth-control regulations before expansion becomes unmanageable?

Developing growth-control legislation is very difficult without strong grass roots cooperation, since most local residents fail to recognize and do something about significant environmental problems until a crisis takes place. In one of the earliest studies concerning human adjustments to floods, White [1945; p. 24] demonstrated that "national catastrophes have led to insistent demands for national action, and the timing of the legislative process has been set by the tempo of destructive floods." The wave of new national policies concerning coastal hazards protection has been stimulated by a series of hurricane disasters on the Easter Seaboard [Burton and Kates, 1964a].

Although the pulse of human affairs changes quickly during and immediately after a crisis, it has also been demonstrated that hazard zone occupants, even after suffering severe losses, resist new governmental protection and regulations. In fact, they often return to their original locations as quickly as possible [Burton and Kates, 1964b; Burton et al., 1968; Burton, 1972; and Moline, 1974]. Similarly, while population

growth offers the prospect of a different type of crisis, some persons living in coastal areas facing imminent development demonstrate little appreciation of the factors triggering growth and the impacts it will have upon their communities [Mitchell, 1976]. As a consequence, it may be difficult to get public support for measures that will prevent the more adverse impacts of development.

II. Central Goals and Questions of this Study

In Fairfax County, no significant resistance to growth occurred until property taxes reached alarmingly high levels, thus awakening community opposition to new sewer lines and development [Stansbury, 1974]. Middlesex County, a Tidewater area in Virginia's Middle Peninsula, was selected as a case study to analyze interest group perceptions of critical issues affecting exurban growth in a coastal region. The recognition of problems contributing to and associated with rapid population growth would seem to be much less evident in Middlesex County because the residents have experienced little, if any, large scale development. For example, one could hardly expect local residents to recognize the effects of a countywide central sewage system, since perception of a problem often requires past experience. Because of its rural quality, which is characterized by low population density, open spaces, primary economic activities, small settlements, low mobility and high social stability, county residents are largely isolated from the issues of northern Virginia. Thus, while their attitudes might appear provincial, they reflect a viewpoint that has been conditioned by limited experiences in a county that has changed little in recent years. In addition, the deeply rooted and cohesive nature of this community are the ingredients which may stimulate greater environmental consciousness and governmental action [Mitchel, 1976].

Therefore, we recognize the need for a research methodology that will help us better understand a community, while also assisting local interest groups to assess their environmental problems, anticipate the outcomes of future developments, and mobilize community support to prevent careless development and its repercussions.

The report documents one community's perception of its situation. Spokesmen for interest groups in Middlesex County were asked the following basic questions:

1. Is growth desirable?
2. Should growth be regulated and if so, how?
3. What factors are retarding growth?
4. What impacts would result from a change in waste treatment methods?
5. Is it socially desirable to solve the county's waste treatment problems and thereby open up the area for impending growth?

We hope that this study has alerted its participants to present and potential developmental issues. Through such awareness, we feel that this community, which is on the verge of rapid development, might be spared many of the inevitable problems that are encountered whenever growth is allowed in an unplanned and chaotic fashion. A discussion of regional demographic trends and growth potentials will set the stage for an analysis of Middlesex County's strengths, weaknesses, and future prospects, as seen primarily from the vantage point of its citizens.

REGIONAL GROWTH POTENTIAL OF TIDEWATER VIRGINIA

The focus of this section is an assessment of the potential for growth and development in a portion of Tidewater Virginia. In common usage, Tidewater can have several different geographic meanings. In this report, Tidewater Virginia comprises the coastal lowlands lying between Chesapeake Bay and the Piedmont. The fall-line, or transition zone between the coastal lowlands and the Piedmont, thus becomes the western limit for the region.

I. Population Distribution in Tidewater, Virginia

The distribution of the present-day population in Tidewater Virginia is the product of a complex assemblage of forces, past and present, operating both locally and from well beyond its territorial limits. The basic form of this distributional pattern can be described quite succinctly in terms of three regions: (1) a densely populated crescent of urban centers stretching from Washinton, D.C. to Norfolk; (2) a largely agricultural region to the southwest dotted with several urban centers and a pronounced small-town population; and (3) a second agricultural region to the east of the urban crescent having a widely dispersed rural population with several small towns clustered along the coast and estuaries of the Chesapeake Bay. Although adjacent to one another, the first and third regions provide the sharpest contrast in population growth and concentration.

A. The Urban Crescent

Along the fall-line lies a chain of cities whose development dates back to colonial America. What was once a highly discontinuous array of towns has developed into a crescent of urban centers. In Virginia, the crescent begins just south of the Washington metropolitan area, continues southward through Richmond, arcs toward the southeast near Hopewell, and terminates in the Norfolk and Virginia Beach Metropolitan areas.

In Virginia, a coalescence of many of these urban areas had occurred by the 1940's. Norfolk, for example, began to merge with such nearby centers as Hampton, Newport News, Portsmouth, Virginia Beach, and Williamsburg. At the same time, the interstitial rural territory, even when still ostensibly agricultural, had been profoundly transformed in residential, social, and economic terms. Since 1950, the process of growth and

accretion of cities along the crescent has been rapid and spatially extensive. By 1970, it was estimated that well over 1.75 million Virginians reside within this nearly continuous zone of urban influence.

B. The Peninsular Tidewater Region

In direct contrast to these trends is the land area lying to the east of the urban crescent. This third region of Tidewater Virginia encompasses the three peninsulas. The upper peninsula is bounded by the Potomac River to the north, while the lower peninsula is bounded by the James River on the south. Unlike the chain of urban centers that partially surround it, the region is decidely rural in character. Fewer than five settlements had populations greater than 2,500 in 1970. These and smaller agglomerations, usually located along rivers and estuaries, owe their existence to favorable transportation or recreational situations.

While urban places to the west and south have made impressive gains in population, the three Tidewater peninsulas, for the most part, have experienced little or no growth in population over the past 25 years. In fact, the annual rate of population growth for the aggregate of counties within the region is below the 1970 rate of natural increase for the nation which was 9.8 percent.

II. Urban and Rural Composition and Development

The date when city dwellers first outnumbered rural residents seems to have been 1918 for the United States and 1926 for Tidewater Virginia. The vagaries of Census definitions of urban and rural residence in recent decades tend to obscure the actual situation. If the official definition sets the percentage of Tidewater Virginians who were urban in 1970 at 63.7 while the national value is 73.5, then the Virginia statistic actually reflects the inadequacy of the current urban definition. Less than one Tidewater Virginian in every 80 now resides on a farm; and a goodly fraction of the 29.8 percent reported as "rural nonfarm" are, in fact, suburban and exurban persons genuinely urban in economic and social outlook. If it were feasible to redefine the population on a functional basis rather than by the physical location of dwellings, then it is probable that well in excess of 70 percent of Tidewater Virginians would be considered urban.

TABLE 1
Percentage Change in Tidewater Population from Preceding Census

		Urban	Rural
Current Urban Definition	1970	+4.2	+4.9
	1960	+8.4	+4.1
Previous Urban Definition	1960	+6.4	+11.2
	1950	+6.2	+7.0
	1940	+1.8	+6.8
	1930	+9.5	+1.3
	1920	+14.7	+4.3

Source: *Historical Statistics of the United States,* U.S. Bureau of the Census, 1965; and, *1970 Census of Population, General Characteristics for Virginia,* U.S. Bureau of the Census, 1970.

Tidewater Virginia has shared with the rest of the Commonwealth and country a decline in its once predominantly agricultural population. When the rural farm population was first distinguished from other categories by the 1920 Census, it had already shrunk to 29.7 and 26.2 percent of the aggregate population in the United States and Tidewater Virginia, respectively. By 1970, the corresponding values were 4.1 and 1.3 percent. Rather paradoxically, however, the size of Tidewater's "rural" population has grown without letup from the first Census to the most recent enumeration (i.e., if we adopt the current urban definition from 1950 onward). The apparent paradox is that of a steadily increasing "rural" population in a region where the tradional rural occupations have dwindled. In part, we are confronted with the problem of outmoded definitions. But more interestingly, it is possible that we are confronted with newer modes of urbanization and exurbanization, or perhaps with an emergent mode of settlement for which there is no proper term as yet.

In any event, both gross categories of population—the "urban" and "rural"—have grown in absolute size, but in rather erratic fashion, during

TABLE 2

Population Totals and Growth Rates for Six Coastal Counties

(Figures within parentheses indicate the relative rate of population growth as compared with the preceding census totals.)

County	1930	1940	%	1950	%	1960	%	1970	%
Gloucester	11,019	9,548	(-13.3)	10,343	(8.3)	11,919	(15.2)	14,059	(18.0)
Lancaster	8,896	8,786	(-1.2)	8,640	(-1.7)	9,174	(6.2)	9,126	(-0.5)
Mathews	7,884	7,149	(-9.3)	7,148	(-0.0)	7,121	(-0.4)	7,168	(-6.4)
Middlesex	7,273	6,673	(-8.2)	6,715	(0.6)	6,319	(-5.9)	6,295	(-0.4)
Northumberland	11,081	10,463	(-5.6)	10,012	(-4.3)	10,185	(1.7)	9,239	(-9.3)
York	7,615	8,857	(16.3)	11,750	(32.7)	21,583	(83.7)	33,203	(53.8)

Source: *Census of Population: 1970. General Social and Economic Characteristics. Final Report PC(1) C-48, Virginia,* U.S. Bureau of the Census, 1972.

recent decades, as indicated in Table 1. Whatever measure may be applied, the dominant trend in Tidewater Virginia is for urban population to grow at a faster rate than the rural. Thus, the urban population has increased from 39.6 to 63.7 percent during the period 1940 to 1970 while the rural percentage has declined correspondingly. Much of this growth has occurred in or near the larger urban centers.

III. Population Characteristics and Growth in Coastal Counties

The research focuses on Middlesex County, one of six coastal counties in the Peninsular Tidewater (Figure 1). Before examining Middlesex County in particular, we look at population growth and development in the context of the six-county area.

A. The Coastal Counties

Population totals and rates of change for the six coastal counties are given in Table 2. The data, spanning half a century, clearly show that the majority of counties have experienced sizeable losses in population. The most significant decrease occurred during the period 1930-1940, which corresponds to the time when nearby urban centers were adding large numbers to their populations. The counties of York and Gloucester, however, deviate from this general trend. Growth in both counties has been on the rise since 1940.

It is difficult to uncover any patterns of population change given only the data in Table 2. When disaggregating the data to minor civil divisions (or magisterial districts) and presenting them in map form (Figure 2), regional trends in population growth become more evident.

Spatial patterns of population change are more easily identified than temporal ones. Population growth rates decrease as one moves northward across the tier of counties. With few exceptions, this regularity has become more evident in recent decades. Thus, the closer a minor civil division is to the urban centers to the south, the more substantial is its population growth. Witness, for example, the large increments over time in total population for York County, and, to a lesser extent, in Gloucester County. Located on the lower peninsula, York County is immediately adjacent to the Newport News and Hampton metropolitan areas. Needless to say, the county has absorbed much of their population growth over the past two decades. Even though suburban and exurban growth

TABLE 3
The Peninsular Tidewater Population Classified by Urban and Rural Residence, 1970

	Total Population	Urban	%	Rural Nonfarm	%	Rural Farm	%	Farm Population Change 1960-1970
Gloucester	14,059	—	(0.0)	13,469	(95.8)	590	(4.2)	-46.3
Lancaster	9,126	—	(0.0)	8,645	(94.7)	481	(5.3)	-56.9
Mathews	7,168	—	(0.0)	6,882	(96.0)	286	(4.0)	-25.9
Middlesex	6,295	—	(0.0)	5,852	(93.0)	443	(7.0)	-58.2
Northumberland	9,239	—	(0.0)	8,103	(87.7)	1,136	(12.3)	-39.9
York	33,203	7,770	(23.4)	25,175	(75.8)	262	(0.8)	-37.8

Source: *Census of Population: 1970. General Social and Economic Characteristics. Final Report PC(1) C-48, Virginia,* U.S. Bureau of the Census, 1972.

in the counties has been substantial, no population in Gloucester County is classified as "urban" and only 23.4 percent of York County's population is considered as such (Table 3). Once again, the Census definitions of urban and rural are inadequate. The statistics in Table 3 do not convey the realities of the situation in spite of large decreases in the farm population over the past decade (Table 3), tracts of agricultural land being converted to housing subdivisions, and a dense and growing nonfarm population.

A second interesting trend can be observed for minor civil divisions that have the largest amount of shoreline along the Chesapeake Bay (Figure 2). With few exceptions, these areal units have experienced higher rates of urban growth than inland districts. The trend is due, in part, to growth in recreation. Both year-round and vacation homes have been increasing in these coastal areas. The vacation and recreational trade has also made an impact on the retail sector which, in turn, has spurred additional population growth.

Looking only at the map of relative increase or decrease in population size of minor civil divisions, we cannot obtain a complete picture of the dynamics of population change in the Peninsular Tidewater. Migration plays a significant role in the changing demographic characteristics of the region. Table 4 gives the net migration rates for the six coastal counties (Figure 2). We find that, in general, population growth due to net migration decreases while moving northward. Throughout recent history, the northern counties have attained a negative net migrational balance. Middlesex County, which lies midway in the north-south tier of counties, records a net migration rate of −1.3. The rate suggests that the number of immigrants entering the county is slightly less than the number of emigrants between 1960 and 1970. According to recent estimates of the population of Virginia counties as of July 1, 1974 [Gilliam and Serow, 1975], Middlesex County has attained a net migrational balance of 4.1 between 1970 and 1974. Once again, the counties of Gloucester and York, being considerably closer to major urban concentrations, experience the highest rates of growth due to net migration.

B. The Middle Peninsula

The socioeconomic and demographic characteristics of emigrants leaving the easternmost counties of the Middle Peninsula differ from the characteristics of those coming in. Proportionally, more blacks than whites

TABLE 4
Net Migration Rates for Six Coastal Counties

	1950	1960	1970
Gloucester	2.5	2.7	11.3
Lancaster	-8.4	-6.0	-5.4
Mathews	-4.6	-2.8	5.0
Middlesex	-9.8	-13.3	-1.3
Northumberland	-11.2	-7.0	-13.0
York	36.1	54.5	37.4
Net Migration Balance of the Region	0.4	3.0	5.6

Source: *City and County Data Book*, U.S. Bureau of the Census, 1972.

leave the area, as evidenced by negative growth rates of −6.8, −5.3, and −10.8 for the black populations of Gloucester, Mathews, and Middlesex counties, respectively. In addition, outward migration is particularly selective of the young and few differentials by sex or educational level can be detected. As the population pryamids for the counties show (Figures 3-5), noticeable losses in population within the 20-39 year age interval have occurred for at least two decades. Only in Gloucester County is the trend beginning to reverse (Figure 5).

The losses in population can be attributed to a local economy in which fewer and fewer job opportunities are available to retain the young, skilled, and educated segments of the population. Since so many among the working population continue to leave the counties and seek jobs elsewhere, unemployment rates are not critically high (Table 5). But, for those who choose to remain, many have had to find employment outside their county of residence.

Few insights into the characteristics of the migrant populations can be gained from net migration rates alone. And, given the relative paucity of migration data in the Census, researchers must resort to more indirect

TABLE 5
Selected Employment Characteristics for Middle Peninsula Counties, 1970

County	Percent Unemployed	Percent Employed Outside County of Residence
Gloucester	3.0	45.6
Mathews	5.8	31.1
Middlesex	2.9	24.6

Source: *City and County Data Book*, U.S. Bureau of the Census, 1972.

methods. Therefore, in this report we use population pyramids for summarizing age and sex characteristics of the resident populations in the three county area.

Population pyramids provide a graphic summary of the number of males and females that fall into each of 18 five-year age groups. Figures 3 through 5 depict the age-sex structure of the county populations for 1960 and 1970. As noted earlier, the counties have lost many of their young adults in recent decades. The decreasing population among the younger ranks means that the number of individuals aged 20-24 years is nearly equal to the number within the 70-74 year age group.

In recent decades, the rural coastal plain counties have added large numbers of people aged 45 years and older to their population. Middlesex and Mathews counties, in particular, have much older populations than, for example, the more suburban York County to the south (Table 6). Moreover, the indices of median age and percent of population over 65 years for magisterial districts in the Middle Peninsula suggest that the oldest populations are situated in the low-lying districts along Chesapeake Bay. These are also the areas in which recreational activities and the construction of vacation homes have been gaining momentum in recent years.

TABLE 6
Age Characteristics for Selected Counties in the Peninsular Tidewater, 1970.

	Median Age	Percent Population Over 65 yrs.	Percent Population Receiving Social Security Benefits
Gloucester	31.0	11.6 %	18.0 %
*Abingdon	28.9	9.7	
Petsworth	33.0	14.2	
Ware	34.7	14.5	
Mathews	40.5	20.5	39.9
*Chesapeake	43.7	23.6	
*Piankitank	41.7	19.0	
*Westville	38.3	17.9	
Middlesex	37.7	17.5	33.5
Jamaica	30.8	15.3	
*Pine Top	43.2	20.3	
Saluda	35.3	15.7	
York	24.4	4.3	9.2
Bethel	22.2	2.7	
Bruton	24.4	3.5	
*Grafton	26.9	5.4	
Nelson	28.8	3.9	
*Poquoson	27.6	7.9	

*Indicates magisterial districts immediately adjacent to the Chesapeake Bay.

Source: *Census of Population: 1970. General Social and Economic Characteristics, Final Report PC(1) C-48, Virginia,* U.S. Bureau of the Census, 1972.

The population pyramids for the black population of the three counties tell a quite different story from the pyramids for total population (Figures 6-8). Blacks constitute a much younger subgroup of the population with proportionally larger numbers of blacks than whites aged 0-19 years. Similar to its effect on the white population, the process of migration is particularly selective of blacks aged 20-39 years. Unlike the white population, however, there are considerably fewer blacks at or beyond retirement age.

The age and sex composition of the white residents, as portrayed in Figures 9 through 11, provide a sharp contrast to the black population pyramids (Figures 6-8). One in every four white residents is over 65 years of age. Alternatively, less than one in every four white residents has yet to reach 20 years of age.

The population pyramids supply the evidence for indirect conclusions regarding the characteristics of migration in the Middle Peninsula. Unlike the demographic characteristics of those leaving the area, the bulk of the incomers fall within the age group 45 years and over. The result of this age selectivity in migration is most noticeable in the white population pyramids of Middlesex and Mathews counties for 1970 (Figures 7 and 8) where substantial growth of the retirement age population has occurred since 1950.

The question of where the migrants originated remains to be answered. Fortunately, the Census has published information summarizing interstate and intrastate migration rates for the population 5 years and older in each of the states for the periods 1955-1960 and 1965-1970 [U.S. Bureau of the Census, 1967 and 1972]. The data are derived from responses to questions about place of residence five years earlier and are administered by the Census to a large sample population. Both the origins and destinations of migration streams between State Economic Areas (SEA's) can be readily obtained. For each time period, the data indicate how many of those living in each SEA in the country at the beginning or end of the five-year period had been residing in each of the others during the other year. Less fortunately, no breakdown by age, sex, or any other characteristics for these migration streams exist.

According to the Census reports of migration between SEA's, the locations supplying the majority of migrants are in close proximity to the three coastal counties. Previous residents of urban centers such as Rich-

mond, Newport News, Hampton, and Norfolk make up a disproportionate share of those migrating to the area during 1955-60 and 1965-70. In general, the previous places of residence for the vast majority of immigrants to Gloucester, Mathews, and Middlesex counties include locations within Tidewater Virginia.

Based upon a preceding description of changes in the age composition of these counties, we have reason to believe that the majority of migrants entering in recent years are white and over 45 years of age. Alternatively, migrants leaving the Middle Peninsula are less than 35 years of age, disproportionately black, and in search of employment in the crescent of urban centers to the south and west. The bulk of migration to and from the Middle Peninsula occurs over relatively short distances. Furthermore, the pattern is one in which young emigrants from the counties are replaced by older working-age and retired populations, the latter group being substantially larger in absolute size.

IV. Prospects for Future Growth in Middlesex County

Middlesex County actually has been declining in population size since 1950, despite large influxes through migration. Perhaps the primary force affecting this decline is a local rural economy unable to support a growing population. The livelihood of the local economy depends upon commercial agriculture, dairying, and the shellfishing, lumbering, boatbuilding and recreational industries. However, the potential for growth within many of these industries is severely limited. Lumbering, commercial agriculture, and dairying activities find it impractical to achieve internal scale economies through expansion due to an already heavy tax burden. The shellfishing industry, central to the economic health of the county, has been adversely affected by the pollution of coastal estuaries. Moreover, small shellfishing enterprises in the county cannot realize sufficient scale economies in order to compete effectively with other large-scale shellfishing industries along the Chesapeake. These and other economic ills place the county on the verge of economic stagnation.

One bright prospect in an otherwise dismal economic outlook is the growth potential in recreation-related activities. Boat-building and recreational service industries, in particular, have experienced considerable growth in recent years. A growing housing demand has spurred increased activity within the construction industry. The abundance of water-related

recreational opportunities make the county a desirable location for vacation homesites. In addition, the strategic location of Middlesex County with respect to the chain of urban centers to the south and west (Figure 12) make it highly desirable for permanent, year-round residential locations.

