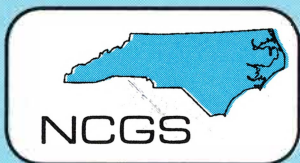
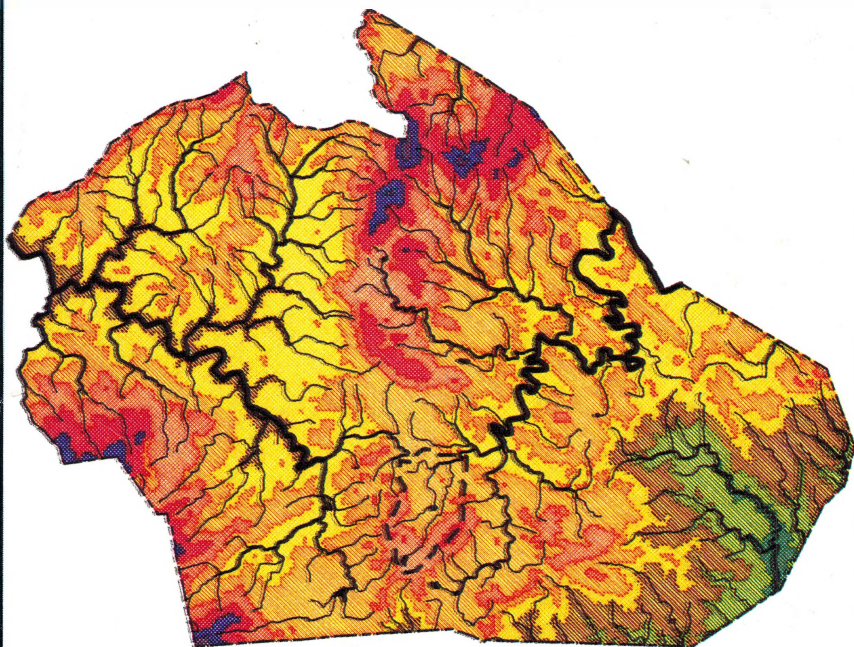


THE NORTH CAROLINA GEOGRAPHER



JOURNAL OF THE NORTH CAROLINA
GEOGRAPHICAL SOCIETY



WINKLER CREEK WATERSHED
WATAUGA COUNTY, NORTH CAROLINA

Stream
Hierarchy

Elevation in Meters

First Order	400 to 550	1,001 to 1,150	1,601 to 1,750
Second Order	551 to 700	1,151 to 1,300	1,751 to 1,800
Third Order	701 to 850	1,301 to 1,450	
Fourth Order	851 to 1,000	1,451 to 1,600	

THE NORTH CAROLINA GEOGRAPHER

VOLUME I

SUMMER, 1992

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EDITORIAL COMMENT

Ole Gade

Welcome to this the premier issue of *The North Carolina Geographer*. The members of the sponsoring organization, the North Carolina Geographical Society, wish with this journal to provide a forum for those in our state and elsewhere, who are interested in writing and in learning about its complex and enticing geography. We feel that our initial issue is representative of the broad perspectives that geographers can bring to bear in support of a popular interest in better understanding the character, problems, and prospects of North Carolina.

Our lead article deals with local and regional ramifications of the scourge of our time, the HIV syndrome and the AIDS epidemic - it is with us and it is not going to go away in the near future! This article by two geographers from UNC-Charlotte, **Gerald F. Pyle and Owen J. Furuseth**, happens to also be a fine example of applied medical geography. An article on the Haw River Valley illustrates the keen interest that we in geography have in sensing and in depicting the interweaving of physical and cultural environments as our local landscapes evolve. The people-land theme is here well set in its appropriate historic evolutionary frame by three geographers from UNC-Chapel Hill, **Kevin J. Patrick, Phil H. Page and Bill Welch**. They incidentally provide an excellent example and set of guidelines for school teachers at all levels to follow in leading their students in a comprehensive field experience, the absolutely best way for young people to gain an appreciation of their local geography. (Students should help in designing the experience).