At this juncture, it should be reemphasized that 25 percent of the economically active population commute to work places outside the county. Thus, an additional demand for housing has been generated by residents of the Richmond and Newport News metropolitan areas who have decided to relocate their residences to the more rural environment of the county while, nevertheless, retaining their employment in these metropolitan areas. And as Figure 14 shows, the commuting time to many of these urban areas is not unreasonable. In fact, suburban employment locations are less than one hour's drive from the geographical center of Middlesex County.

Added to the demand for vacation and permanent homesites for resident and nonresident workers are two additional categories of housing demand. The first category pertains to the demand for permanent retirement homesites. The population figures presented earlier clearly support this observation. As previously indicated in Table 6, 17.5 percent of the county's population in 1970 was over 65 years of age, and the Pine Top District attained an even more impressive figure of 20.3 percent. The figures, and the even higher one for adjacent Mathews County, are considerably higher than the state-wide figure of 7.9 percent. These trends, coupled with the prevailing migration patterns, indicate that migrants choose a more rural environment in which to reside upon retirement from jobs in nearby urban centers. And the location of Middlesex County on the fringe of several metropolitan areas affords one with accessibility to urban opportunities when the need arises.

Although only slight corroborating evidence from field interviews exists, there is some reason to believe that many of the retirees establishing residency in Middlesex County are, in fact, return migrants. Thus, many of the incoming retirees are either native to or former residents of the county. Those who once were drawn away from the county, perhaps as young adults, find their home area sufficiently appealing to return later in life. Although this is an interesting supposition, the migration of retirees to the county is by no means limited to former residents.

A final category of housing demand is that of long-term residents—those who have lived in the county for many years and require larger or better quality homes. The category also includes young couples establishing their first households. However, given the continued emigration of young adults due to a lack of job opportunities, the housing demand of young couples is a declining factor.

The following indicators of potential growth presently exist, and these trends are unlikely to be reversed. First, further immigration of retirees is expected to continue as people seek the amenities of this rural setting. Second, families are relocating in Middlesex County from nearby urban centers where they continue to hold employment. (That urbanization is encroaching upon this region was officially recognized in April 1973, when Gloucester County was designated as an addition to the Newport News Standard Metropolitan Statistical Area.) Third, until new employment opportunities become available, Middlesex County will continue to lose its skilled and educated young adults. However, as firms continue to suburbanize as they have in York and Gloucester counties, Middlesex County will be in a slightly better position to retain its younger population as a labor source for these outside opportunities.

Therefore, as we have maintained, immediate and significant pressures for residential development do exist in Middlesex County. Piankatank Shores, for example, is a planned residential communtity under construction in the southcentral portion of the county. In addition, the Tranquility Development Corporation applied for a building permit to construct a sizeable condominium complex [*The Southside Sentinel,* 1976]. Here, then, are two among many examples of housing projects in the area. Furthermore, as highway accessibliity is improved, this demand for housing can only intensify (Figure 12).

V. A Physical Constraint on Growth

A major constraint to the impending urban growth of the Middle Peninsula, and Middlesex County in particular, is the inherent problem of wastewater treatment and disposal. Conventional low-density household and commercial treatment systems consisting of septic tanks and drainfields are frequently unsuited to particular soil conditions and high water tables. In theory, the waste water is treated and filtered through septic tank and drainfield systems. Yet, when the water table is too close to

the surface or when the soil is saturated from heavy rains, septic tanks back up, raw sewage oozes into drainage ditches and eventually empties into the region's waterways.

Much of Middlesex County's coastal area is characterized by swampy, poorly-drained soils with high clay content. The county is also characterized by a preponderance of low-lying land (Figure 13). Since these conditions contribute to poor drainage, septic tanks cannot function effectively on a consistent basis in many areas where soils are either too porous or impermeable. Thus, the only areas normally suitable for septic tanks under current regulations include the loamy, gravelly and the deep, well-drained soils which lie in the higher, central portions of the county (Figure 14). The runoff of poorly treated sewage has contributed to the pollution of offshore shellfishing beds. One policy resulting from these conditions is a "tough" stance by the Virginia Bureau of Environmental Health, whereby a homesite's percolation and soil chemistry must be tested and approved before the issuance of a building permit. The result has been a substantial reduction in new residential development in areas that do not "perk" and a general anxiety among residents of restricted areas as they await technological solutions to the problem.

The simple, but costly, technological answer for these conditions is the construction of central sewage treatment facilities. Aside from the initial costs for these facilities–which such a rural area would be unable to bear–other social, political and economic consequences would follow the "green light" to development resulting from central sewage facilities. Perhaps many of the problems associated with rapid growth in northern Virginia would occur in Middlesex County. Therefore, we question the extent to which the wastewater treatment issue is recognized as one of Middlesex County's regional problems, and to what extent it is understood as a deterent to development by various spokesmen for interest groups in the County.

A TOOL FOR GRASS ROOTS PARTICIPATION
The Delphi Method: Its Scope and Application

It is apparent from the previous discussion that the primary theme of this report is as much methodological as it is conceptual. Related to the principal conceptual questions are a set of important methodological questions. These are:

> 1. How can environmental scientists and planners help a community address critical environmental problems *before* they become detrimental to the quality of life in that community? and,
>
> 2. How can these analysts help a community to reach agreement among themselves concerning adaptive or preventive responses to critical environmental problems?

Certainly, an educational component is inherent in both of these questions. What is needed, therefore, is a methodology which will help citizens to identify and understand environmental problems so that they can play an active role in the decisionmaking process and positively influence the future of their communities. We believe that the Delphi Method has an educational component and fulfills these needs. Other practitioners have demonstrated that group interaction and the Nominal Group Technique are also useful for factfinding and decisionmaking problems [Delbecq et al., 1975; p. 31-35].

Delphi is a technique used to summarize the opinions of a group of experts concerning a specific issue. Pill defines Delphi as,

> a method of combining the knowledge and abilities of a diverse group of experts to the task of quantifying variables which are either intangible or shrouded in uncertainty [Pill, 1971; p. 58].

Delphi achieves its goal through a series of questionnaires interspersed with feedback opinion. The items in the questionaire

> are designed to bring out the respondent's reasoning that went into his reply to the primary question, the factors he considers relevant to the problem, his own estimate of these factors, and information as to the kind of data that he feels would enable him to arrive at a better appraisal of these factors and, thereby,

at a more confident answer to the primary question [Dalkey and Helmer, 1963; p. 458].

The Delphi Method was developed at the Rand Corporation in the early 1950's for use in military forecasting. As a consequence, information about the technique was not made available until the early 1960's for security reasons. Since that time, Delphi has been used in a wide variety of contexts to elicit expert opinion concerning forecasting, and planning issues for the future. In geography, the technique has been used only recently and quite sparingly [Smil, 1975, 1972]. An excellent critique and bibliography of Delphi are given by Pill 1971.

To make a Delphi forecast, the investigator must first assemble a "panel" of experts who will agree to participate in the procedure. The investigator then sends each panel member an open-ended questionnaire concerning the topic being considered. The purpose of this first questionnaire is to define the topic and establish a common frame of reference in which to respond. In this way, the panel isolates the primary dimensions of the topic for the investigator. Upon receiving the completed questionnaires from the panel, the investigator synthesizes the results and returns them to the panel members together with a second questionnaire. Providing the panel with results gives them feedback about the opinions expressed by other panel members, and the second questionnaire gives them an opportunity to comment on these other opinions and/or change their own opinion. The process of questionnaire followed by feedback and another questionnaire is repeated until the panel has achieved some type of concensus or made a decision or forecast.

In its basic form, the Delphi Method has many of the advantages of a committee interacting in a face-to-face setting, without many of the disadvantages of such a situation [Martino, 1972]. For example, the sum of the information available to a group is at least as great as the information available to each of its members. In fact, it is conceivable that the group's information pool may be greater since information may be created during or through the interaction process. Similarly, the number of relevant factors which can be considered by a group is at least as large or larger than the number which can be considered by any group member. Third, it is experimentally true that groups tend to be more willing to take risks (particularly in forecasting) than do individuals. This is because the

groups find it easier to share the risk (or responsibility) of wrong projections rather than to have to shoulder the responsibility of an error as an individual.

Unfortunately, there are several disadvantages associated with group interaction in committees. First, while the sum of the information available to a group is greater than that which is available to each individual, the sum of the misinformation available is also greater. Hopefully, misinformation presented to the group will be challenged and refuted, but there is no guarantee that this will happen. Furthermore, groups exert social pressure on their membership. Occasionally, the majority opinion in a group exerts pressure on the minority opinion to conform. If this happens, the minority view, which may have considerable merit, is lost, thereby decreasing the overall quality of the conclusions or forecast. In addition to the social pressure of the group, dominant individuals may also wield undue influence on the activities of the group. Again, in an effort to produce concensus and conformity, the dominant individual may cause valuable opinions and comments to be suppressed or ignored. Finally,

> experiments with small groups have shown that frequently it is not the validity but the number of comments and arguments for or against a proposed position which carries the day. Thus a strong vocal minority may overwhelm the remainder of the group by pushing its views vigorously, even though the arguments presented, taken objectively, may have little merit. [Martino, 1972; p. 19].

The advantage of the Delphi method is that it incorporates the advantages of committee without many of the disadvantages. The Delphi procedure offers three main characteristics: (1) anonymity, (2) controlled feedback, and (3) statistical group response. Because Delphi is involved with a panel of experts, who theoretically have access to the best information available, it maximizes the informational advantages of a group. Furthermore, since it offers each member systematic feedback concerning the opinions of others, information is shared, synthesized and created. In this way, Delphi allows each panel member to evaluate other points of view, consider new opinions, and reconsider his own stated position. Because of this information exchange procedure, Delphi achieves the benefits of group interaction. However, because Delphi has the characteristic of anonymity, it avoids the disadvantages of social interaction. These include the inordinate influence of dominant individuals, and the tendency for

minority or non-conformist opinions to be suppressed due to social pressures. In fact, because of the statistical group response characteristic, each and every opinion that is expressed is reflected in the final product of the Delphi sequence.

From what little information has been gathered, it appears that Delphi is a successful method for collecting "hard to get" data. A 1950-era Rand Corporation study, for example, showed that Delphi produced at least as good predictions as a group round table discussion, but did not have to depend on the skills of a discussion leader to keep the group on the subject at hand [Pill,1971; p.59]. Pill [1971, p.58] indicates, "Delphi is a rapid and efficient way to cream the top off the heads of knowledgeable people." Furthermore, he goes on to say that, "The output of this procedure represents new information which (can) be used to help in some decision-making process." [p.60].

Thus, Delphi would seem to be a logical technique to use in cases where the answers are vague, and subject to many interpretations, and where education is an important objective of the investigative experience. This is, in fact, the case in our Middlesex County study, and in any community and regional planning situation. In the community planning case, public education and communication are important goals of the whole planning and policymaking process. In such cases, the various dimensions of the problem are not always clear, and are subject to many interpretations and points of view. Therefore, Delphi would seem to be invaluable as an advocacy research technique to help a community recognize local problems and agree upon appropriate community responses to these problems. Molnar and Kammerud [1975] have successfully used Delphi techniques in their research on priorities for improving the urban social environment. For these reasons, we decided to employ Delphi techniques in our analysis of man-environment conflicts in Middlesex County.

One of the more difficult aspects of using the Delphi Method is to assemble a panel of experts. People considered to be experts on the topic of the Delphi research are sought because they can be expected to have access to the best information and current thinking about the subject. Yet the question remains, "How does one go about selecting a Delphi panel?" Unfortunately, the Delphi literature does not offer much help in answering this question. In fact, Pill's [1971; p.60] comment that "the term expert could really be defined to include anyone who can contribute relevant inputs" illustrates the looseness of the definition. The de-

finitional problem makes the selection of panel members difficult at best. In community planning uses of Delphi, however, the problem of assembling a panel of experts may not be quite as serious.

It would seem that those people who might be considered "experts" on community planning matters are the formal and informal leaders of a community. Those people who can be identified as "community leaders" have the bulk of information, and influence most of the decisions affecting the quality of life in a community. Presthus [1967], for example, estimates that no more than one percent of the population (of most American communities) is involved in local decisionmaking. Sociologists have developed methods and procedures for identifying these community leaders.

For the most part, community leaders are those people who have power and make decisions affecting community life [Sanders, 1966]. Sociologists [Nix, 1969; Sanders, 1966, 1960; Payne, 1963; Long, 1958] suggest that there are three basic approaches to the problem of identifying people who wield power: the reputational approach, positional approach, and decisional approach. Others [Danzer, 1964; Freeman et al., 1963] mention a fourth method, the activist approach, for identifying this group.

In using the reputational approach, the researcher asks citizens of a community to compile a list of names of those persons in the local area who are the most influential or powerful in local decisionmaking. By selecting those names that appear most often on these lists, it is possible to compile a group of persons perceived or reputed to be the most powerful and influential in the community. This approach is satisfactory, but critics maintain its major shortcoming is that it does not measure power or leadership per se, but rather the reputation for leadership and power. It is often the case that perceived leaders merely obscure from view the powers-that-be. [Bonjean and Olson, 1964].

In utilizing the positional approach, one assumes that those persons who occupy important official positions in the institutionalized economic, political, social, and civic structures of a community are by definition powerful and influential. An investigator would, therefore, make a list of such people as the mayor, industry president, P.T.A. leader, Elk's Club president, and local political party chairman, and assume that such

people make the majority of the decisions affecting the community. Again, critics suggest that these people might well be figureheads, and that there are others who are the prime movers.

The third method of identifying community leadership is the decisional approach. In this case, the list of leaders is the product of lengthy participant observation on the part of the investigator. He compiles his list of community influentials by observing how community issues are settled, and who makes important decisions. While the leadership list resulting from this approach may be the most valid, it is extremely time consuming to complete. In addition, this approach requires considerable skill on the part of the investigator who must develop sufficient rapport within the community so that he can witness the decisionmaking process.

The activist approach is the last of the more often cited methods of identifying community leaders. This approach assumes that spokesmen for issue-specific groups are also important actors in local decisionmaking. Proponents of this method recommend, therefore, that leaders of special interest groups, such as the committee to prevent the use of certain texts in local classrooms, or the group fighting expansion of the local airport might be valuable additions to the community leadership list.

To avoid the pitfalls of each of these methods and to assemble a list of names that best reflects those who occupy positions of leadership in a community, Sanders [1966] recommends that all of these approaches be employed simultaneously to identify community influentials. A combination of the above mentioned methods was used in Middlesex County to identify community leaders, who we then asked to serve as experts on our panel.

The decisional approach was undoubtedly the most difficult method of leader identification to use in Middlesex County, and consequently was the least successful. Working at full-time jobs about 250 miles from the study area did not allow us to become fully seasoned or accepted "participant observers." We did, however, make monthly trips to the county lasting two to three days per visit. During these visits nearly 50 pre-arranged interviews were conducted with a variety of community residents. In addition, we talked casually about community events with local residents during these visits. These contacts enabled us to become quite familiar with the community, its citizens, their values and

attitudes, and local problems from many points of view. We addressed public meetings such as the Middlesex County Chamber of Commerce, Planning Commission, and Board of Supervisors, but did not become part of the community to the extent that we followed an issue completely through the decisionmaking process. In this sense, the project failed in its attempt to use the decisional approach to the identification of leadership. Our involvement in the community did, however, give us confidence that we correctly identified influentials through our use of the other three methods.

During our visits, county residents were asked to suggest names of the most influential people in Middlesex County. From these various lists, a reputational list was compiled which included all those persons who were mentioned by at least three residents. Using this procedure, we arrived at a reputed leadership list of about 60 people. It soon became apparent that the first 15 or 20 names on this list were being mentioned by almost every one of our interviewees. The people on the reputational list were predominately white men, but included a few women, a few black men and women, and nobody under the age of 30 years old.

This reputational list was augmented with inputs from the positional and activist methods of leadership identification. We considered persons occupying offices in local government, industry, civic and social organizations in the county. Many of these office holders were also present on the reputational list of leaders. We scanned local telephone directories to insure that we were aware of all the prominent groups and organizations in the area, and that they were well represented on our list of influentials. Also, we read local newspapers regularly to note the names and spokesmen of the active local special interest groups. For example, in Middlesex County, one such group was concerned about the possible expansion and upgrading of the county airport. It felt such a move would unnecessarily increase air traffic, noise pollution, and accidents.

By using this combination of leadership identification methods, we compiled a list of approximately 70 persons from Middlesex County whom we considered locally powerful and knowledgeable about community problems and decisionmaking. We then sent each of these persons whom we had not met a letter introducing ourselves and describing the nature of our research project in Middlesex County. After they had received the letters, we telephoned each person and asked if he would be willing to serve on the Delphi panel (i.e., to complete the several rounds

of questionnaires). Nearly all of these people agreed to be panel members and they were sent the first round of questionnaires. About 43 residents completed two or more of the subsequent four questionnaires in the Delphi sequence, and these persons are henceforth referred to as our Delphi panel.

Interestingly, 20 of the panel members (most often mentioned as being influential) were at the top of the reputational list. In this regard, our panel is very representative of at least the local perceptions of who has power. The rest of the panel is comprised of people who occupy positions of authority in formal organizations and special interest groups. The following table presents a breakdown of some of the more important characteristics of our Delphi panel. In examining this table, it should be noted that most people wear several "hats" as they carry out their leadership roles in Middlesex County. For example, one individual is at the same time a large county landowner, an active promoter of the recreational industry, and a member of the Board of Supervisors. Another panel member is a "retiree," a small businesswoman, an activist in the Chamber of Commerce, and President of the Woman's Club. This type of complexity is an essential part of community power structures, and has been ably documented in the classic study by Long [1958].

The composition of the Delphi panel does not adequately reflect certain interest groups in the county, i.e., blacks, young people, and lower income persons. Community influentials tend to come from the middle-aged, white, affluent segments of our society and not from these above-mentioned groups. Youth, blacks, and the poor have consistently been denied access to the information and institutions through which critical policy decisions are made. In addition, young people generally lack the necessary experience and maturity to be considered expert on matters of community interest. We recognized, however, that these groups have valuable opinions and points of view which should be described and included in the regional planning process.

To collect these alternative viewpoints, all seniors were given a questionnaire in their government class at Middlesex High School. Youth, blacks, and the poor are all well represented in this class. The single questionnaire dealt with their attitudes about the county, its problems, and their plans for the future. These responses are used throughout this document to augment the information obtained from the Delphi panel "experts."

TABLE 7

Interests Represented by Delphi Panel

Government

- A State Board of Health officer
- Commonwealth's Attorney for the county
- Three members of the county Board of Supervisors
- Three local planning commission members, one of whom is a full-time planner of the state regional agency
- The county sheriff
- The county agricultural agent

Industry, Business

- The county's major seafood buyer and packer
- Two timber industry representatives, including the vice president of a national pulp and paper firm located in the region
- Six representatives of the agricultural industry, including one of the nation's leading commercial duck producers, several farmers, and agri-businessmen
- Ten local businessmen, including the president of the local Chamber of Commerce
- Two local bankers
- Two marina owners and the areas's largest recreational boat builder
- Owner of the county's largest campground
- Six of the area's largest landowners
- A local general building contractor and landowner

Civic

- President of the Lion's Club
- Past-president of the NAACP Chapter
- President of the local Women's Club
- Past-president of the Women's Club and member of the county historical association

Education and Health

- Three school board members
- High school principal
- Headmaster of local private high school
- Three doctors
- Two dentists

continued

TABLE 7, continued

Other
- Five women
- Four blacks
- Three retirees (newcomers to the area)

Source: Authors' survey, 1975.

(The major findings of the Middlesex High School Questionnaire will be discussed under a separate heading in Chapter 3.)

Samples of the Delphi panel and Middlesex High School questionnaires are not reproduced in this report due to space and format limitations. However, the authors would be happy to provide, on request, Xerox copies of these materials to those who wish to see them.

FINDINGS OF THE QUESTIONNAIRE SURVEYS

I. Round One

In Round One, we were interested in each Delphi panel member's overall philosophy toward the regulation of growth in Middlesex County and the Middle Peninsula region. These attitudes were expected to range from a "hands off," or laissez faire policy to tight land use controls. The overall posture of the forty-three participants toward regulation, new industry, and population growth was recognized as basic to further specific questions regarding the wastewater disposal issue. Thus, we asked them to respond to the following statement and question, modified from a previous national survey [Watts and Free, 1974]:

> Speaking now of the Middle Peninsula area where you live, some people say that population and industrial growth should be restricted in order to preserve the community just as it is. Others, feeling that job opportunities and quality of life are essential, favor regulated growth to provide orderly and harmonious economic development. Still other residents feel that unregulated growth provides the best vehicle for rapid and much needed economic development. How do you personally feel about population and industrial growth for this region?

The great majority indicated a preference for regulated growth in the Middle Peninsula. They suggested that growth is vital to prevent economic stagnation, especially to provide the jobs for the area's youth and unemployed low income groups. Yet, they also felt, almost without exception, that land use and growth regulation are vital to preserve the rural character of the area, and to ensure the survival of already established industries: shellfishing, farming, recreation, and timber. Representative of the comments by the Panel are the following:

> "We need well-planned and regulated light industry located in the area in order to assure jobs for our people."

> "We need their [young people's] potential here to improve the county."

"Welfare's financial load on the counties would lessen were diverse industries (keyed to the older age group) sought and placed in this Peninsula."

"Any community were stagnation is allowed will perish."

"I favor regulated growth with proper zoning which would provide a more orderly economic development in the Middle Peninsula than a wild unregulated growth."

"It is unwise to try to preserve the community as it is because this would be slipping backward."

"I feel that job opportunitites and quality of life are essential and favor regulated growth to provide orderly and harmonious economic development."

"Planning can accomplish orderly, well thought development of an area if done before accelerated growth takes place. In my way of thinking, growth is something that happens—it isn't planned. Controlling and organizing growth is another matter—the desired method once an area begins to grow."

"There are some areas of the Middle Peninsula that need regulated industrial growth to provide the tax base for public services and provide employment. . . . Regulated industrial growth will not necessarily mean a destruction of the rural character of the area."

"... if we could get the right kind [of industrial growth], it would greatly help our young population, as many of them have to leave today."

"Apparently nothing will come of this [regulated growth] because of the lack of a county master plan by the Board of Supervisors. Middlesex has great potential but is stymied by an attitude of complacency."

There were several minority opinions which expressed a somewhat different point of view. Some suggested to their peers that the region should be carefully developed as a "bedroom" commuter region. Others felt that the area's scenic attractions are its greatest advantage; hence, the

area should specialize exclusively in recreational and retirement services. A few expressed the notion that the county is already over-regulated by certain interests and that economic development is vital to lower income groups. Representative of the minority opinions are the following:

> "I feel that this area is poor for industrial development in the usual sense. In fact, our greatest assets naturally would be destroyed by industrialization. . . . We should develop businesses to live by serving and improving the area as a playground, retirement village, and bedroom for nearby population centers."

> "I feel that this county is overly regulated by a few of the residents who do so with their personal interest in mind. I also feel industrial growth is definitely needed here to provide a large percentage of our population, who remain on the lower socio-economic level, a means toward opportunities for a better life."

> "To industrialize or greatly increase the population here would destroy a way of life here that is foreign to any growth neighborhood or urban expansion area. This area can support only so many—to bring in jobs would bring in people and rapid growth would be bad. . . . I sincerely hope that the quaintness so many seek is not destroyed by the rush to find it."

> "I feel that population growth in the county is inevitable regardless of the fact that the most sought after property has already basically been ruined with uncontrolled development along the waterfronts and highways."

Thus, it is our opinion that most of the Delphi panel want regulated growth to stimulate a stagnant and seasonal economy, but not at the expense of added urban problems or the loss of the region's distinctive "peace and tranquility." We assume that these goals are not mutually exclusive.

In Round One we also asked the Delphi panel to rate local issues on a scale of 1 (least important) to 6 (most important). The items were rated according to how critical each was recognized to be in the region. (Table 8 consists of a listing of highest ranked issues.) These problems were suggest-

ed to us in field interviews with local citizens and residents and by senior students who completed a pilot questionnaire at nearby Gloucester High School on May 2, 1975. It is important to note that we did not initially direct their attention to the problem of inadequate sewage treatment and disposal, but rather, asked them to identify the major problems facing their community. As a critical issue, the Panel rated inadequate sewage treatment and disposal thirteenth among the most critical issues (Table 8). Note that many of the most "critical" problems are related to water quality. The pollution of shellfish areas, shoreline erosion, excessive federal and state land and water regulations, the lack of public recreational facilities, and the destruction of primary industries by competing land uses are all major water-related concerns that indicate at least the panel's awareness of the importance of water quality.

Other issues that ranked highly include the political questions of zoning, land use taxations, and dissatisfaction with the structure and activities of local government. Panel members also added other problems to the list such as inadequate public health and educational facilities, periodic shortages of suitable drinking water, and the lack of arts and entertainment. These items were added to the list of community issues to be reevaluated in Round Two. Environmental hazards such as hurricanes and flooding were not suggested by the panel despite the seriousness of these problem in coastal zones.

II. Round Two

In Round Two, each panel member was given the opportunity to reevaluate his or her position concerning the basic questions of growth and regulation in the Middle Peninsula. In the materials we mailed out, we summarized the overall viewpoint of Round One and asked the panel to respond to our summary. Nearly everyone agreed that our evaluation of the majority and minority opinions was correct. They agreed that growth was necessary, but that it should be held in check by regulations, and that the rural character of the area, economically dependent upon shellfishing, farming, recreation, and lumbering, should be preserved. Several restated their opinions concerning the need to establish better recreational facilities and to promote the region as a "bedroom" community for nearby recreational areas. A few reacted to the "minority" position of Round One by stating that the region was not over-regulated, that a "bedroom community" would create a tax burden far greater

TABLE 8

Most Significant Issues Affecting Development of Middlesex County: Round One

Group mean scores (1.0 [least important] to 6.0 [most important]) are based upon an issue's critical nature (N=43).

Critical Nature	Issues
5.05	Pollution of shellfish areas
4.74	Shoreline erosion
4.67	Lack of adequate zoning regulation
4.56	Lack of year-round job opportunities
4.56	Crime
4.23	Excessive federal, state land and water regulations
4.23	Major decisionmaking not representative of community interest
4.21	Political, economic influence in the hands of a few
4.07	Lack of public recreational facilities
3.98	Destruction of seafood, agricultural, and forest areas by competing land uses
3.93	Land taxed on the basis of its potential use rather than its current use
3.91	Anti-growth attitudes
3.65	Inadequate sewage treatment and disposal

Source: Authors' Delphi survey, 1975.

than that imposed by industry, and that recreation in the region, specifically in Middlesex County, has already reached the capacity of the resource base.

We also asked the panel to rank the types of development they perceived to be the most desirable for the Middle Peninsula region. Their overwhelming choice was residential growth followed by commercial activities, public services and recreation. Industrial growth and private recreation were perceived to be the least desirable (Table 9).

TABLE 9

Types of Development Desired for Middlesex County: Perceptions of Delphi Panel–Round Two

1.0 indicates most desirable, while 6.0 indicates least desirable of six options (N = 32).

Mean Ranking (1.0-6.0)	Kinds of Development
1.68	Residential
3.08	Commercial
3.28	Public Services (Roads, Utilities, Sanitation Systems, etc.)
3.59	Public Parks and Recreation
3.86	Industrial
4.32	Private Parks and Recreation

Source: Authors' Delphi survey, 1975.

Since there was such a gap in the panel's preference for residential over industrial development, we asked them to shade in areas of a map of Middlesex County where residential and where industrial developments are thought to be most desirable (Figures 15 and 16). The areas most often selected for residential development are in the low-lying coastal areas along the Rappahannock and Piankatank Rivers and in the Deltaville or Flattop district at the eastern tip of Middlesex County. These areas are already densely developed with seasonal and permanent homes and would seem to offer the least potential for further expansion. Furthermore, the soils, especially in the coastal margins of the county, periodically experience high water tables and exhibit poor conditions for septic systems (Figure 14). Thus, these areas are least likely to be approved by health authorities for septic tanks and building permits, since further development would aggravate existing waste treatment problems.

Areas selected by the Delphi panel as favorable for industrial development are oriented to the Route 17 corridor and western end of Middlesex County. Apparently, the respondents do not see much possibility for

TABLE 10

Institutions Considered by Delphi Panel to be Most Effective in Regulating Growth in Region—Round Two

The number of responses in each column does not equal 32 since several respondents selected more than one factor.

Number of Times Selected by Delphi Panel		
Currently	Ideally	Institutions
12	13	Regulatory codes, permits and inspections
2	21	Zoning regulations
9	11	Decisions regulating utilities and public services
10	8	Development loans from regional banks
7	6	Regional property taxes
1	1	Waterfront regulations*
1	1	Subdivision ordinances*
1	–	Virginia Health Department regulations*

*Suggested by panel members.

Source: Author's Delphi survey, 1975.

compatibility between these distinct land uses. It seems necessary that land use zoning would have to be instituted in the future to guarantee these choices.

Round Two continued with a question concerning the factors which currently and ideally should regulate growth in the area (Table 10). Note that while regulatory codes, permits, and inspections are currently perceived to be the most effective in regulating development, zoning ordinances ranked as the most ideal regulatory mechanism. Thus, zoning is perceived to be the policy mechanism which preserves the region's rural character while encouraging the right kind of growth in the best locations.

TABLE 11

Most Significant Issues Affecting Development of Middlesex County (1975)—Round Two

Group mean scores (1.0 [least important] to 6.0 [most important]) are based upon an issue's likelihood to retard development (N = 32).

Likelihood to retard development	Issues
5.1	Pollution of shellfish areas
5.1	Lack of adequate zoning regulations
4.4	Lack of year-round job opportunities
4.3	Excessive federal and state land and water regulations
4.2	Inadequate sewage treatment and disposal
4.2	Shoreline erosion
4.0	Destruction of seafood, agricultural, and forest areas by competing land uses
4.0	Anti-growth attitudes
4.0	Major decisionmaking not representative of community interests
4.0	Lack of full-service shopping facilities
3.7	Political and economic influence in the hands of a few

Source: Authors' Delphi survey, 1975.

In Round Two, we asked the panel members to again evaluate the significance of the area's problems, this time in terms of a problem's likelihood to retard or hold up development (Table 11). Obviously, this is a slightly different perspective than the initial rankings of issues in Round One. Note that the water-related issues scored very high on this round, and that inadequate sewage treatment and disposal rose to fifth place. Except for the job shortages issue, the preponderance of water-oriented problems is again evident in the panel's evaluation. Hence, they recognize at least in part that their future growth depends on maintaining a level of water quality and meeting federal and state regulations.

The final section of Round Two was a drastic departure from general issues, since it involved a shift of focus to the specific problem of inadequate waste treatment. It is at this point that our advocacy role becomes clear to the panel. We addressed this question in three parts. First, we asked the panel why there was such a wide range of opinion in Round One concerning the importance of sewage treatment and disposal. We related to them the fact that other coastal areas in the eastern United States have found it to be the critical problem hindering any type of growth and development. Several panel members suggested that the wide variety of responses reveals that an awareness of the waste treatment issue is related to one's experience with the problem (e.g., the threatened seafood industry is very aware of this issue). In addition, those living in a low-lying coastal area which is rapidly developing are more likely to have experienced some difficulty with septic tanks. On the other hand, those living in higher areas, where septic tanks function adequately, are less likely to perceive sewage treatment as a problem. Thus, if your septic tank "perks" and you are not dependent upon a water-based industry, the problem might not seem as serious.

Second, we asked the panel whether or not the sewage treatment issue has the potential effect of reducing the rate of growth in the area. Five of the 32 respondents indicated that sewage treatment regulations, if enforced, could reduce the rate of growth in the area. Among the reasons for the consensus are: the costs of required sewage treatment and stringency of regulations in critical low-lying areas; the inability of land and water resources to accomodate the demand for both new industrial and residential development; and the financial difficulties of installing central treatment facilities in communities where septic tanks already exist or in less populated portions of the region. Those who thought that sewage treatment would not stop growth are confident that these services would be provided if the county is zoned soon enough and if people are willing to pay for these benefits.

Third, we queried the panel concerning the adequacy of fresh water supplies to accommodate the demands of future developments. Many panel members thought that they lacked sufficient information about this topic. Others, however, suggested that potential shortages of fresh water may also complicate waste treatment problems. Although fourteen panel members believe that there is enough fresh water for future regional development, a few indicated that local artesian wells are producing less,

TABLE 12

Most Significant Issues Affecting Development of Middlesex County (1975)—Round Three

Group mean scores (1.0 [least important] to 6.0 [most important]) are based upon an issue's alterability (N = 32).

Alterability	Issues
4.9	Lack of adequate zoning regulations
4.1	Inadequate sewage treatment and disposal
4.1	Major decisionmaking not representative of community interests
4.0	Pollution of shellfish areas
3.8	Destruction of seafood, agricultural, and forest areas by competing land uses
3.8	Lack of full-service shopping facilities
3.8	Shoreline erosion
3.6	Political and economic influence in the hands of a few
3.0	Excessive federal and state land and water regulations
2.9	Anti-growth attitudes
2.5	Lack of year-round job opportunities

Source: Author's Delphi survey, 1975.

and that water quality was declining. Still others assume that large industry provides the greatest threat to ground water supplies. In any case, this issue was perceived to become more important as the area grows.

III. Round Three

In Round Three, we again summarized the panel's consensus for controlled regional growth. We also presented them with a synopsis of the findings of Round Two (as presented above). After each synopsis, we also asked them to state whether or not they agreed that the views presented adequately represented all points of view. At most, out of 32 who com-

pleted Round Three, only four respondents said they disagreed with the paragraphs that attempted to express and summarize the range of viewpoints disclosed during Round Two.

In addition, we asked panel members to reevaluate selected regional problems a final time. This time we asked them to rate each problem according to its alterability, given present regulations and governmental institutions. In other words, we were interested in which problems have solutions which could be practically implemented at this time (Table 12). Note that the zoning question was perceived to be the most easily solved or altered. Interestingly, the problems of zoning, nonrepresentative decisionmaking, inadequate sewage treatment, and shellfish area pollution were similar to major points of discussion at Middlesex County Public Meeting held in in September 1975, and attended by one of the researchers [Burton, 1975]. We were somewhat surprised that the panel also selected the sanitation and shellfish problems among those that have high alterability. Perhaps this relates to the popular notion that technological "solutions" are usually available for such seemingly "simple" problems. Yet, such solutions must be weighed in the context of a region's environmental setting, both social and physical. The problems identified indicate once again the panel's priorities and expectations concerning change in the Middlesex County and the Middle Peninsula.

We once again probed the panel concerning the waste treatment issue by asking the following question:

> Inasmuch as this issue (inadequate sewage treatment) is foremost in retarding development in many coastal areas and is considered by the majority of the respondents to stop growth in the Middle Peninsula, is it socially desirable to apply a new technology to solve the waste water disposal problem and thereby open up a host of subsequent growth-related issues? (Option One) Or, is the desirable option simply living with existing environmental and governmental restraints until local planning and/or zoning ordinances can control developments? (Option Two)

The results were almost equally divided between Options One and Two. After evaluating the panel's comments, we decided to rewrite the question and include it again in an unexpected Round Four (to be discussed below).

TABLE 13
Delphi Panel's Preferences for Regulating Future Growth in Middlesex County (1975)—Round Three

Mean Ranking(s)*	Procedure or Policy (j)
1.42	Growth regulated by preplanned and/or constructed road and utility systems
2.16	Growth denied by restrictions on septic tanks, sewers and services (schools, roads, or other utilities)
2.28	Growth only where developers pay the costs of services
2.94	Growth curtailed by moratoria on services (roads, schools, power lines, central sewers)

*Items were ranked 1 to 4 by Delphi panel. Each mean ranking is the sum of the individual rankings for each item (j) divided by the number of responses (i) for each item (j), i.e.:

$$s = \sum_{i=1}^{n} \frac{S_j}{n} \quad \text{where } i = 1, 2, \ldots, 32; \; j = 1, 2, \ldots, 4; \; N = 32.$$

Source: Author's Delphi survey, 1975.

In Round Three, we also asked the panel to evaluate their preferences of procedures for regulating growth in Middlesex County (Table 13). As Table 13 indicates, the panel primarily seeks a type of growth resulting from preplanned services. They are less inclined to regulate development according to restrictions or moratoria on services. We believe, however, that the listing in Table 13 by no means exhausts the methods of regulating development. In fact, some of the regulation procedures might have been unclear to the less informed members of the panel, and the preferences in Table 13 are not mutually exclusive. The lack of opportunity for verbal, person-to-person clarification of questions is therefore one of the problems of this technique since Delphi participants do not interact directly with one another [Delbecq et al., 1975; p. 35). Nevertheless, it is most interesting that the experience of northern Virginia

(i.e., moratoria of sewers and no-growth policies) is ranked the least desirable policy for regulating growth in Middlesex County.

We concluded Round Three by presenting each panel member with copies of the residential and industrial preferences maps compiled from their responses in Round Two. The maps indicated that most respondents selected the low-lying shorelines as most favorable for residential development (Figure 15). In light of such choices, we then asked the Panel if residential locations in these areas would increase the risk of serious water pollution problems. Out of 32 responses, 18 selected "yes," six selected "no," and eight did not answer the question. The panel's preferences suggest that certain groups are willing to trade off the potential water quality problems associated with living in low-lying areas for amenities on or near the shoreline. Others are ignorant of the water pollution problems or simply are apathetic to these issues.

IV. Round Four

Round four was a final summary of the panel's responses in Round Three; but it also provided us with the opportunity to restate one of the central questions of this study. The question was presented in the following context:

> There are numerous communities in the United States (e.g., Fairfax County and Virginia Beach, Va.) where rapid and uncontrolled growth has caused financial and esthetic problems to the community. This tragedy has occurred because the communities did not have regulatory mechanisms such as comprehensive plans, zoning ordinances, and suitable building codes prior to the onrush of rapid growth. Presently, Middlesex County has a sewage treatment and disposal problem, which according to survey responses, has the potential to severely retard growth in the county. Were it not for this sanitation problem, rapid and uncontrolled growth could occur because regulatory mechanisms are not presently in force (although they are in the planning stages). If a new (and successful) method of sewage disposal could be available tomorrow, do you think it would be better to:
>
> Option One—Prevent the use of this new waste treatment method until regulatory mechanisms can be put into effect and thereby prevent the possibility of rapid and uncontrolled growth?

Or

Option Two—Go ahead and use the new waste treatment method rather than retard any possibility of future growth? If rapid and unregulated growth occurs (with its unpleasant side-effects), it will just have to be tolerated as part of the costs of growth.

We felt that this further elaboration of the issue clarified many of the uncertainties of the question that were detected in Round Three. Of the 28 responding, 80 percent chose Option One. Some of those selecting Option Two, despite past discussions in previous rounds, could not conceive of the fact that sewage treatment problems and regulations could, or were in fact, retarding development. The remainder favored the use of available technology rather than hold up potential growth any longer.

These options are especially timely because the Virginia State Water Control Board presented to the county the long-awaited Water Quality Management Plan in September 1975. The plan calls for the construction of two sewage treatment facilities, one of which will cost at least $2.2 million. One of the local planners astutely recognized the immediate and potential consequences of central sewage disposal for Middlesex County:

> Such an example of sewer-mania indicates total disregard for soil and water table conditions in the area; potential ground water supply problems; local planning prerogatives; importance of agriculture in the area; and ability of the county government to provide other public services for the population growth which would be stimulated by the proposed sewer lines.[*The Southside Sentinel,* 1975].

The Middle Peninsula Planning District Commission promptly rejected the proposal, which, in line with the above Option Two, advocates a new waste treatment method for Middlesex County. We were most encouraged to witness the decisionmakers' awareness of the possible impacts of a central sewage system and hope our questions stimulated the panel's thinking about issues that are certain to become critical in the future.

V. Middlesex High School Questionnaire

On October 3, 1975, a questionnaire was administered to all high school seniors at Middlesex County High School. These students represent nearly all residential areas in the county (Figure 17). The reasons for this supplementary survey are at least fourfold. First, most of the Delphi panel represented the white, middle-aged, and leadership components of the community. Although we contacted approximately one dozen recognized black leaders, only four cooperated throughout the Delphi survey. Second, a survey of Middle Peninsula college students who attend Virginia Polytechnic Institute and State University documented that the vast majority would prefer to return to the Middle Peninsula following graduation. They indicated, however, that the jobs they wanted were not available in the area. Hence, we assumed that high school students, who likely were about to leave the area, would provide a similarly interesting perspective on the advantages and disadvantages of their home territory. Third, we expected these responses would substantiate the findings of the Delphi survey. Finally, similar methods used with high school students in West Virginia have proven to be an effective means of opinion survey in past studies [Smith and Alanen, 1976; Alanen and Smith, 1977].

Seventy-eight senior class members completed the questionnaire. Of this number 47.4 percent were black, reflecting the approximate racial balance in Middlesex County. We asked the group several questions concerning the impact of new permanent residents, tourists, and additional industry in their county. They reacted favorably to each issue with 67.9 percent supporting new permanent residents, 75.6 in agreement that additional tourists would help the county, and 80.8 percent in favor of new industry.

Although 61.0 percent prefer living in the country or in a small town, only 51.0 percent of the students felt that living in Middlesex County after graduation was desirable. One explanation for this might be the fact that 53.8 percent want white-collar occupations. Only 3.8 percent seek farming as a future occupation while blue-collar jobs are attractive to 26.9 percent. Of the variety of jobs that students desire, only 34.6 percent thought that they can find their preferred occupation in Middlesex County.

TABLE 14
Correspondence Between Student Attitudes Toward Growth Regulations and Attitudes Toward New Industry

In Favor of New Industry	In Favor of Regulation					
	Yes		No		Total	
	n	%	n	%	n	%
Yes	37	63.8	21	36.2	58	100.0
No	15	100.0	0	0.0	15	100.0
Total	52	71.2	21	28.8	73	100.0

Chi Square = 5.96 with 1 DF. Significance = .01.

Source: Middlesex High School Questionnaire, 1975.

These findings confirmed many of the conclusions of the Delphi questionnaires. For example, the students favor additional permanent residents, tourists, and industry which could provide a boost to the local economy. Furthermore, they realize that their goal to remain in their home setting is largely precluded by the lack of jobs which would encourage them to stay. Nevertheless, they have a general understanding of the idea that population and industrial growth, despite their obvious advantages, must be regulated to prevent additional pollution and improve the quality of life. We noted that the students largely agree with the Delphi panel concerning regulating future development as 71.2 percent prefer some form of regulation (as compared to approximately 75 percent of the Delphi panel.)