D. Gordon Bennett of UNC-Greensboro leads us in an investigation of a fairly recent social geography phenomenon for our state, the immigration of retirees. This is a feature of not only the coastal counties, since some mountain and Sand Hills counties are experiencing it as well, but our author uses well the examples of Brunswick and Carteret counties to show how this special population impacts our local environments and benefits their economies. How critical it is for our local communities to plan well for these arrivals in providing appropriate service facilities and amenities, and in ensuring the preservation of environments that are attracting the influx of retirees. And in response to the question of how we may in fact aid these smaller and in many cases, predominantly rural communities to plan for their futures, **Garry Cooper** of Appalachian suggests that the use of a group of planning students, in consultation with local planners and decisionmakers, is the answer. Planning continues to be a critical component of the geographic perspective

that takes us along the continuum from understanding the nature of our physical environment and cultural landscape behaviors, to the implementation of those decisions that enhance our total environment and local communities for future generations.

A contribution to political/electoral geography is made by **Jerry Ingalls and Jamie L. Strickland** of UNC-Charlotte in their analysis of the two most recent Jesse Helms senatorial victories in North Carolina. At issue is the degree to which Senator Helms' victories varied in their geographic dimension when the results against two somewhat different democratic opponents, Jim Hunt in 1986 and Harvey Gantt in 1990, are compared. Then **Thomas E. Ross** of Pembroke State looks at opportunities for economic development in a part of our state not otherwise well known for its potential for economic growth. In this example of economic geography the case in point is aquaculture, or fish farming, an industry very much in a growth mode. His study suggests that a spark ignited by a new invention or approach may demonstrate an unexpected capacity of a region to develop. What other options exist for those economically lagging regions of our state?

Two progress reports complement these studies of North Carolina's geography. **William Imperatore** of Appalachian and **Douglas Wilms** of East Carolina are the state co-coordinators of the North Carolina Geographic Alliance. They present here a capsule history of the extraordinary success this organization has had in promoting geographic education since its founding as one of the initial members of the National Geographic Society's Geographic Education Alliance Network in 1986. One critical aspect of the historic contribution of geographers to science and societal welfare is in cartography, the art and craft of map making. We hope in each issue of the journal to highlight new approaches to the use of maps as tools of communication and analysis. On our cover for this issue we are demonstrating the use of geographic information systems in dealing with the complex data sets needed for the application of the new North Carolina watershed management requirements. **Art Rex** of Appalachian describes how this four-color cover exemplifies the utility of GIS in this important land use management need.

The North Carolina Geographer seeks to present current findings of academic and applied geographers, and of others who feel that their work and interest is in some way defined within the broad spectrum of this field. But we are committed to the pursuit of presenting exclusively subject matter that reflects or has a direct bearing on North Carolina conditions, past, present and future; this avowedly is a state geographic journal. Any and all are invited to submit materials of interest to a readership that we expect to range from academicians, to planners and local and state decisionmakers,

to school teachers, and to any member of the public at large who find fascination with the intricacies of our state's multidimensional geography. Submitters of materials proposed to be published herein should know that research articles are refereed by peers prior to acceptance for publication. Though this issue characterizes the style adopted by this journal, all prospective authors should request detailed guidelines from the Editor. All articles should be received by the Editor prior to January 31st of the year of publication. Present plans call for the publication of *The North Carolina Geographer* on an annual basis as the journal of the North Carolina Geographical Society. The journal is free to the members of the Society; others may request annual subscriptions at a cost of \$7.50, including handling and postage. All interested are urged to join the Society as the probable least cost method of not only obtaining this journal, but also of being more directly involved in contributing to the welfare of geography in North Carolina.

Ole Gade, Editor of the North Carolina Geographer, is a Professor of Geography and Planning and Director of the Masters of Arts program in Social Science (Ed) at Appalachian State University, Boone, NC 28608, Phone (704) 262-2650 Fax (704) 262-2127

The Society wishes herewith to express heartfelt appreciation to those who have donated freely of their time in insuring the appearance of this initial issue. Especially must be mentioned the efforts of the Editorial Assistant, Dai Cui, a graduate student in Appalachian's Geography and Planning Department. In addition to also being the home of the Editor this department provided needed facilities, equipment, and secretarial support in addition to covering many costs incidental to publication. A number of faculty, notably Neal Lineback, H. Daniel Stillwell, and Art Rex, as well as Doug Eyre

of UNC-Chapel Hill, provided editorial support and encouragement.