In an effort to understand more clearly the sentiments toward growth among Middlesex High School students, we cross-tabulated their attitudes toward additional industry against their attitudes toward regulation of future population and industrial growth (Table 14). As expected, the majority prefer both new industry and effective growth controls. Of those students who are not in favor of new industry, all are in favor of regulation. Thus, the minority recognizes the need for land use regulations while this same group unanimously opposes new industry. These

students echo the panel's earlier evaluation that zoning or other land use controls are necessary, but are to be used to promote and regulate the existing primary industry and recreational facilities in the area.

A major section of the high school questionnaire concerns the respondent's evaluation of selected issues suggested to the authors in the field and in the Delphi survey. Each item is rated according to a six-point scale, and the prominent problems perceived by the students are listed in Table 15. The young people's concern for the shortage of jobs and entertainment are top priorities. Other problems widely recognized include the potential destruction of basic industries, the lack of sufficient public school facilities, the concern over political representation, and the water-related problems of shellfish contamination, inadequate waste treatment, and shoreline erosion. They also thought that the area may be losing its rural character while it continues to face shortages of public services and lower income housing. These responses suggested to us that the area's youth are waiting to be heard, and indeed may be another means of mobilizing community support for controlled land development in the future.

We also asked students to shade in areas of a map of Middlesex County which they felt were most polluted (Figure 18). It is evident to us that most clearly recognize the problem of water pollution, especially along the Rappahannock River. The largest number of students believed that the shoreline from Urbanna to the Rappahannock River toll bridge at Grey's Point is polluted.

Items that students considered to be less important in the county included the lack of zoning, crime, traffic congestion, and overcrowded tourist facilities. Their failure to recognize the importance of zoning can perhaps be understood in terms of their lack of knowledge concerning this land use regulation. Nevertheless, the Delphi panel's recognition of water pollution was greatly reinforced when water issues were also identified by the students as the most serious hazards in the area. Finially, we discovered that the high school seniors, like some of their parents and others who served on the Delphi panel, were largely in favor of holding up any developments of central sewage systems or advanced waste treatment technology until governmental institutions are able to better regulate the growth that would inevitably follow. This again supports the contention that the citizens of Middlesex County are looking carefully toward the

TABLE 15

Most Critical Community Problems Rated by High School Seniors

1.0 indicates least important, 6.0 indicates most important.

Group Mean Scores 1.0-6.0	Problems
5.00	Lack of year-round job opportunities
4.96	Lack of arts and entertainment
4.93	Destruction of seafood, agricultural, and forest areas by competing land uses
4.88	Lack of adequate public educational facilities
4.73	Political and economic influence in the hands of a few
4.71	Pollution of shellfish areas
4.60	Inadequate sewage treatment and disposal
4.58	Lack of public water recreational opportunities
4.41	Area losing its rural character
4.37	Inability of public services (fire, police, sanitation, health and welfare) to keep pace with growth
4.30	Lack of full service shpping facilities
4.27	Excessive federal and state land and water regulations
4.25	Increasing visual blight (billboards, litter, etc.)
4.14	Lack of adequate housing for lower income groups
4.04	Shoreline erosion

Source: Middlesex High School Questionnaire given to all seniors on October 3, 1975 (N = 78).

future and hoping that land use regulation will check the trends that are evident, particularly in the neighboring counties.

A final conclusion of this survey concerns the areas that students favor for recreation (Figure 19). Many of the same areas that were perceived to be polluted (Figure 18) are primary recreation areas for the area's

youth. Yet, we also discovered a significant difference between the favored recreation areas of the blacks (Figure 20) versus those favored by the whites (Figure 21). These preferences perhaps are symptomatic of differences in recreational opportunity between these two groups and trust that future recreational planning is oriented to the distinct needs and desires of all social groups of the county.

We conclude that the high school seniors share the viewpoint of the Delphi panel concerning the county's benefits, prospects, and problems. Furthermore, the questionnaire has at least partially presented opinions of minority groups that were not represented to the extent we wanted in the Delphi survey. Finally, we were encouraged by their sensitivities to regional issues and hope that their opinions will be considered in future policies for Middlesex County.

VI. Summary

Based on four rounds of Middlesex County Delphi questionnnaires and the survey of high school seniors, we offer the following general conclusions:

1. The large majority of both the Delphi panel and the high school seniors indicated that growth is necessary to prevent economic stagnation and to reduce the out-migration of the area's youth who must seek employment elsewhere. Residential development was selected as the most desirable type of growth for the region.

2. Regulation of future development was recognized as being critical if the area's distinctive rural qualities are to be preserved. Land use zoning was selected to be the first step toward regulating future change.

3. Factors cited as the most significant in retarding future development include: pollution of shellfish areas, lack of year-round job opportunities, excessive land and water regulations, inadequate sewage treatment and disposal, and shoreline erosion. The lack of jobs relates to the out-migration of the area's youth and the local shortage of jobs, while the other prominent issues relate directly to water quality—the common denominator of most of most of the area's strengths and weaknesses.

4. Although the Delphi panel demonstrated a wide range of opinions concerning the adequacy of the region's sewage treatment and disposal,

all but five respondents felt that inadequate sewage treatment has the potential to reduce the rate of growth. An interesting dimension to the Middlesex County wastewater treatment problem is the fact that over 50 percent of respondents selected low-lying coastal areas, where soil is less suited for septic tanks, as the areas most favorable for residential development (Figure 15).

5. The vast majority of the respondents felt that even if a new waste treatment method could be installed immediately to solve Middlesex County's sanitation problems, it would be socially desirable to prevent the installation of this new method until effective regulatory mechanisms are available to prevent uncontrolled growth.

6. Finally, the use of the Delphi process perhaps raises more methodological questions than we could hope to answer, but several conclusions are worth comment:

a. From a financial standpoint, Delphi methods were cheaper (but not necessarily more effective) than a field survey. While periodic visits were necessary during the project, a field survey would have demanded that the investigators remain in the study area for more extended periods of time, adding significantly to project expenses. With Delphi procedures, the costs were limited to clerical assistance and postage for preparing and mailing four rounds of questionnaires. For small planning agencies, these savings may be important.

b. The wide range of interests and abilities of panel members is reflected in their rate of response, which varied from 43 in Round One to 23 in Round Four. Perhaps a personal telephone call by the investigator to each participant after the survey is fully in progress might increase the respondent's initiative and encourage participation.

c. One of the pitfalls of any Delphi process is its lack of opportunity for verbal clarification, creating problems of communication and interpretation between the investigator and the respondent. For example, the misunderstanding about a key question in Round Three necessitated a Fourth Round to clarify the investigators' purpose and the respondent's choices. A pretest of each of the questionnaires (whenever possible) may remedy some of these difficulties. Yet, one of the major advantages of Delphi procedures is the elimination

of face-to-face contact which often leads to social intimidation, competition, and the over-emphasis of viewpoints by dominant individuals. Personal contact is therefore to be avoided, particularly in situations like Middlesex County where important attitudes are often held by less dominant, less articulate, and less influential people. Tradeoffs, then, must be made between differing interpretations of key questions and a respondent's freedom to express ideas openly. In situations where panel composition is more homogenous and members express ideas freely, group interaction methods, such as the Nominal Group Technique, might be more appropriate than the Delphi process [Delbecq et al., 1975; p. 31-35]. A public meeting at the conclusion of a study also is an appropriate way to clarify key issues and insure that the findings are available to the attention of the general public.

d. Based on the above conclusions, some would argue that an area's youth and lower socioeconomic groups are seldom well-represented in this kind of investigation. For this reason, we used the high school questionnaire to evaluate the black viewpoint and understand the attitudes of high school seniors, the potential leaders in the community. We found that while the seniors' opinions were similar to the Delphi panel, the supplementary survey was a useful and educational experience.

e. Perhaps the greatest strength of Delphi methodology is its usefulness in advocacy research where the investigators are committed to educating the public in addition to monitoring their opinions. We are convinced that the panel's overall understanding of development issues increased throughout the study.

PROSPECTS FOR A COASTAL REGION:
Recommendations and Conclusions

From several rounds of questionnaires, field interviews, and the general impressions gained from Middlesex County and the Middle Peninsula Region in 1975, we have come to appreciate the concern that a rural community shows for local problems. We offer the following recommendations and conclusions in light of these experiences.

Our major conclusion is that no decision concerning wastewater treatment should be made until the decisionmakers are very sure that the local community recognizes the potential consequences of such decisions. This investigation has shown that few people initially understand that public sewer systems are often the catalyst for rapid growth. Unfortunately, neither technicians nor citizens usually understand the full consequences of a central sewage system, especially the kind and magnitude of growth it encourages. This is particularly true in cases where the potential for residential growth already exists but is restricted by lack of suitable sanitation facilities. Implementation of such facilities opens the way for dramatic increases in residential population, as has been demonstrated in Fairfax County, Virginia.

The social and psychological impact of exurban growth in Middlesex County may have even greater importance than the actual physical impact. Residents of the county have indicated that they find such development intolerable. Therefore, it is imperative that they become aware of the relationship between the construction of new sewer lines and the urban sprawl that is likely to follow. Indeed, they have every right to make choices concerning alternative futures for their own environment. In Middlesex County, residents prefer the existing rural lifestyle, but they also recognize the need for selected industries to prevent economic stagnation and retain the area's youth. They have an increasing awareness of the idea that rural quality and industrial growth are not necessarily mutually exclusive, and recognize that trade-offs have to be made. In Middlesex County, this will probably mean land use regulation at the expense of certain individual land use rights. This is agreeable, since land use regulation is a choice that citizens and communities can make for themselves. In fact, it is our contention that communities have every right to make informed decisions which range along a continuum from unrestricted growth through "limited" to "no growth" policies, as long as certain socioeconomic gropus are not excluded from decisionmaking.

Therefore, it is essential that the communities be introduced to information about environmental conditions and processes in order that informed choices will result.

In light of this, we make the following specific recommendations which are applicable not only to Middlesex County and the Middle Peninsula Region but also to coastal areas along the Eastern Seaboard.

First, public education of local citizens regarding the nature of an area's fragile environment relative to water quality should be promoted in a variety of forms. In particular, people who live in coastal areas should be informed that septic systems often function inefficiently at medium densities and very unsatisfactorily at higher density suburban subdivisions. Thus, Middlesex County should continue the practice of holding periodic public meetings where environmental problems or constraints can be fully explained, and thereby document the need for new ordinances and controls. Furthermore, increases newspaper coverage of these issues should be encouraged to inform the public. Finally, public officials and planners should also be invited to speak about regional problems at local high schools and civic organizations.

Second, no decision concerning the implementation of central sanitation systems should be made until the public is better informed about all potential impacts (including rapid population growth) of the proposed waste treatment systems. In Middlesex County, no decisions should be made until land use ordinances are legally binding. The county's existing regulatory mechanisms would never be able to check the population growth that has occurred in other coastal areas of Virginia. Most citizens have indicated to us that they would rather forego immediate short-run gains from development in order for cautious and more deliberate planning to prevent long term and irreversable damages. Thus, we reemphasize that citizens participate as a collective decisionmaking body, particularly on issues concerning sanitation and future development.

Third, county planners and supervisors should be encouraged to institute, quickly but carefully, limited growth ordinances within a comprehensive regional land use plan. It is important to recognize, however, that growth controlling ordinances from other areas of the United States are being contested in the courts. Two of the best known examples of local governments attempting to limit population size are Ramapo, New York and Petaluma, California. Both cases are well known for their controversial

timing and sequenced control (TASC) ordinances [Scott et al., 1975; p. 1-210]. Another interesting example, and one that indeed might apply to Middlesex County, is *Southern Burlington County NAACP* vs *Town of Mount Laurel*, in which the New Jersey State Supreme Courth has ruled that large lot zoning and restrictive building requirements were unlawfully excluding low and moderate income groups from the community [McCahill, 1975; p. 12-13; Scott, 1975; p. 1-15].

In Middlesex County, the comprehensive plan is in its final stages, and we enthusiastically urge the county's Board of Supervisors to critically evaluate and adopt it if it insures community goals. Furthermore, to prevent the diffusion of responsibility and promote greater efficiency in county government, one alternative might be to expand the responsibilities of the County Administrator. This is not to suggest that county government is presently ineffective, but stems instead from a belief that problems Middlesex County will face in the near future will be more than the present government can handle without a larger staff.

Fourth, existing basic industries should be given the utmost community support as they continue to face the problems of tight government regulations, deteriorating water quality, urban encroachments, and rising taxes. These older traditional enterprises (i.e., forest products, agriculture, and shellfishing) are indeed compatible with the growing recreational and retirement industry. In fact, all such industries depend upon a quality environment that includes clean water, an unpolluted atmosphere, and scenic amenities. Loss of any of these industries would detract from the distinctive rural advantages of the region. A few specific suggestions include land use taxation based upon existing rather than potential use, careful study and monitoring of point and non-point sources of water pollution and the provision of additional public waterfront recreational sites. Specifically concerning recreational assets, the county is urged to pay closer attention to quality of recreational land use because scenic land is a critical but exhaustable resource. Better regulation of marinas, campgrounds, and other public places, and restoration of old buildings and landmarks, will enhance the recreational assets ot the area. This is especially important due to the county's proximity to large metropolitan areas and nationally important historical sites and theme parks (e.g. Williamsburg, Yorktown, Jamestown, Busch Gardens, King's Dominion.)

Fifth, while many Middlesex County residents want to attract new light industry, we are not as convinced of its desirability. Residents want such

industries to provide attractive jobs for the area's youth and lower income wage earners. However, new industries attract young families who will require additional public services and facilities. It is difficult to add residential units to a community without significantly increasing the costs of public education [Smith and Hiltner, 1975]. A careful examination of Middlesex County's fiscal structure would provide much needed information about its ability to support the cost of education and other services should the residential population begin to swell [Real Estate Research Corporation, 1974]. The "bedroom" type of community and the attraction of light industries, desired by many residents, should be considered only after careful examination of fiscal and environmental impacts.

Finally, an important contribution of this research is methodological. Our objective was to help a community identify and define critical environmental problems before they became detrimental to the local quality of life. We employed a technique which assists community leaders to reach consensus concerning adaptive or preventive responses and strategies to such problems. The use of the Delphi Method has been useful in helping us to attain our objectives. This is an innovative use of the Delphi Method to facilitate local inputs into the community planning process, and we actively recommend it to community and regional planners for this purpose. Citizens' input to decisions concerning environmental problems are particularly difficult to incorporate because professionals are often skeptical about involving the public in policymaking [Sewell, 1971]. Furthermore, such problems are frequently complex and technical, and a measure of public education is usually required before this complexity is fully appreciated. The Delphi Method is invaluable because it bridges the gap between the professional and the citizen and has this strong educational component.

The Delphi Method assisted in identifying the environmental problems that are perceived to exist in Middlesex County. The rather diverse list of local problems that were suggested in Round One became a more refined and commonly agreed upon list in Round Four. In addition, panel members were able to agree on priorities for dealing with these issues and a rank ordering of the problems in terms of their alterability. The panel members also agreed that they wanted regulated and controlled growth in the county and that zoning and land use regulations are the best means of achieving this goal. This illustrates, therefore, that the Delphi procedure is an excellent tool for acquiring grass roots participation and support in land use decisionmaking [Kaufman and Gustafson,

1973]. The panel's composite image of development in Middlesex County, as well as its identification of conflicts , should assist local officials in forecasting and managing future growth in the Middle Peninsula Region.

Generating community interest to understand and to solve local problems, particularly those involving poorly perceived environmental hazzards ranging from hurricanes to contaminated waste water, is indeed a difficult task. While we had reservations about our ability to identify and elicit opinions from all relevant interest groups in the county, we were later encouraged by the complementary results of the high school questionnaire. This survey documented that the findings of the Delphi procedure were representative of community attitudes. As a result, secondary surveys may not be necessary as long as every attempt is made to include all segments of the population in the Delphi panel. As a device for generating consensus, it is an effective method to foster environmental awareness while analyzing community attitudes about controversial issues.

REFERENCES CITED

Alanen, Arnold R., and Smith, Kenard E., 1977. "Growth vs No-Growth Issues, With an American Appalachian Highlands Perspective." *Tijdscrift Voor Economishe en Social Geografie.* Vol. 68, pp. 32-43.

Bonjean, Charles M., and Olson, David M., 1964. "Community Leadership: Directions of Research." *Administrative Science Quarterly, Vol. 9,* pp. 278-300.

Bosselman, F.; Callies, D.; and Banta, J., 1973. *The Taking Issue.* Council of Environmental Quality. Washington, D. C.

Boulding, Kenneth E., 1964. *The Meaning of the 20th Century.* Harper and Row, Inc.

Burton, D., 1975. "Results of Public Meetings," Middlesex Planning Commission, Saluda, Virginia (Mimeographed).

Burton, Ian, 1972. "Cultural and Personality Variables in the Perception of Natural Hazards." *Environment and the Social Sciences: Perceptions and Applications.* Edited by J. F. Wohlwill and D. H. Carson. American Psychological Association.

Burton, Ian and Kates, Robert W., 1964a. "The Flood Plain and the Seashore: A Comparative Analysis of Hazard Zone Occupance." *The Geographical Review.* Vol. 54, pp. 366-385.

———, 1964b. "The Perception of Natural Hazards in Resource Management." *Natural Resource Journal.* Vol. 3, pp. 412-441.

Burton, Ian; Kates, Robert W.; and White, Gilbert F., 1968. *The Human Ecology of Extreme Geophysical Events.* Natural Hazard Research Working Paper No. 1. Department of Geography, University of Toronto.

Dalkey, N., and Helmer, O., 1963. "An Experimental Application of the Delphi Method to the Use of Experts." *Management Science,* Vol. 9, pp. 458-467.

Danzger, M. Herbert, 1964. "Community Power Structure: Problems and Continuities." *American Sociological Review.* Vol. 29, pp. 707-717.

Delbecq, Andre L.; Van de Ven, Andrew H.; and Gustafson, David H., 1975. *Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes.* Scott Foresman and Company.

Downie, Leonard, Jr., 1974. *Mortgage in America: The Real Cost of Real Estage Speculation.* Praeger Publishers.

Emanuel, M., 1974. "Ramapo's Managed Growth Program." *Planner's Notebook,* Vol. 4, pp. 1-8.

Freeman, Linton C.; Fararo, Thomas J.; Bloombert, Warner, Jr.; and Sunshine, Morris H., 1963. "Locating Leaders in Local Communities: A Comparison of Some Alternative Approaches." *American Sociological Review.* Vol. 27, pp. 791-798.

Gilliam, Sara K., and William J. Serow, 1975. *Estimates of the Population of Virginia Counties and Cities: July 1, 1973 and July 1, 1974.* Tayloe Murphy Institute, University of Virginia.

Hart, John Fraser, 1976. "Urban Encroachment on Rural Areas." *The Geographical Review.* Vol. 66, pp. 1-17.

Hill, G., 1974. "Nation's Cities Fighting to Stem Growth." *New York Times.* July 28, 1974, pp. 1, 30.

Kaufman, Jerome and Gustafson, David H., 1973. *Multi-County Land Use Policy Formation: A Delphi Analysis.* Technical Report of the Department of Industrial Engineering, University of Wisconsin.

Lewis, P.; Tuan, Y.; and Lowenthal, D., 1973. *Visual Blight in America.* Commission on College Geography Research Paper No. 23. Association of American Geoghaphers.

Long, Norton E., 1958. "The Local Community as an Ecology of Games." *American Journal of Sociology,* Vol. 64, pp. 251-261.

Martino, Joseph P., 1972. "Delphi." *Technological Forecasting for Decisionmaking.* American Elsevier Publishing Company. pp. 18-63.

McGranahan, David; Wilkening, E. A.; Hutchison, John; and Geisler, Charles., 1975. *The Use of Leader Ratings to Assess Community Services and Characteristics in the Kickapoo Valley.* Institute for Environmental Studies, University of Wisconsin.

Mitchell, James K., 1976. "Adjustment to New Physical Environments Beyond the Metropolitan Fringe." *The Geographical Review.* Vol. 66 pp. 18-31.

Moline, Norman T., 1974. "Perception Research and Local Planning: Floods on the Rock River, Illinois." *Natural Hazards: Local, National, Global.* Edited by G. F. White. Oxford University Press. pp. 52-59.

Molnar, Daniel, and Kammerud, Marshall, 1975. "Developing Priorities for Improving the Urban Social Environment: A Use of Delphi." *Socio-Economic Planning Science.* Vol. 9, pp. 25-29.

Nix, Harold L., 1969. "Concepts of Community and Community Leadership." *Sociology and Social Research.* Vol. 53, pp. 500-510.

Packard, Vance, 1972. *A Nation of Strangers.* Pocket Books.

Payne, Raymond, 1963. "Leadership and Perceptions of Change in a Village Confronted with Urbanism." *Social Forces.* Vol. 41, pp. 264-269.

Pill, Juri, 1971. "The Delphi Method: Substance, Control, A Critique and an Annotated Bibliography." *Socio-Economic Planning Science,* Vol. 5, pp. 57-71.

Presthus, Robert, 1967. *Men at the Top: A Study in Community Power.* Oxford University Press.

Real Estate Research Corporation, 1974. *The Cost of Sprawl: Detailed Cost Analysis.* Council on Environmental Quality, Department of Housing and Urban Development and Environment Protection Agency.

Sanders, Irwin T., 1966. "Allocation of Power." *The Community: An Introduction to a Social System.* Second edition. Ronald Press, pp. 440-457.

———, 1960. "The Community Social Profile." *American Sociological Review.* Vol. 25, pp. 75-77.

Scott, R., 1975. "A View from the Mount: Laurels and Criticisms for a Major Judicial Advance." *Environmental Comment.* July 23, 1975, pp. 1-15.

Scott, R.; Brower, D.; and Miner, D. (Editors), 1975. *Management and Control of Growth.* Urban Land Institute. Vols. 1-3 .

Sewell, W. R. Derrick, 1971. "Environmental Perceptions and Attitudes of Engineers and Public Health Officials." *Environment and Behavior.* Vol. 3, pp. 23-59.

Skutsch, Margaret, and Schofer, J. L., 1973. "Goals-Delphis for Urban Planning: Concepts in the Design." *Socio-Economic Planning Science.* Vol. 7, pp. 305-313.

Smil, Vaclav, 1972. "Energy and the Environment: A Long Range Forecasting Study." Ph. D. dissertation. The Pennsylvania State University.

------, 1975. "A Delphi Study of Future Developments in Energy Resources and their Environmental Impacts." *Human Geography in a Shrinking World.* Edited by R. Abler, D. Janelle, A. Philbrick, and J. Sommer. Duxbury Press, pp. 266-278.

Smith, Bruce W., and Hiltner, John, 1975. "The Fiscal Impact of Urban Expansion." *The Professional Geographer.* Vol. 27, pp. 449-453.

Smith, Kenard E., and Alanen, Arnold R., 1976. "Social and Economic Considerations in Appalachian Recreation Development: A West Virginia Case Study." *Planning Frontiers in Rural America.* Edited by O. Gade and B. Purrington. Committee Print, U.S. Senate Committee on Agriculture and Forestry. pp. 85-95. U.S. Government Printing Office.

Southard, C. E., 1973. *The Anti-Growth Syndrome in the Pacific Northwest.* Senior Seminar in Foreign Policy, Department of State.

Stansbury, Jeffrey, 1972. "Suburban Growth: A Case Study." *The Population Bulletin.* Vol. 28, pp. 1-30.

The Southside Sentinel, 1975. "Water Quality Plan Proposes Sewage Service Area Plants in Deltaville, Urbanna-Saluda." October 2, 1975, pp. 1-2.

The Southside Sentinel, 1976. "Council Tables Action on Sewer Line Extension." January 15, 1976. p. 1.

Tofler, Alvin, 1971. *Future Shock.* Bantam Books.

Warner, S., 1974. "Turf and Environment." *New Republic.* Vol. 170, p. 24.

Watts, W., and Free, L., 1974. *State of the Nation.* Potomac Associates.

White, Gilbert F., 1945. *Human Adjustments to Floods.* Department of Geography Research Paper No. 29. Chicago: University of Chicago Press.

Wiener, A., 1973. "The Future of Economic Activity, with Questions and Answers." *Annals, American Academy of Political and Social Sciences.* Vol. 408, pp. 50-51.

U.S. Bureau of the Census, 1961. *1960 Census of Population, Vol. 1, Characteristics of the Population, Part 48, Virginia.* U.S. Government Printing Office.

———, 1967. *U. S. Census of Population: 1960. Subject Reports. Migration Between State Economic Areas, Final Report PC (2)-2E.* U.S. Government Printing Office.

———, 1972. *Census of Population 1970. Subject Reports. Final Report PC (2)-2E, Migration Between State Economic Areas.* U.S. Government Printing Office.

———, 1972. *Census of Population: 1970. General Social and Economic Characteristics, Final Report PC(1) C-48, Virginia.* U.S. Government Printing Office.

———, 1972. *City and County Data Book, 1972.* U.S. Government Printing Office.

FIGURES

FIGURE 1
Middlesex County, Virginia

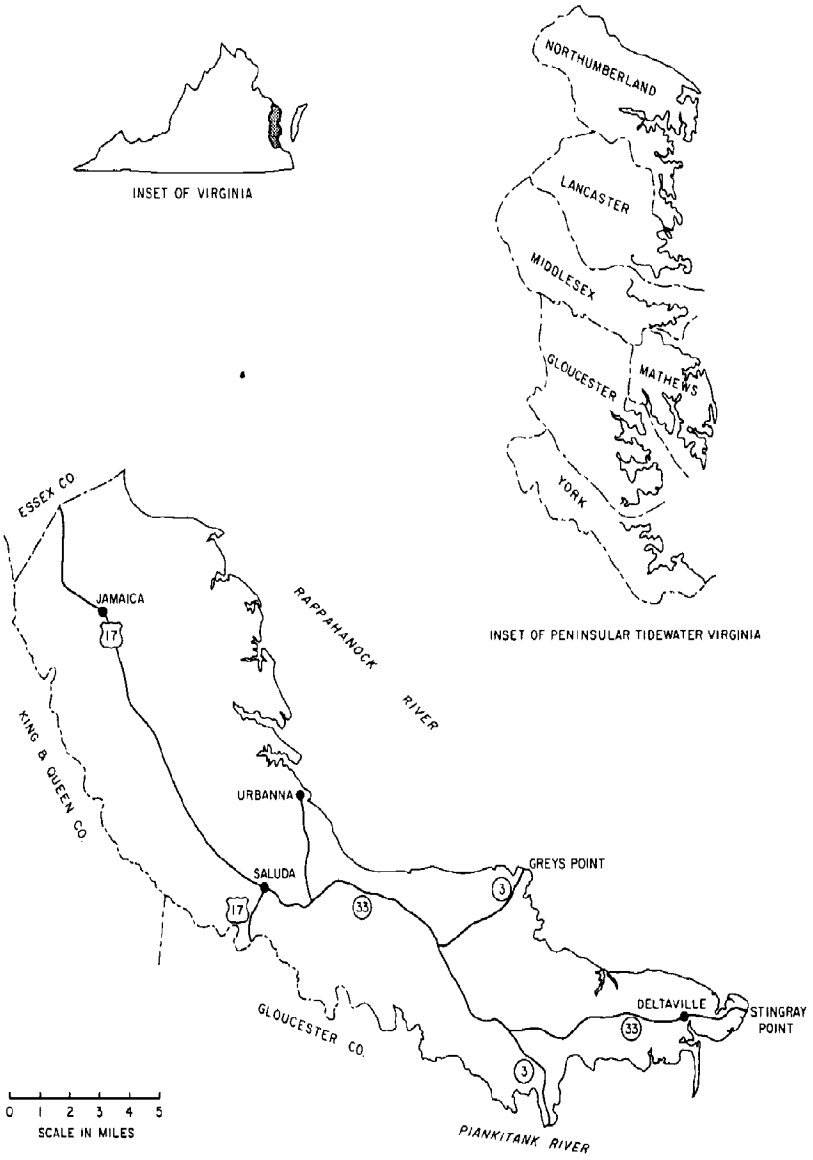


FIGURE 2

Rates of Population Change for Tidewater Virginia, 1930-1970, by Minor Civil Divisions

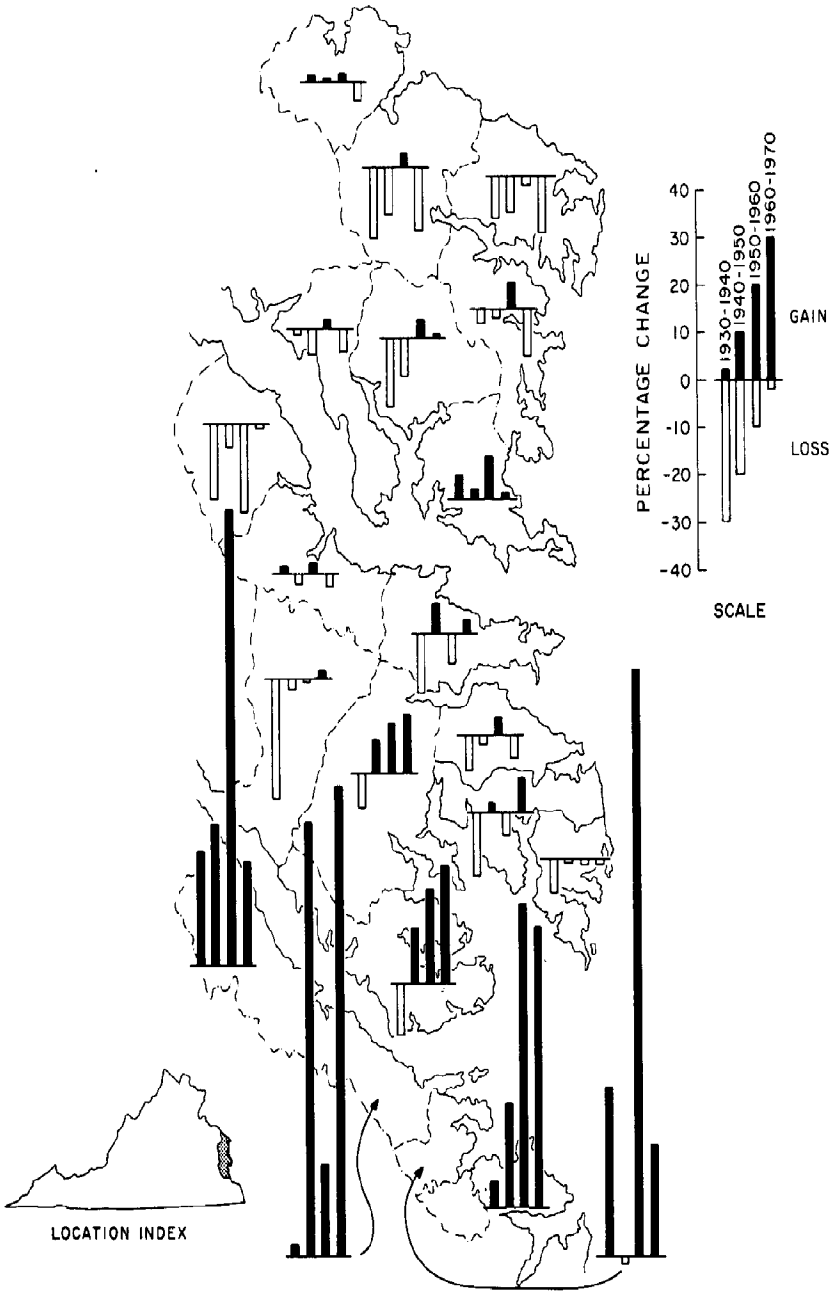


FIGURE 3

Population Pyramids for Gloucester County: Total Population, 1960

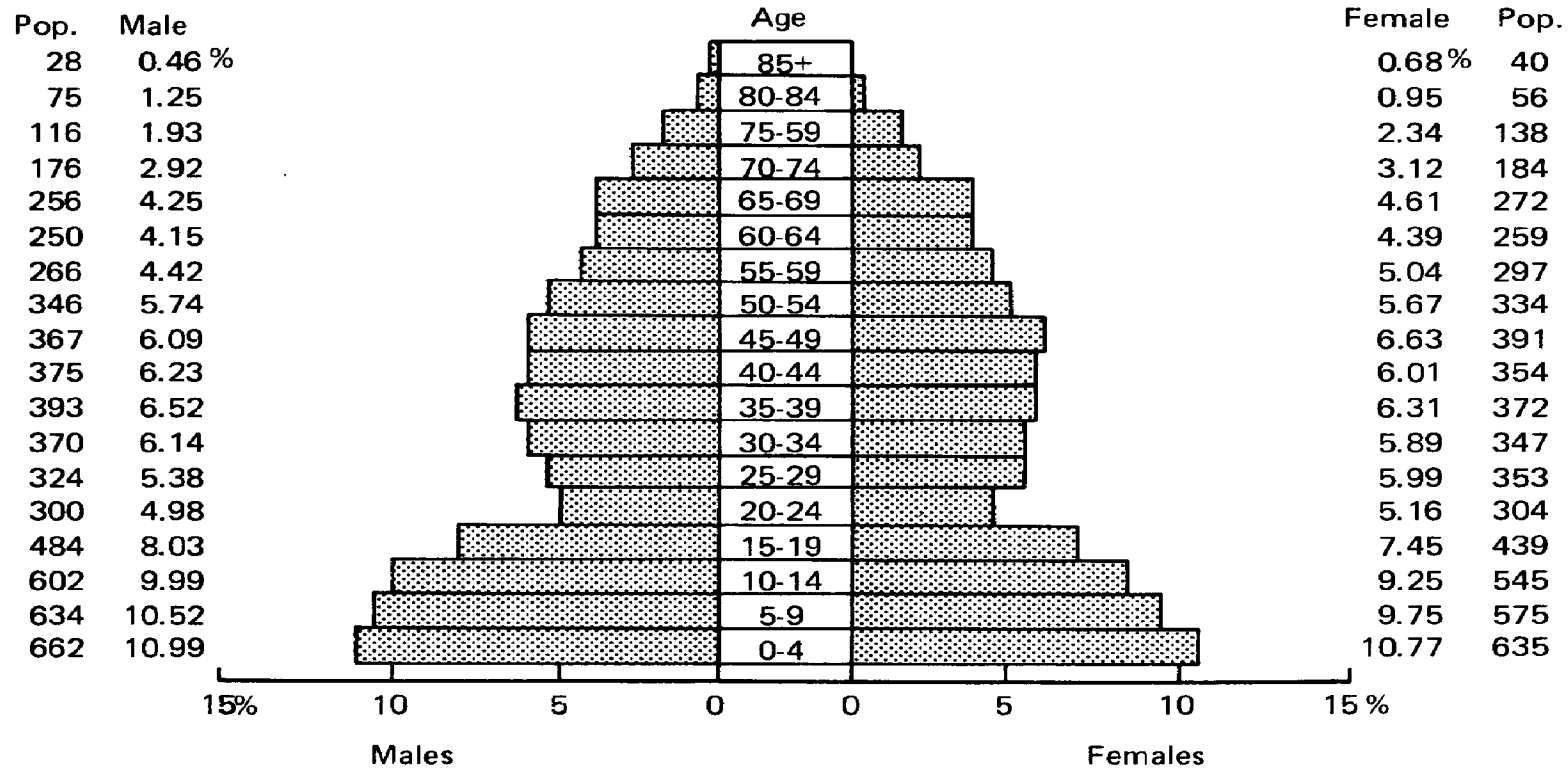


FIGURE 3 continued
Total Population, 1970

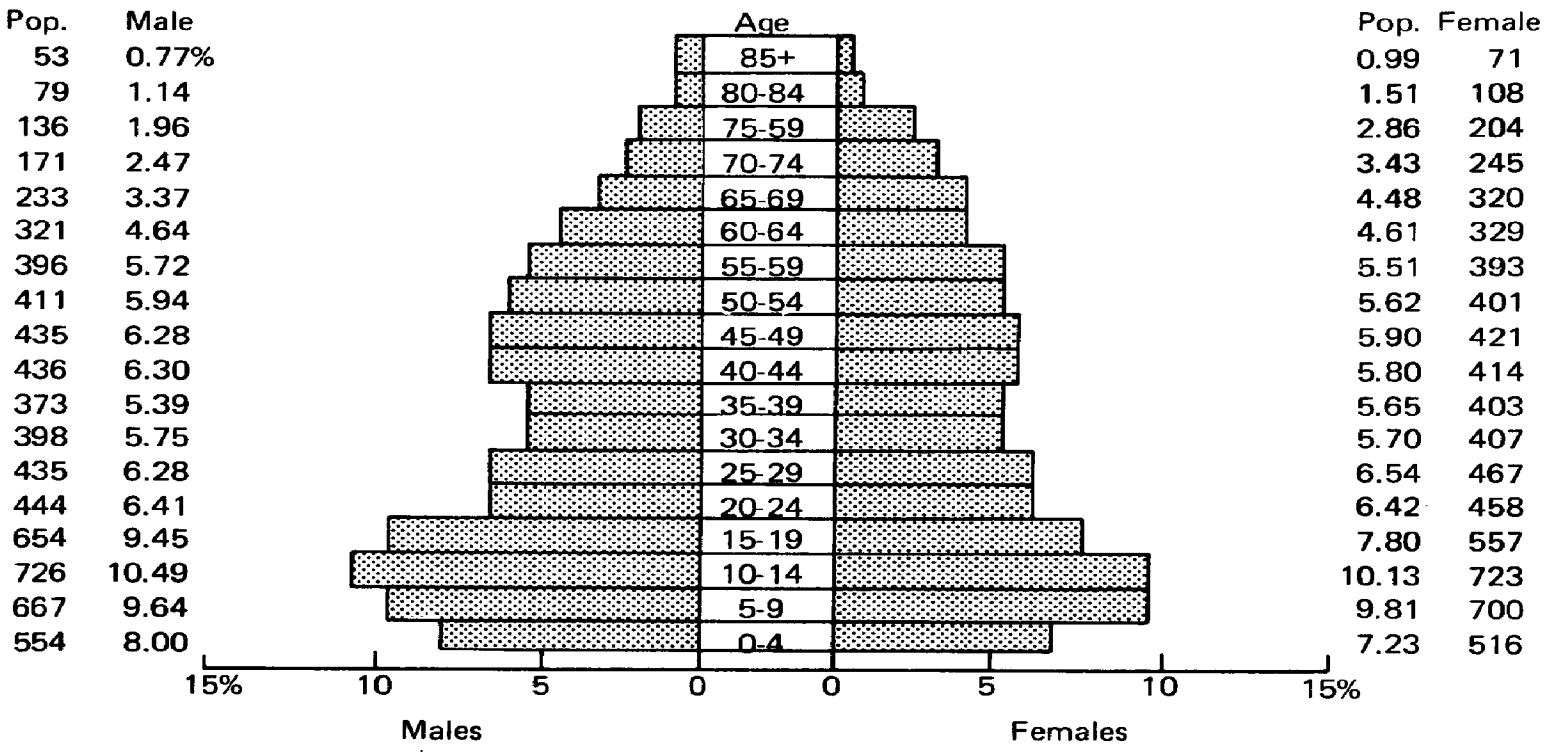
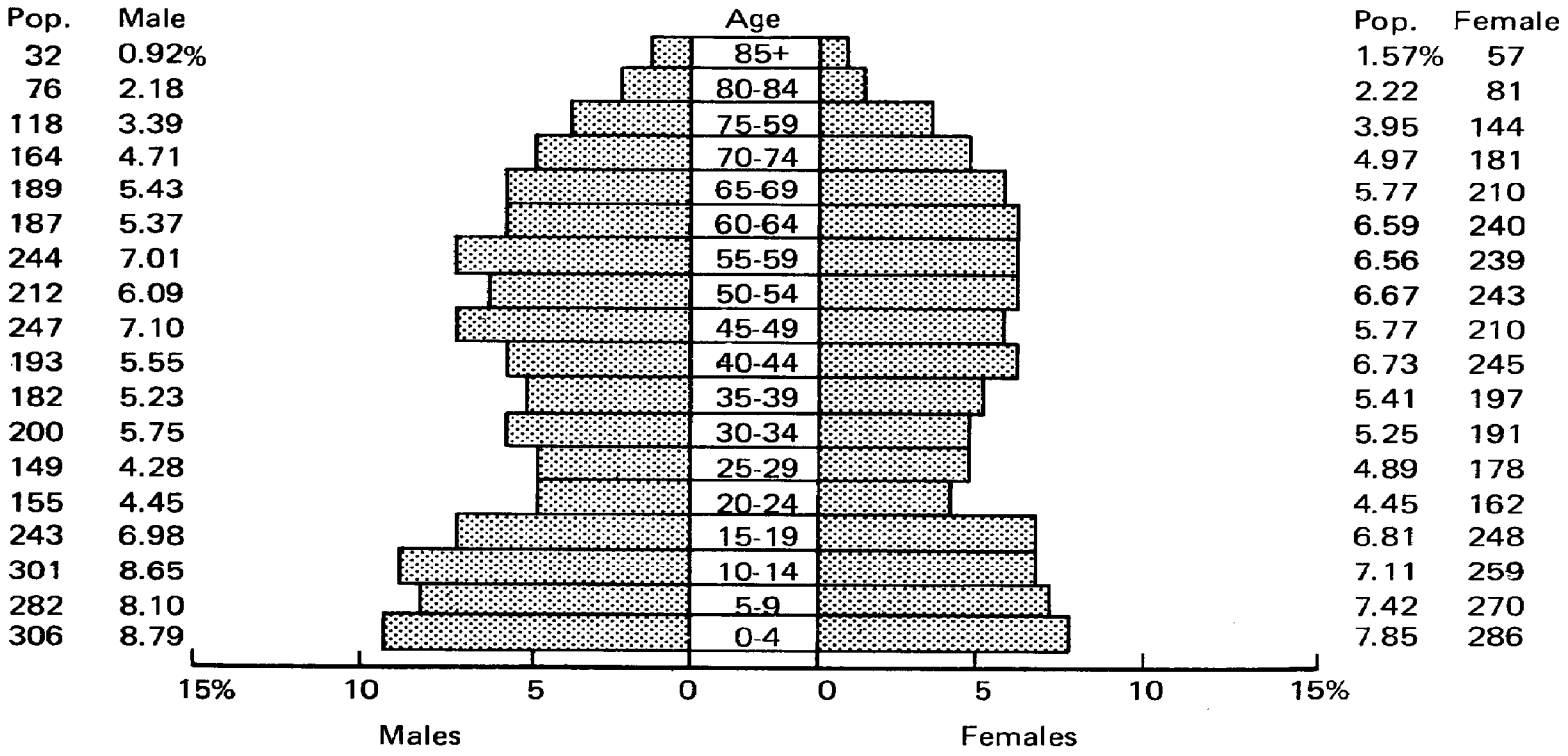


FIGURE 4

Population Pyramids for Mathews County: Total Population, 1960



Source: *U.S. Census of Population,* 1960 and 1970.