In financing this publication it is primarily the members of the North Carolina Geographical Society and its Executive Committee who are responsible. But additional financial support was gratefully received from the North Carolina Geographic Alliance, the Environmental System Research Institute, Inc., and members of the Department of Geography of UNC-Chapel Hill. The promotinal work of Doug Wilms, Art Rex, and Tink Moore (UNC-Charlotte) in obtaining the needed finances is especially appreciated.

Please send all inquiries relating to *The North Carolina Geographer* to the Editor.

THE DIFFUSION OF AIDS AND SOCIAL DEPRIVATION IN NORTH CAROLINA

Gerald F. Pyle and Owen J. Furuseth

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Introduction

The dominant public perception of AIDS in the United States is that it is a problem for persons living deviant, socially unacceptable lifestyles. Bombarded by television images and print media accounts of the AIDS epidemic among male homosexuals and intravenous drug users living in large cities, many Americans have concluded AIDS is a problem only for socially marginalized populations. An examination of the data, however, reveals that with the spatial diffusion of AIDS the risk of contracting the disease has spread out of earlier AIDS clusters into virtually all strata of American society. And, in fact, AIDS has already become a serious problem for the economically deprived.

As the disease has progressed during the past five years, the linkage between AIDS and poor and socially disadvantaged Americans has become stronger. While AIDS and HIV infection remains a serious public health concern for affluent, white, homosexual or

As AIDS has diffused through our population over the past five years, the linkage between the disease and the poor and socially disadvantaged has grown stronger

bisexual males, it is equally important for young, poor, African American, white, and Native American women and men living in rural and urban areas. The spread of AIDS into and among disadvantaged populations comes as no surprise to anyone familiar with the patterns of disease and health care systems in the U.S. Disadvantaged populations, living in urban ghettos or rural areas, have greater medical and health problems and less access to medical services than other Americans.

The major purpose of this paper is to offer an analysis of the geographical spread of AIDS within North Carolina, with particular emphasis on the linkage between the disease and social deprivation. Our research draws upon the earlier diffusion modeling of AIDS by the senior author, integrating it with research themes from social geography.

Geography of AIDS

While the disease, Acquired Immune Deficiency Syndrome (AIDS) entered the United States during the late 1970s, it did not start spreading through North Carolina until the mid-to-late 1980s. The geographical spread of AIDS within the United States has been documented (Shannon and Pyle, 1989; Shannon, Pyle and Bashshur, 1991). That spread within the United States followed an ascertainable sequence of events. During the early phases of the AIDS infusion into

the U.S., HIV infection was spread by individuals who frequently used international air travel. Clusters of HIV infections and AIDS cases initially appeared within very specific neighborhoods of large cities. Outbreaks of AIDS among homosexual and bisexual males residing in or frequenting these particular neighborhoods of New York, San Francisco, Los Angeles, Miami and Houston made for spectacular media coverage. Epidemic reconstruction has led to the conclusion that the HIV epidemic had spread from these urban core nodes much more quickly than had been initially surmised. Eventually, a major regional core area and secondary diffusion nodes developed within the United States by the mid-1980s (Gould, 1989).

Clearly, some of these regional diffusion nodes were more extensive than others. The larger of these nodes were contained within New York, San Francisco and Los Angeles, and they were referred to as "incubator districts." Other regional nodes of HIV diffusion included an area extending outward from southern Florida that eventually spread into Georgia and South Carolina. As these AIDS core areas expanded, a well defined fringe and periphery could be

Regional AIDS 'incubator districts' developed in New York, San Francisco, and Los Angeles by the Mid-1980s

identified by the late 1980s. By 1985, North Carolina was still on the periphery of the major AIDS epidemic within the United States. In other words, no national AIDS diffusion core area had developed within North Carolina during the 1980s.

Information supplied by the North Carolina Department of Environment, Health and Natural Resources indicates that by the end of 1990 there were nearly 1700 cases of AIDS reported for the state of North Carolina since the beginning of the national epidemic. By the end of 1990 the cumulative national AIDS rate within the United States was 64 cases per 100,000 persons. Comparatively, for North Carolina, the cumulative rate was 28 per 100,000.