FIGURE 4, continued
Total Population, 1970

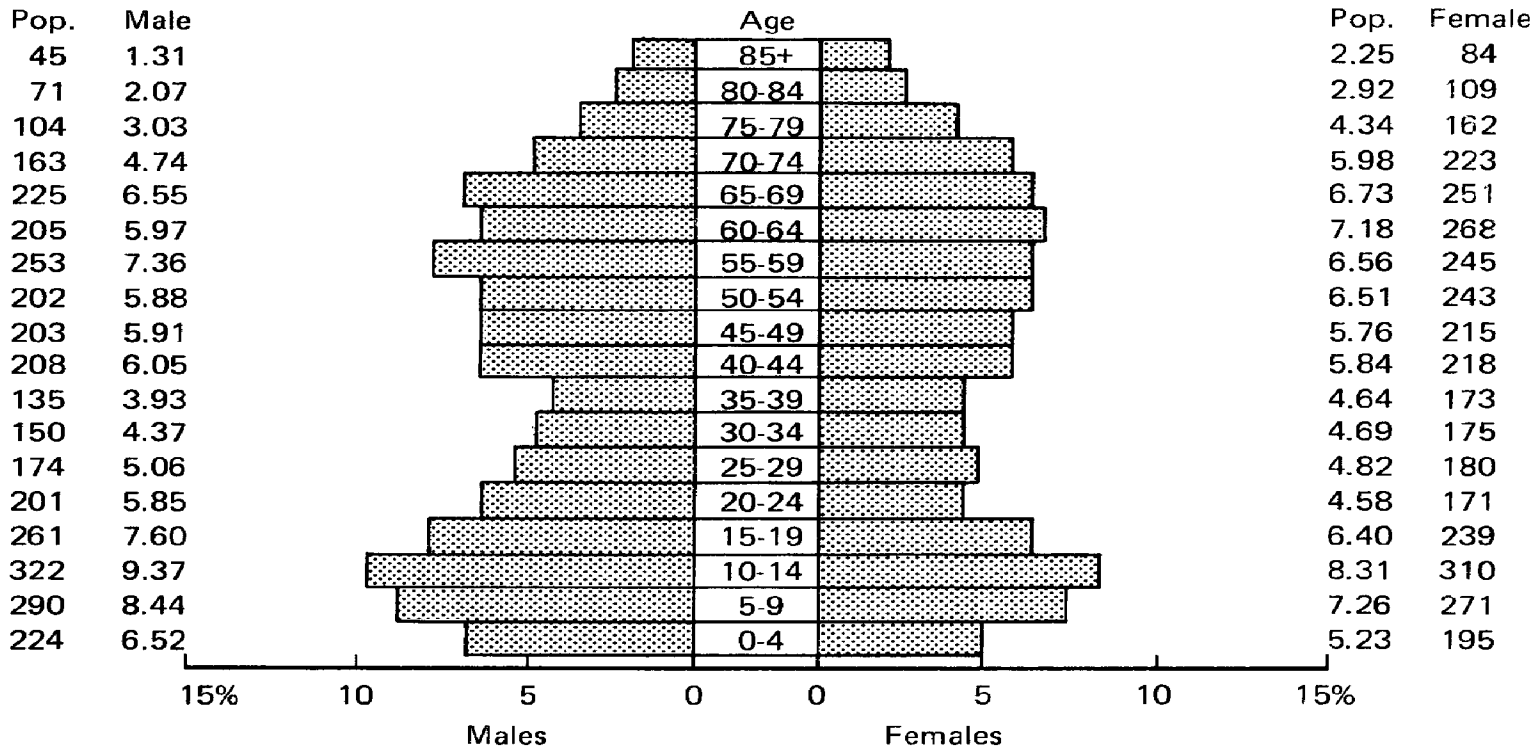


FIGURE 5

Population Pyramids for Middlesex County: Total Population, 1960

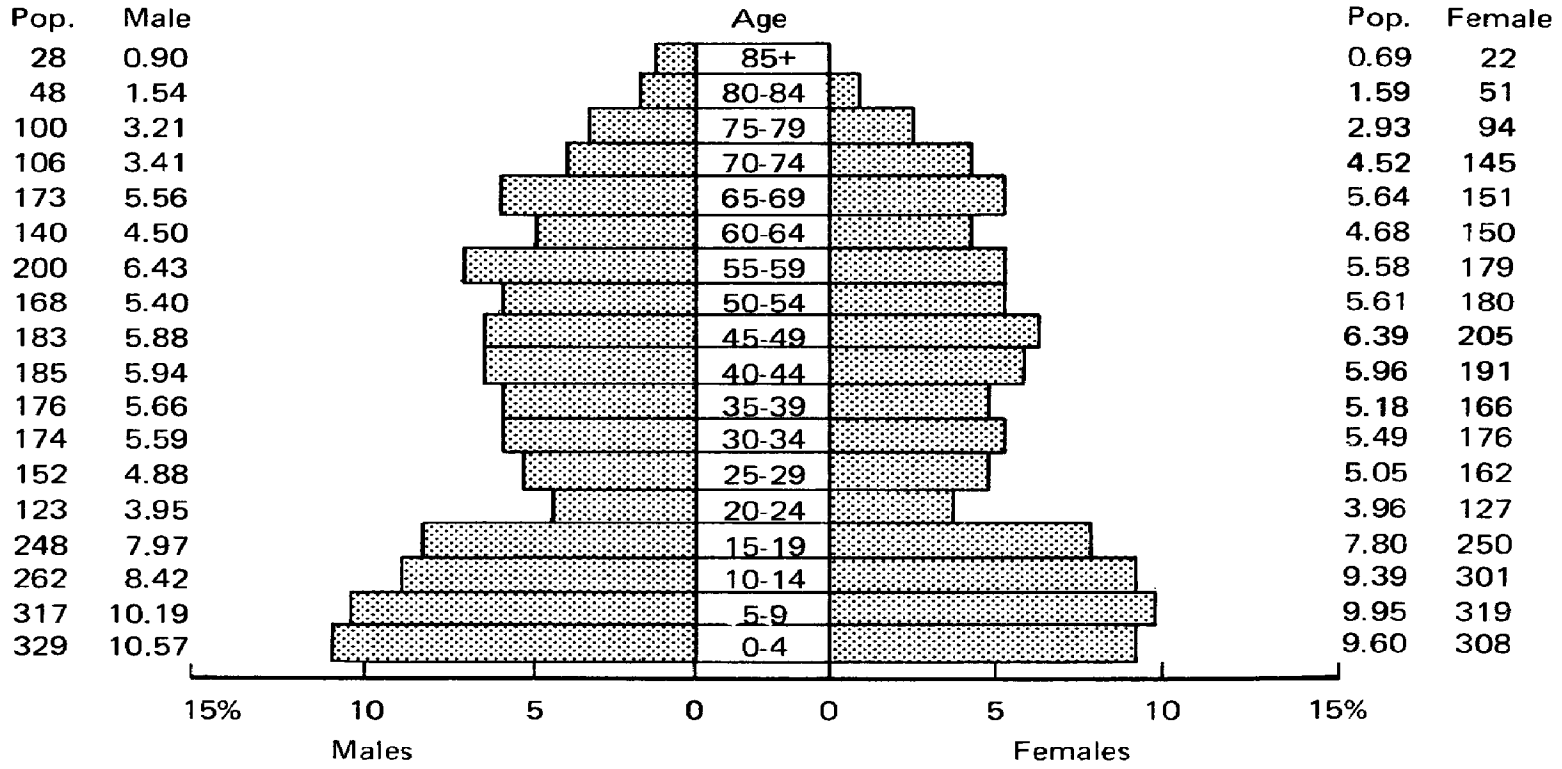


FIGURE 5, continued
Total Population 1970

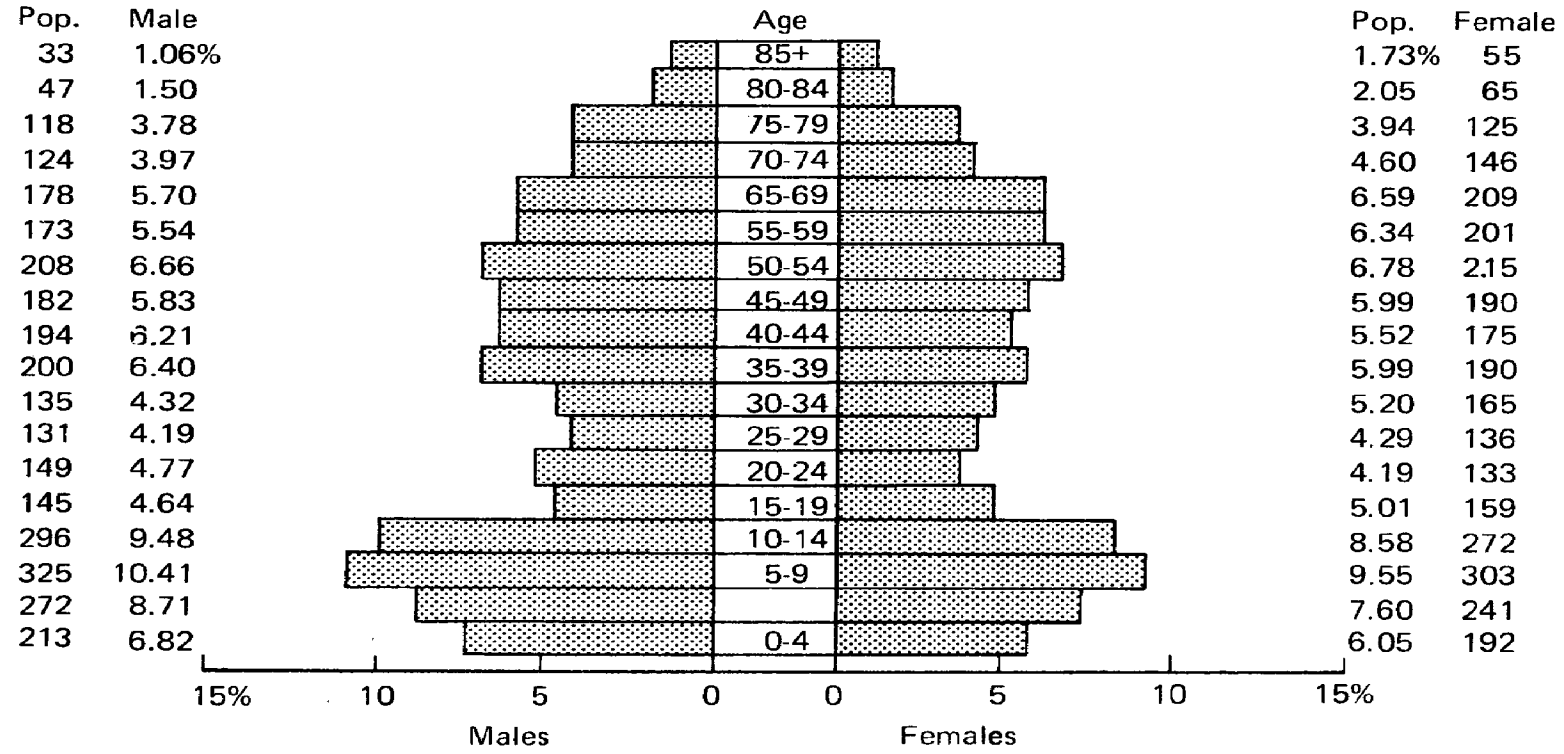


FIGURE 6

Population Pyramid of the White Population in Gloucester County, 1970

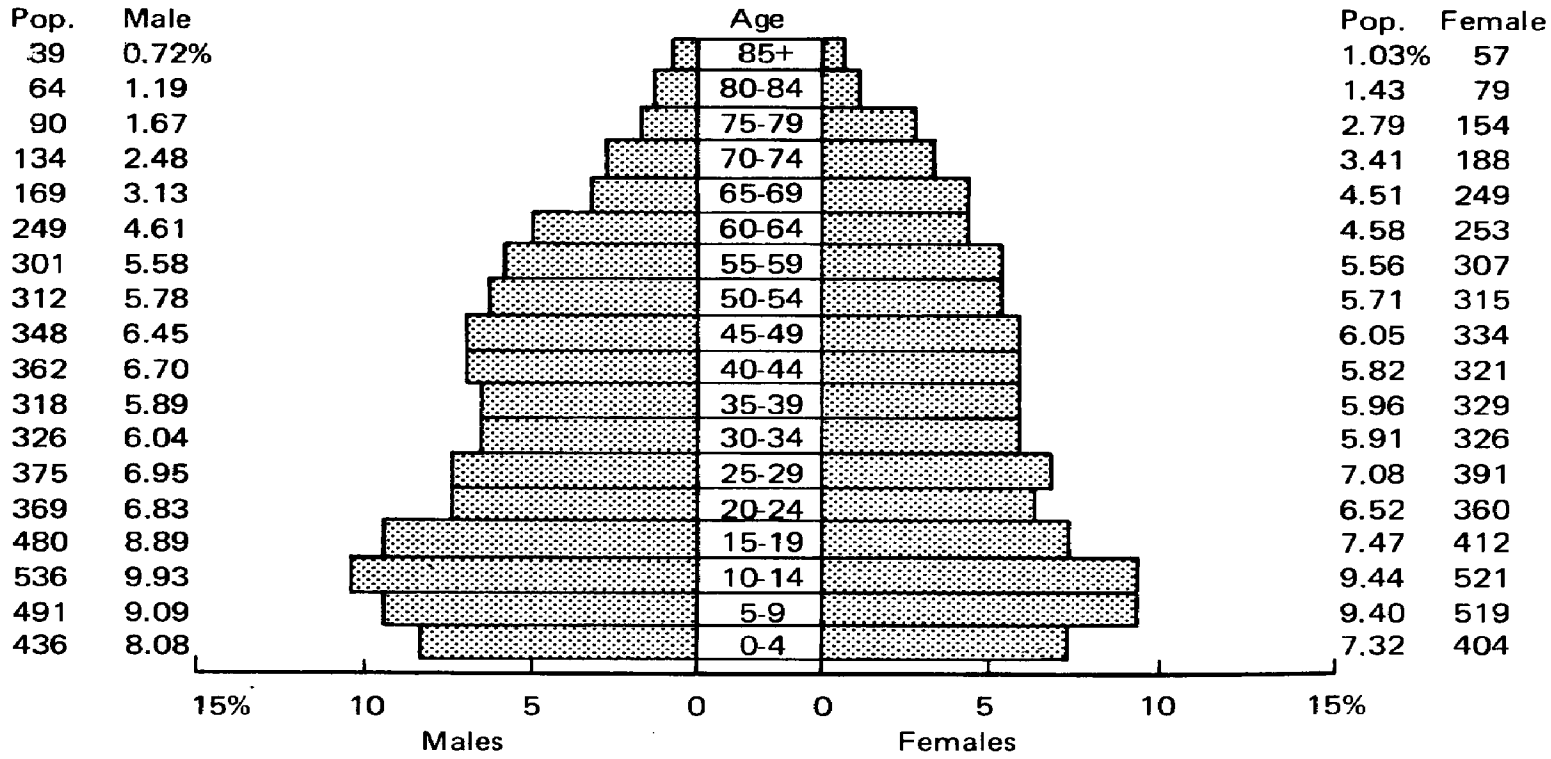
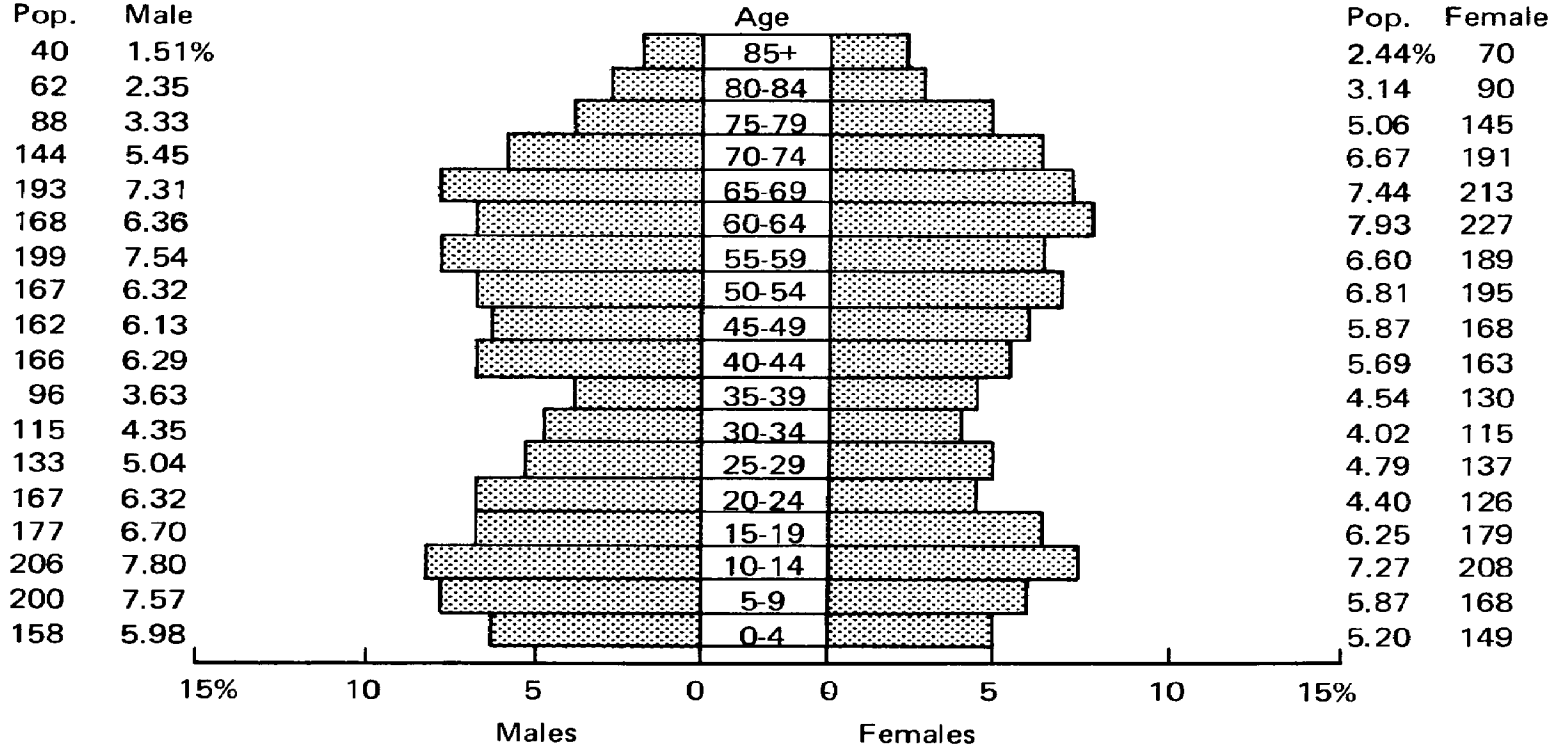


FIGURE 7

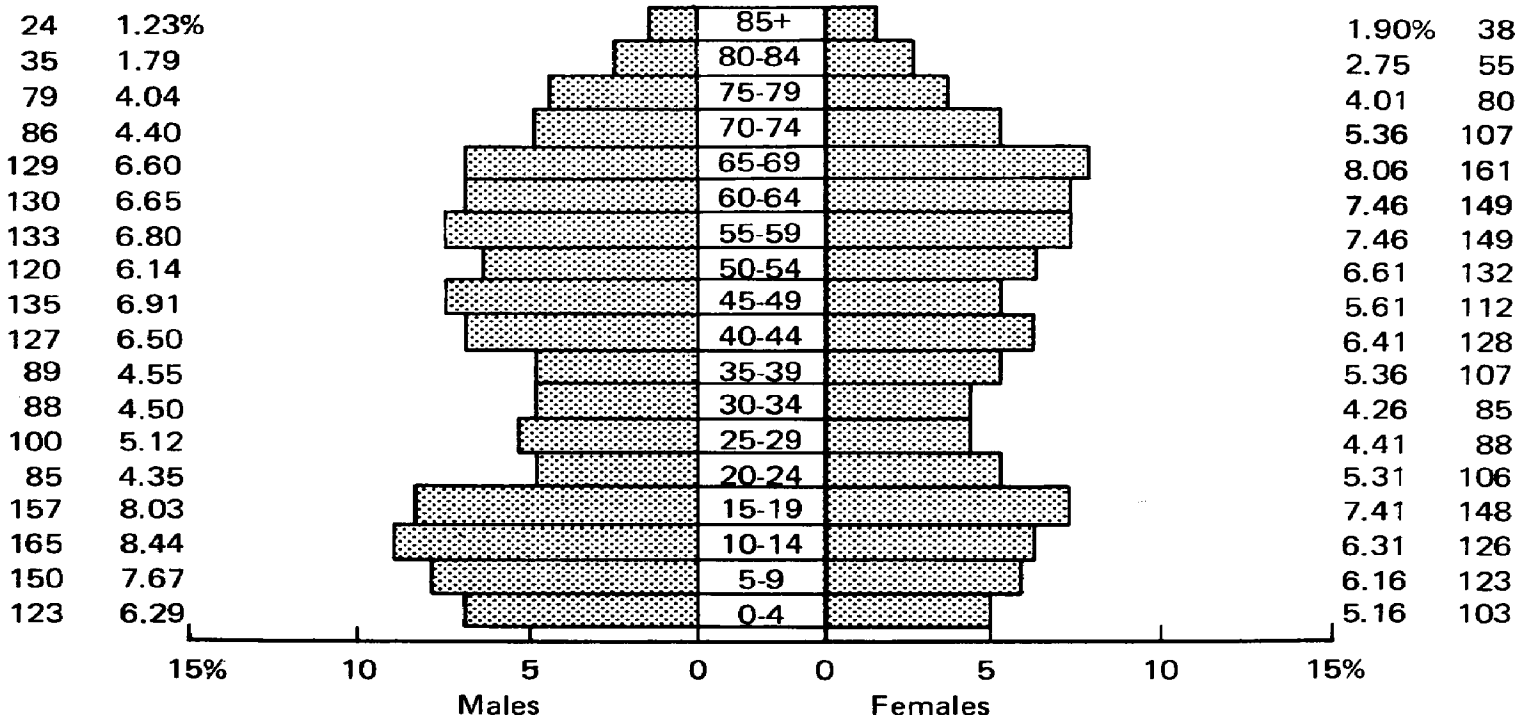
Population Pyramid of the White Population in Mathews County, 1970



Source: *U.S. Census of Population,* 1970.

FIGURE 8

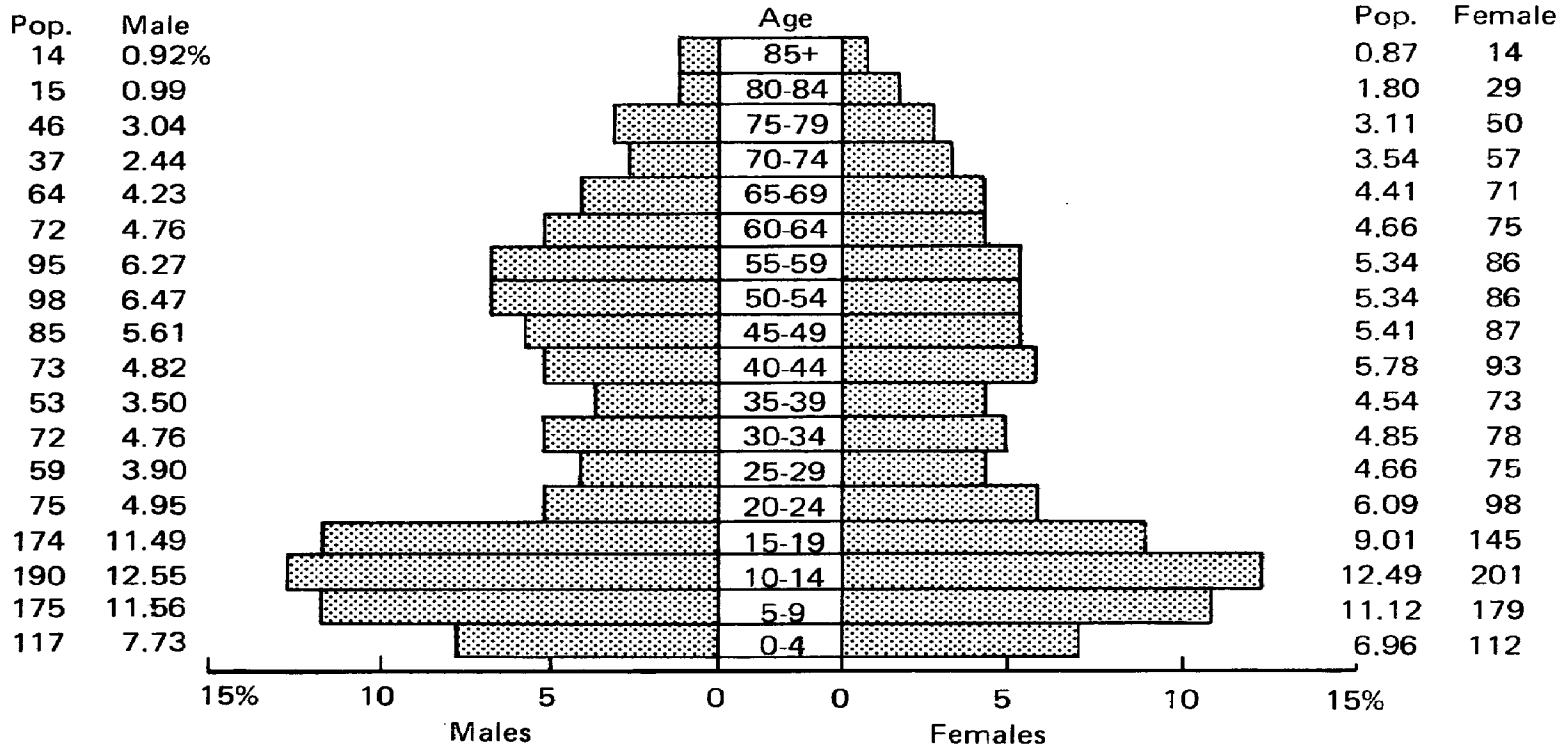
Population Pyramid of the White Population in Middlesex County, 1970



Source: *U.S. Census of Population,* 1970.

FIGURE 9

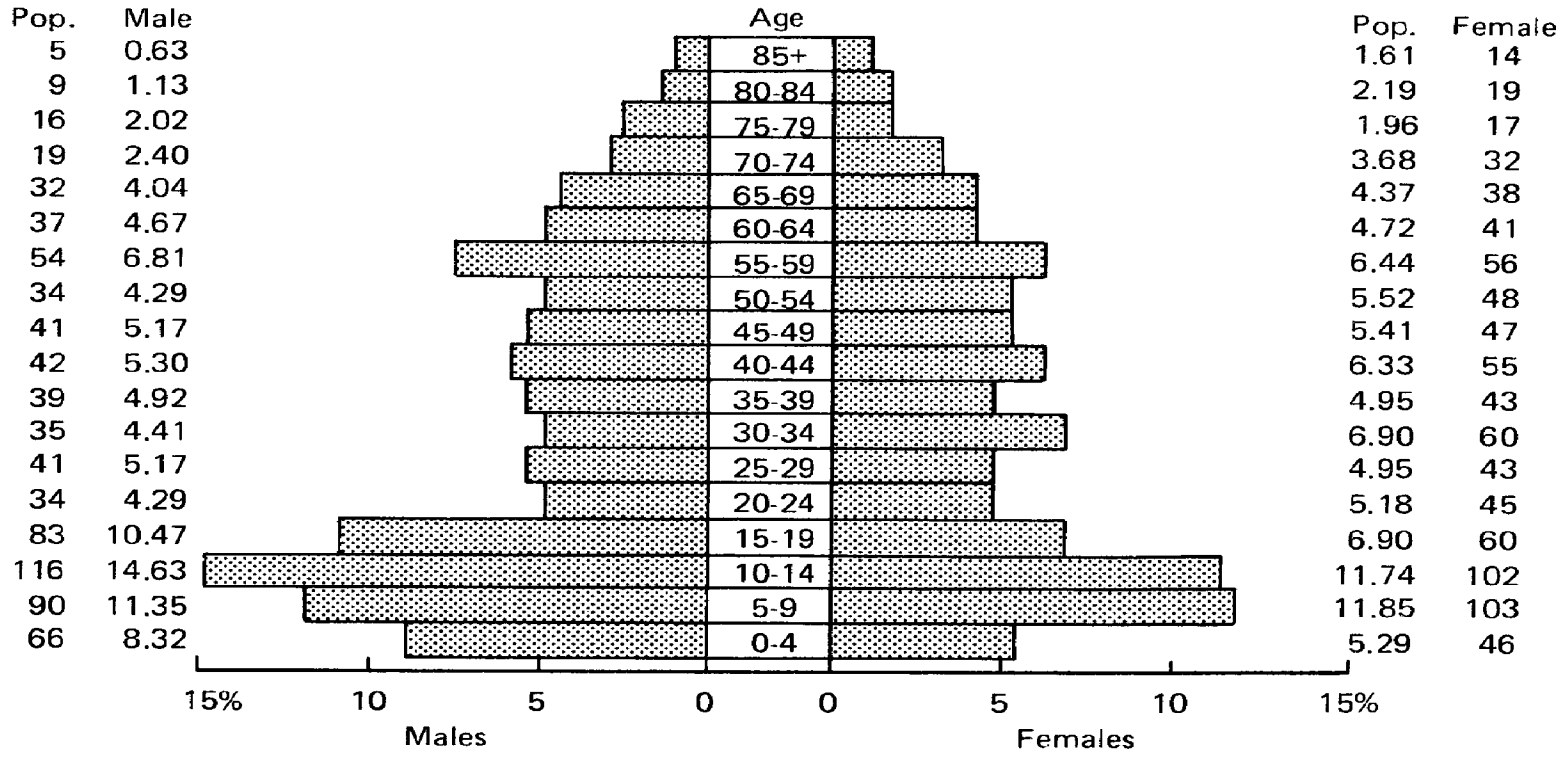
Population Pyramid of the Black Population in Gloucester County, 1970



Source: *U.S. Census of Population*, 1970.

FIGURE 10

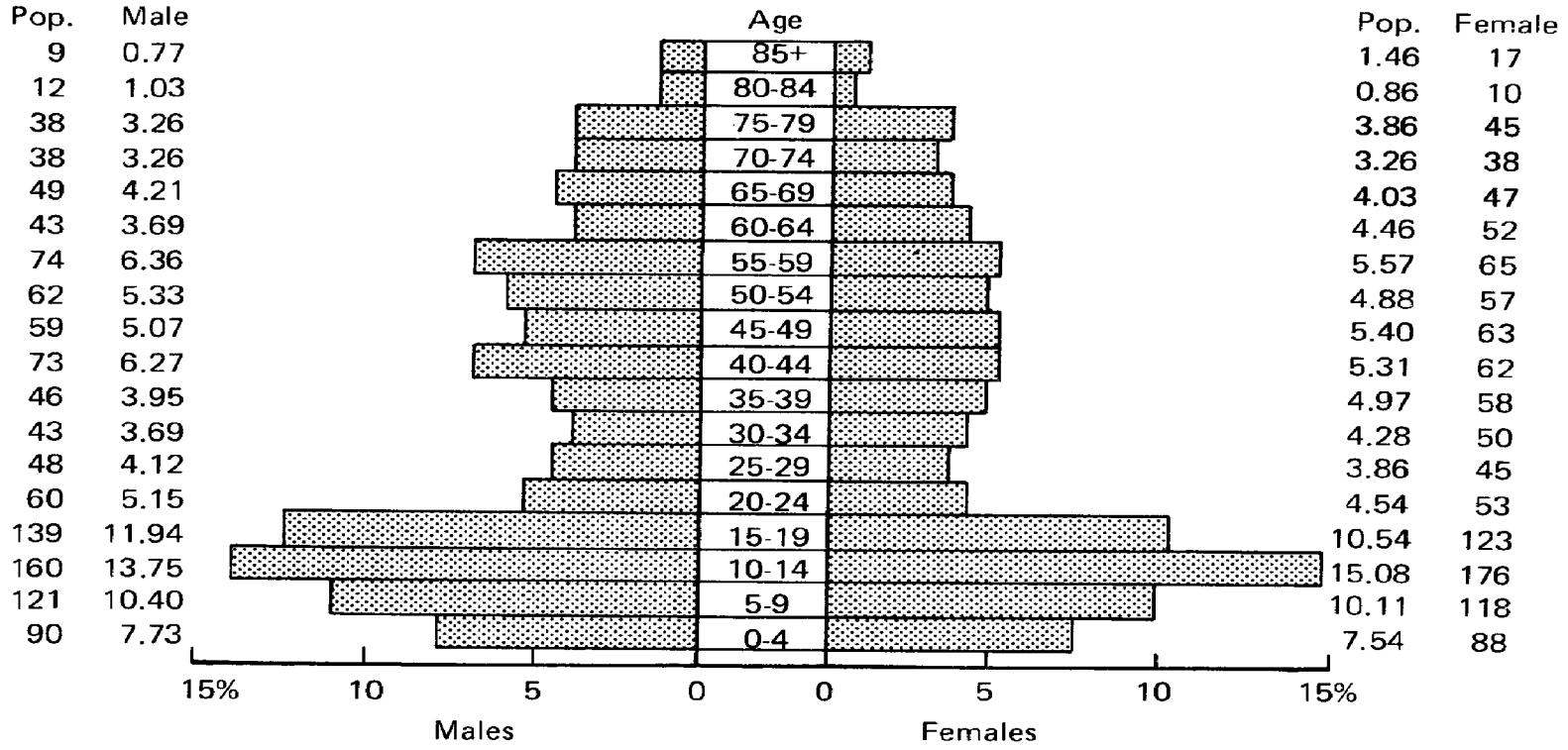
Population Pyramid of the Black Population in Mathews County, 1970



Source: *U.S. Census of Population,* 1970.

FIGURE 11

Population Pyramid of the Black Population in Middlesex County, 1970



Source: *U.S. Census of Population,* 1970.

FIGURE 12

Accessibility to Tidewater Virginia from Middlesex County

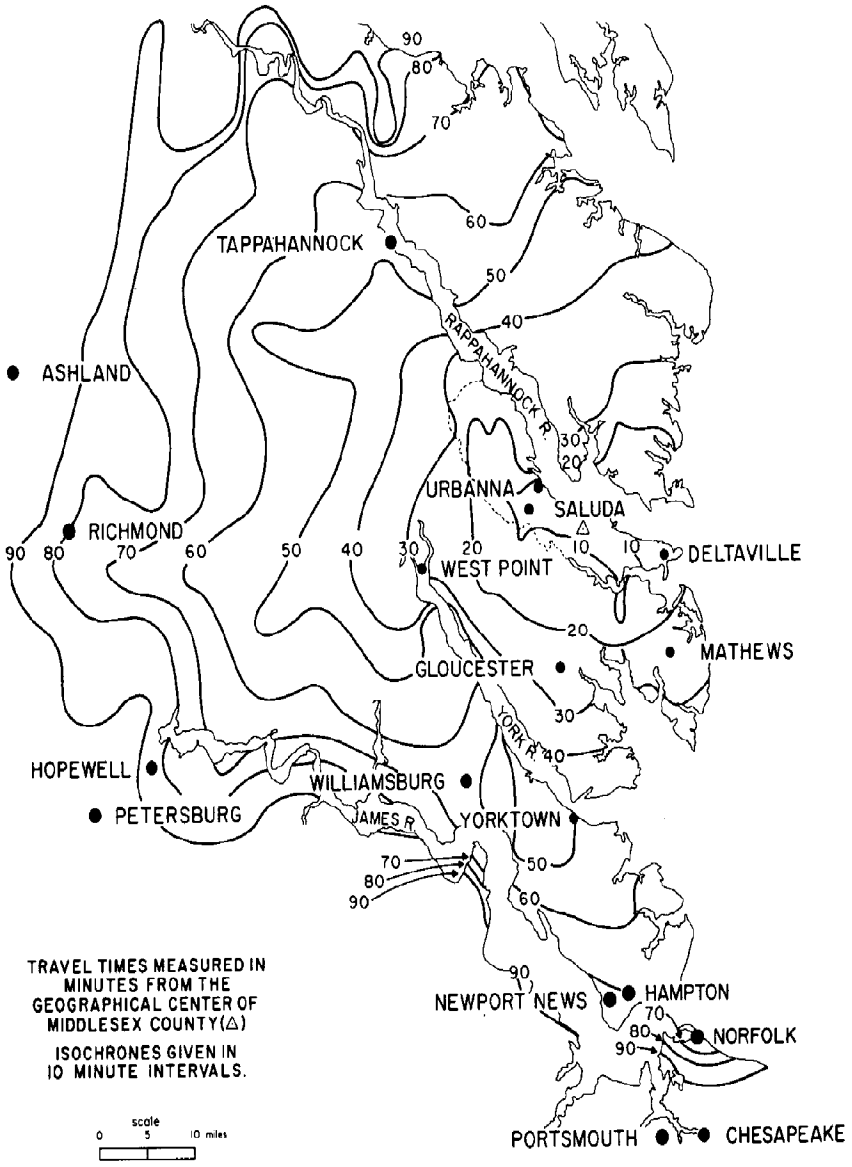
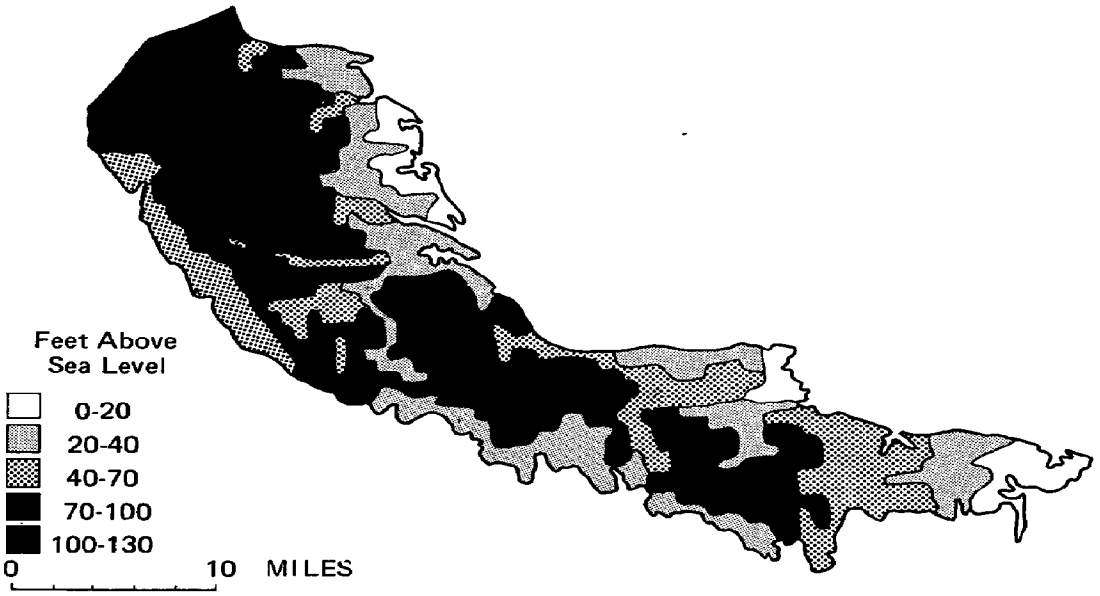
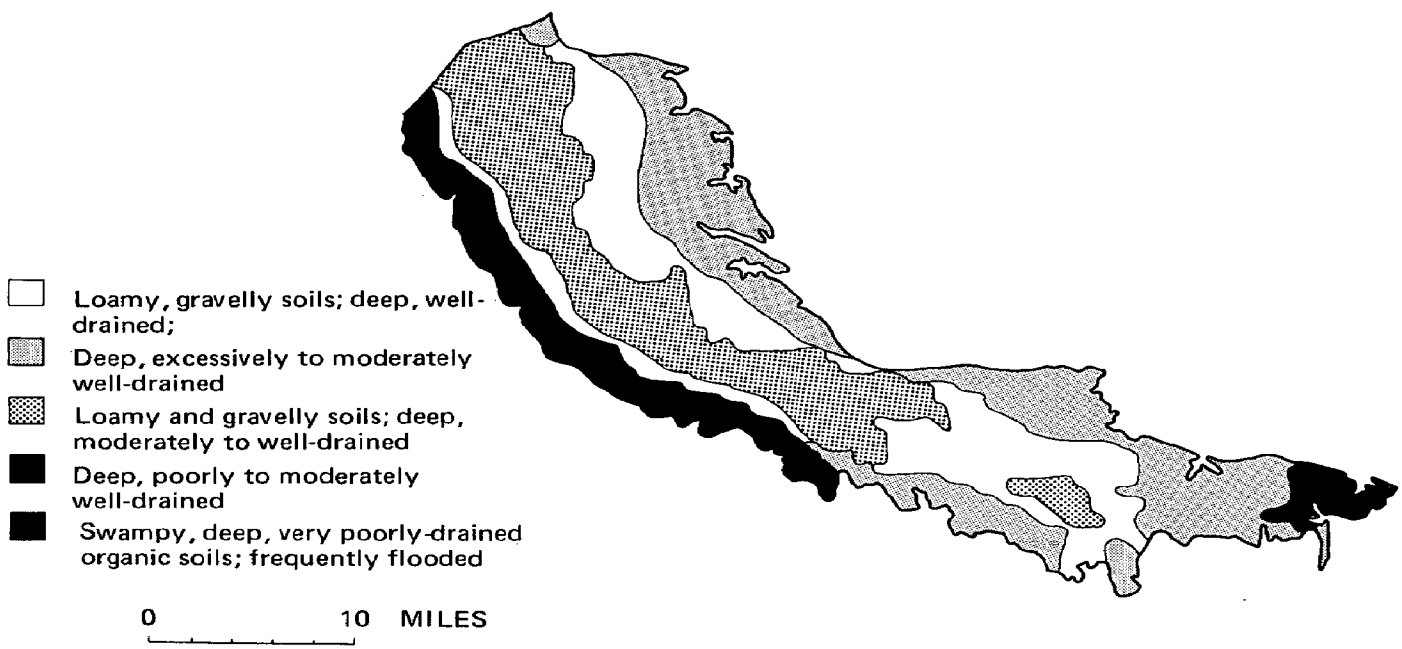


FIGURE 13
Middlesex County Elevation Map



Source: U.S. Geological Survey, 1973. *Topographic Maps of Virginia.*

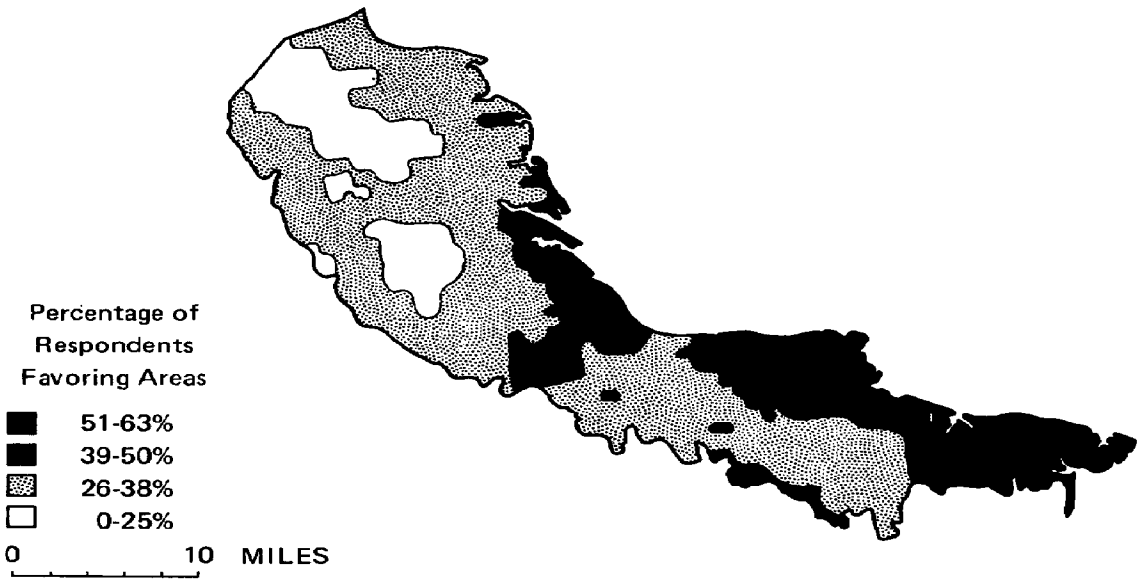
FIGURE 14
Middlesex County Soil Characteristics



Source: Middle Peninsula Planning District Commission, 1974. "Soils Association Map."

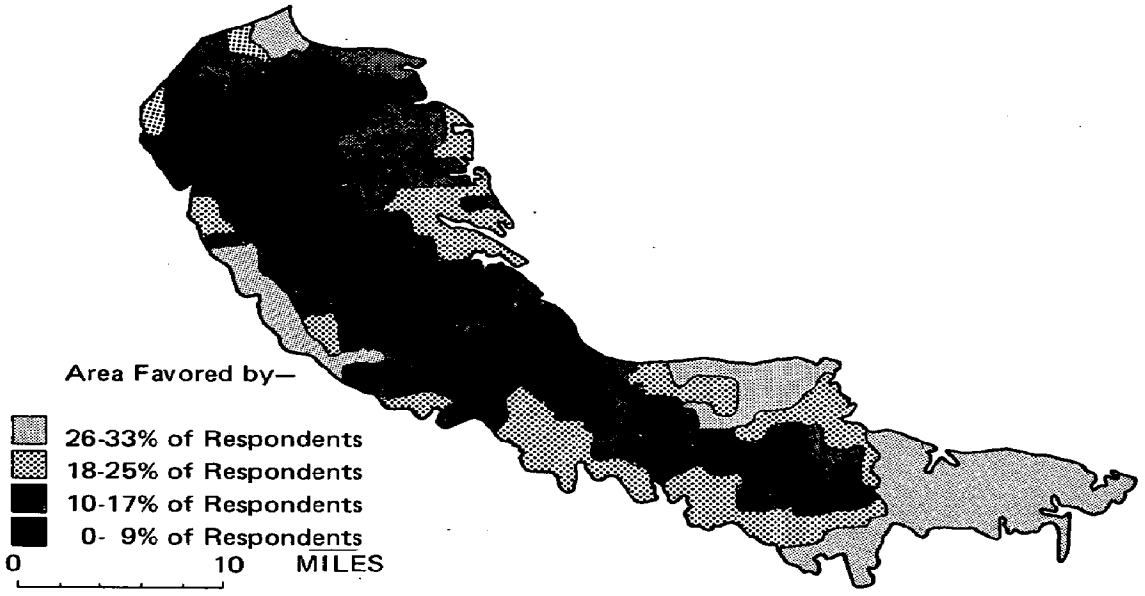
FIGURE 15

Areas Preferred for Residential Development in Middlesex County



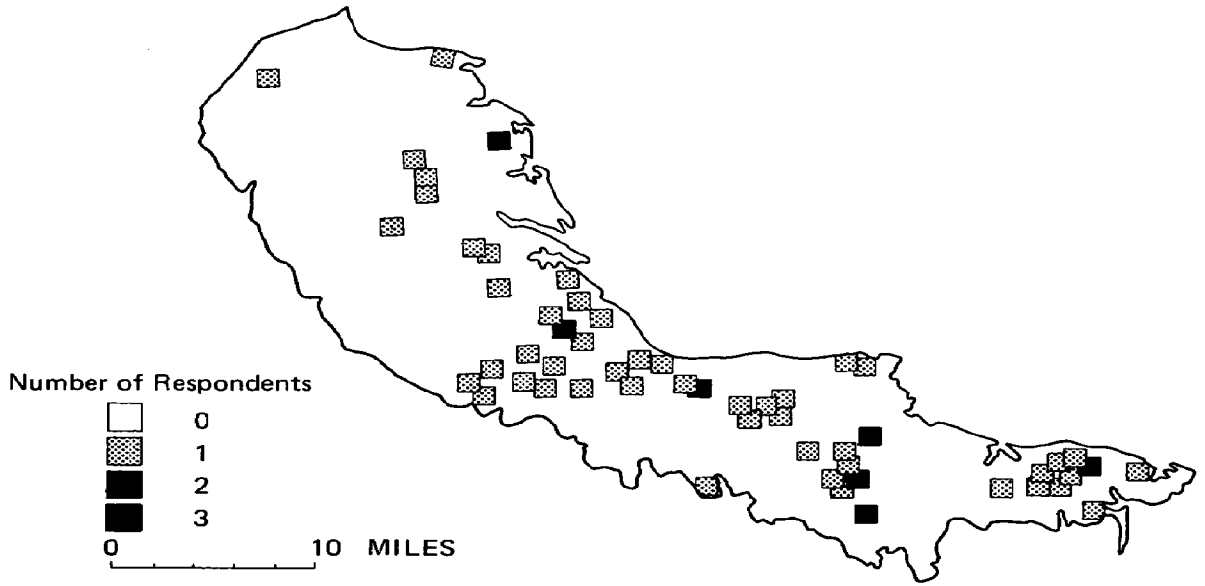
Source: Author's survey, 1975.

FIGURE 16
Areas Preferred for Industrial Development in Middlesex County



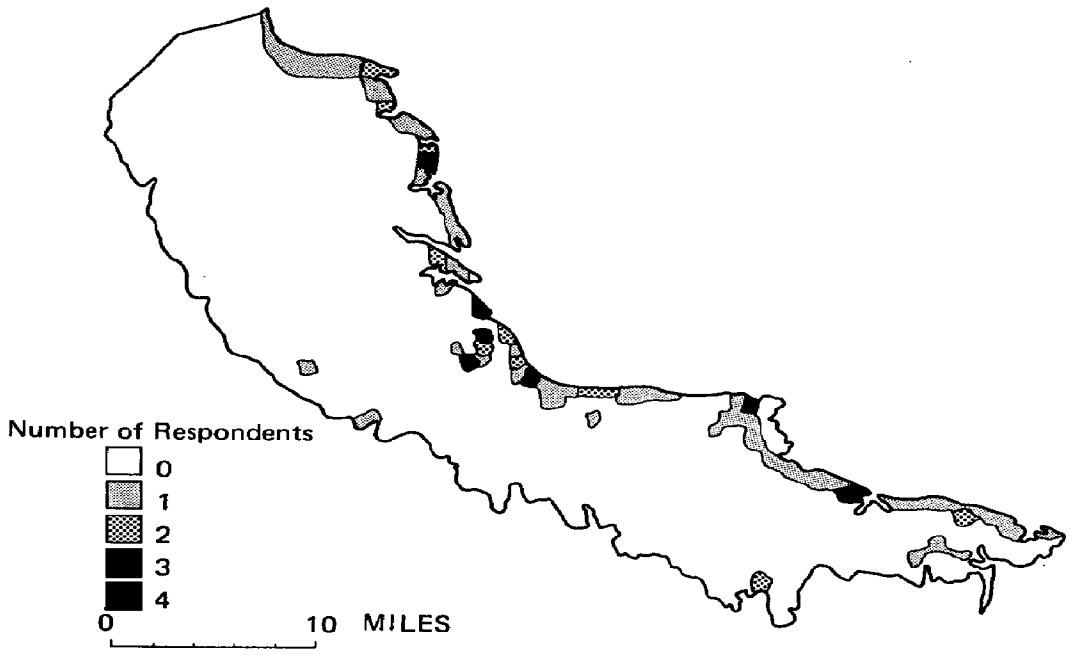
Source: Author's survey, 1975.

FIGURE 17
Middlesex County Residential Locations of All Survey Respondents



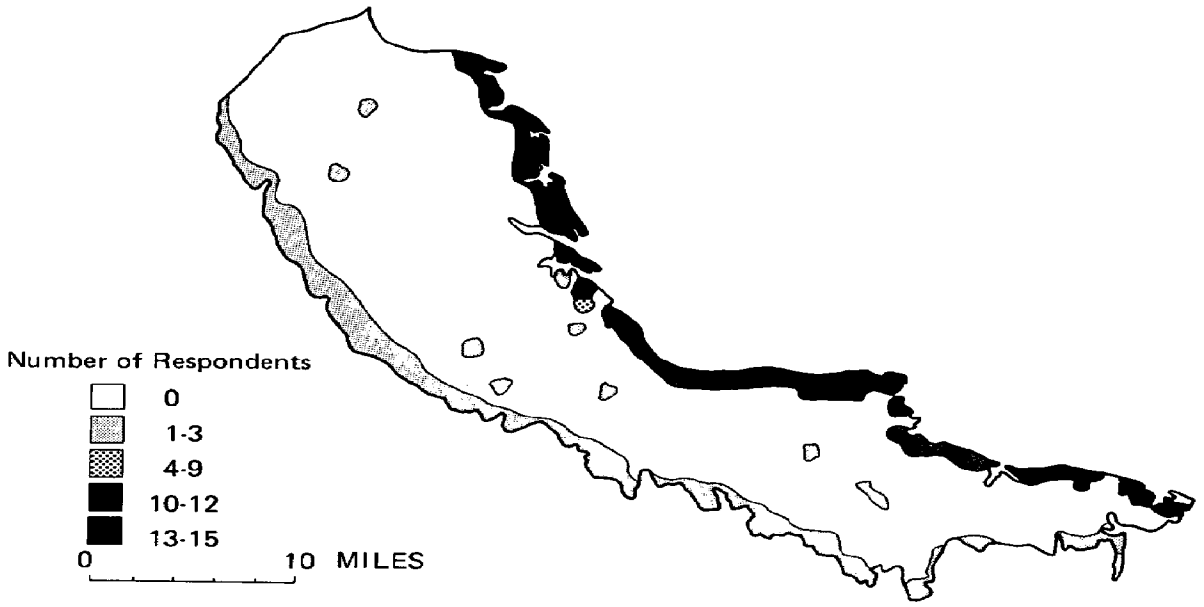
Source: Middlesex County High School Questionnaire, 1975.

FIGURE 18
Middlesex County Areas of Perceived Pollution



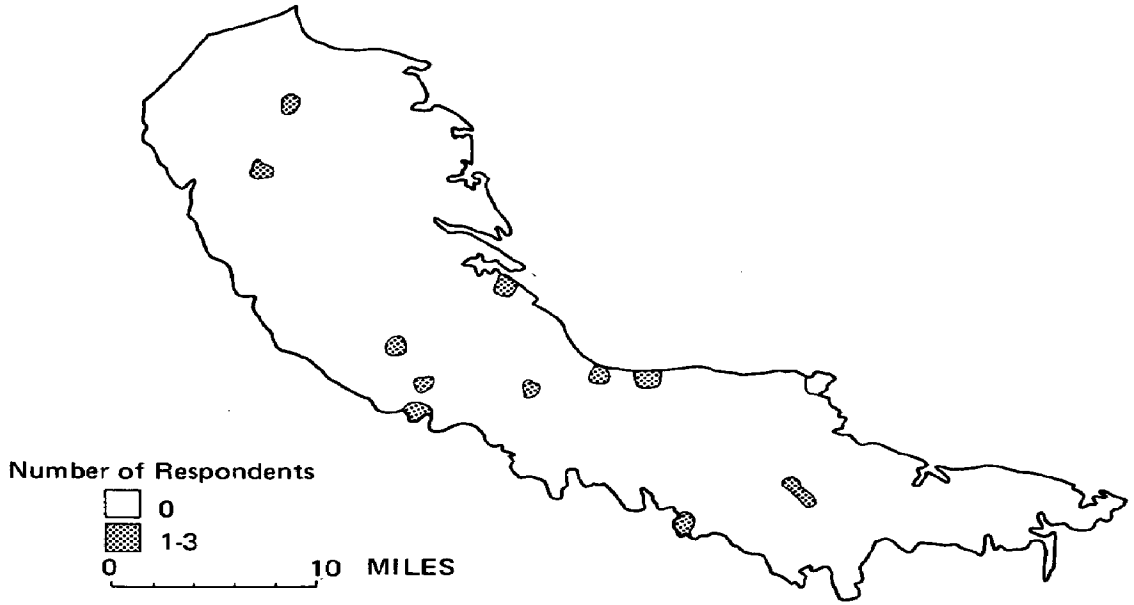
Source: Middlesex High School Questionnaire, 1975.

FIGURE 19
Middlesex County Areas Favored for Recreation



Source: Middlesex High School Questionnaire, 1975.

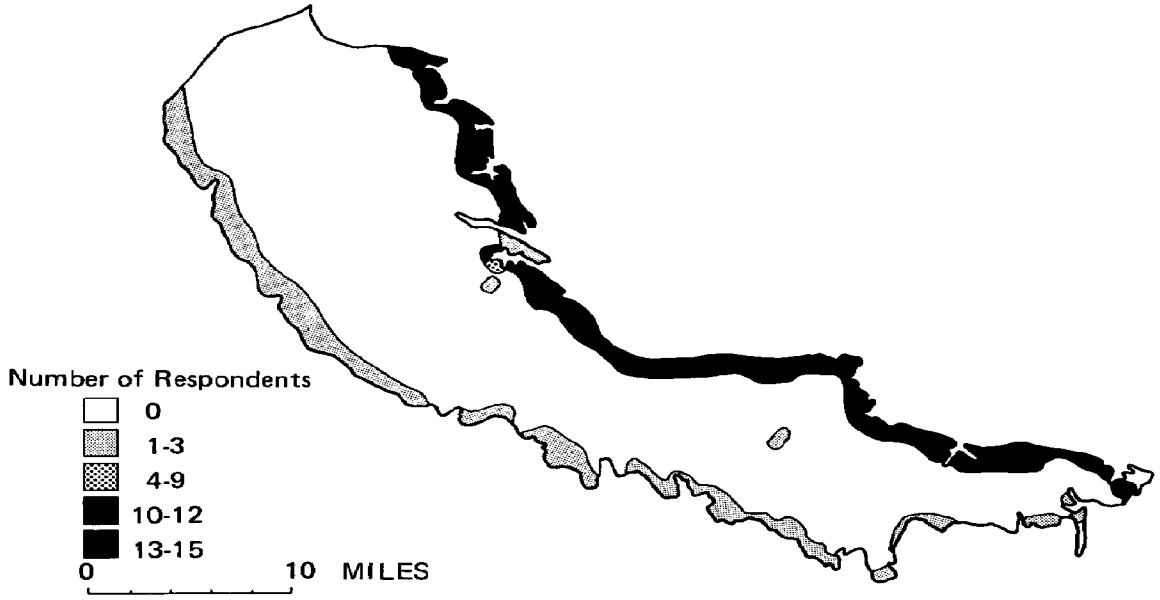
FIGURE 20
Middlesex County Areas Favored by Blacks for Recreation



Source: Middlesex High School Questionnaire, 1975.

FIGURE 21

Middlesex County Areas Favored by Whites for Recreation



Source: Middlesex County High School Questionnaire, 1975.

APPENDIX

COMPUTER PROGRAM DOCUMENTATION

Title:	PYRAMID
Origin of Program:	John D. Stephens Department of Geography Virginia Polytechnic Institute and State University
Purpose and Application of Program:	PYRAMID is a general computer program designed to plot population pyramids and compute basic demographic measures. The program was written for the purpose of graphically displaying the age and sex characteristics of coastal county populations in Tidewater Virginia as well as summarizing change in population composition.
Computer System:	The program was developed and implemented on an IBM 370/158 computer system.
Compiler:	FORTRAN G
Reference:	"PYRAMID: Program to Plot Population Pyramids and Compute Basic Demographic Measures," *Computer Program Documentation 75-1,* Department of Geography, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, June, 1975.

Abstract: The age-sex distribution of a population can be most clearly represented in a graphical form known as a "population pyramid." PYRAMID is a computer program that can be used to plot population pyramids using the computer's high-speed line printer. Output from the program (Figures 3-11) show population pyramids for coastal counties in Tidewater Virginia drawn on the basis of 1960 and 1970 age-sex distribu-

tions. It is apparent from the figures that ages are marked-off on the Y-axis with age 0 at the origin. Male population totals for various age groups are shown on the negative side and the corresponding female population totals on the positive side of the Y-axis. Each population pyramid consists of 18 horizontal bars on the male and female sides. The height of each bar represents the age groups and the length shows the proportion of population in that age group. Usually the population pyramids are drawn by taking age data in 5-year age groups, but they can be plotted in any other age interval or in single years of age. The program described herein allows for a maximum of 20 age groups.

When comparing pyramids for two or more populations, it is essential to use percentage distributions by age and sex. These percentages are calculated by expressing each age-sex category as a percentage of the total population. PYRAMID requires only that the user input the population totals, i.e., total males and total females, for each age group. All raw data-to-percentage computations are performed internally.

In addition to plotting age-sex distributions, PYRAMID will compute several basic demographic measures such as sex, child-woman, and dependency ratios. All computations use the same data necessary to construct the population pyramids.

The following input is necessary in order to obtain the output described above:

(1) Job title card
(2) Age group labels card (2)
(3) Subtitle and Control Card
(4) Data format card (optional)
(5) Data card(s) for male population
(6) Data card(s) for female population
(7) Any number of repetitions of cards 3-6

Title: GRID

Origin of Program: David Sinton and Carl Steinitz
Laboratory for Computer Graphics
and Spatial Analysis
Graduate School of Design
Harvard University

Purpose and Application of Program:	GRID is a general computer program which provides an efficient means for graphic display of map information collected on the basis of a rectangular coordinate grid. The program has been used to generate map displays of data compiled from questionnaires, field surveys, and map sources.
Computer System:	The program was modified to operate on an IBM 370/158 computer system.
Compiler:	FORTRAN G
Reference:	GRID Manual, Version 3, Laboratory for Computer Graphics and Spatial Analysis, Harvard University, October, 1971.

Abstract: GRID efficiently displays large quantities of information collected at regular grid intervals. In the case of the Middlesex County study area, the grid interval is 2,000 feet. Thus, a rectangular grid net (48 x 67), where each grid cell represents 2,000 feet square, adequately covers the study area.

GRID accepts a matrix of data values as input and assigns each value to a grid cell, based on the sequence in which the values are read and on the user-specified dimensions of the data matrix. Each data value is assigned to a specific value range and each range is assigned a unique graphic symbol. Output from GRID consists of the symbolic representation of the data values.

The user can specify the characteristics of the data and the intervals used. In addition, one must specify the symbols used in printing the map and can include legends and text for the map. Although GRID is designed for rectangular areas, provision has been made for describing irregularly shaped outlines such as Middlesex County. The size of the input matrix is not limited to any maximum size, since each line of in-

put is immediately converted into a line of output. Input values may be manipulated, however, by other routines which then pass on modified values to GRID prior to the creation of the output map. The size of the output map is a function of the size of the data matrix and the size of the output cells.

To obtain a map, one must provide three sets of instructions and the fourth set is optional. The instructions are prepared in the following packages: Data Package, Map Package, Irregular Outlines Package (optional), and Subroutine FLEXIN.

(1) The Data Package contains the data or numerical information which generates the graphic display. A multiple data set option permits the user to handle unlimited numbers of data cells.

(2) The Map Package permits the user to specify the precise form of the map output in terms of various electives.

(3) The Irregular Outline Option allows the user to specify the boundaries of the study area if one is dealing with a grid which is not rectangularly bounded.

(4) Subroutine FLEXIN is a FORTRAN subroutine which allows the user to specify the format of the data.

COASTAL ZONE
INFORMATION CENTER

DATE DUE

GAYLORD	No. 2333		PRINTED IN U.S.A.

NOAA COASTAL SERVICES CENTER LIBRARY
3 6668 14106 4016