The AIDS epidemic within North Carolina from 1985 to 1990 can be divided into two distinct periods. The first of these, including

1985, 1986 and 1987, can be referred to as the infusion stage. During this three-year period, HIV infection and AIDS had become "seeded" within some counties of the state. By the end of 1987, nodal areas for the future proliferation of the disease had been established. The sequence of maps contained within Figure 1 shows this progression. For example, there were few cases reported in 1985 and they appeared to be somewhat scattered; however, most counties with larger cities were represented in early reporting. Cumulative AIDS reporting per 100,000 by 1986 indicated geographical

Absent a national diffusion core area in 1985 it was clear that North Carolina had seen the AIDS epidemic evolve to the point of having several 'seeded' counties by 1987

patterns that continued for several years. By 1987 some of the larger counties in the state, Mecklenburg and Wake, for example, had seen the formation of certain nodes for diffusion.

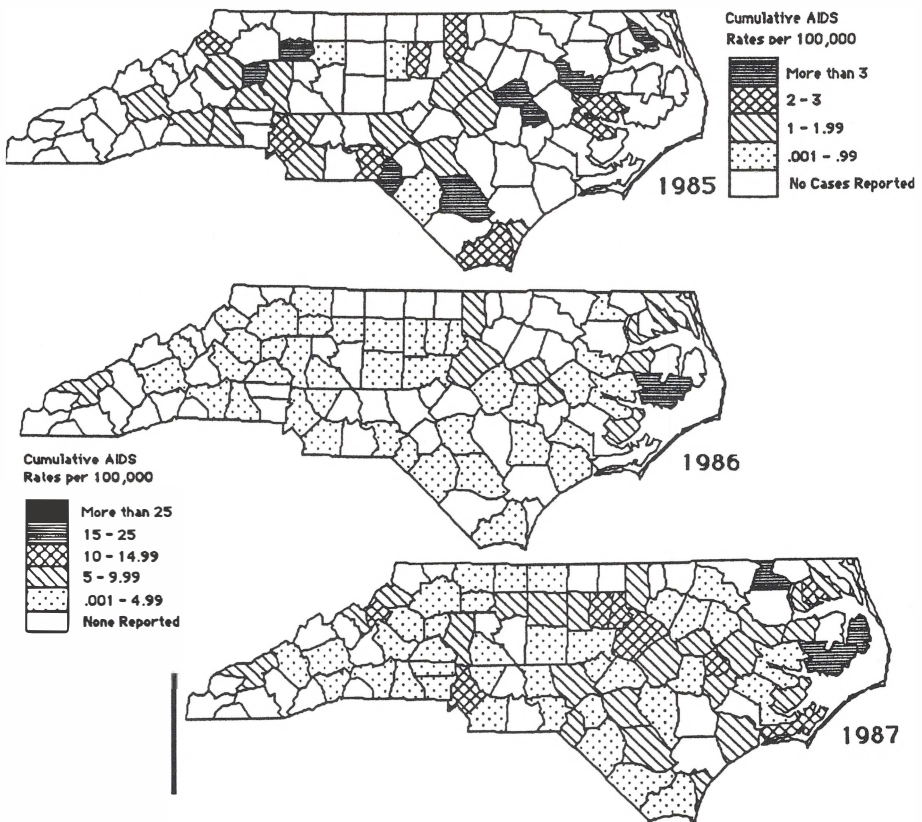


Figure 1. North Carolina: The AIDS infusion stage, 1985, 1986, 1987.

(Reader should note that the legend for 1985 differs from the legend for 1986 and 1987).

North Carolina's 'second wave' saw the spatial diffusion of the disease from the AIDS corridor of the urban crescent to many rural eastern coastal plains and tidewater counties

The subsequent period of AIDS diffusion is referred to here as the "second wave." Shown within the sequence of maps depicted as Figure 2, this second wave included the continued growth of AIDS reporting within major metropolitan areas as well as the formation of an AIDS corridor essentially mirroring the Piedmont Urban Crescent extending from Charlotte to Raleigh. The cumulative AIDS reporting for 1988 reflects this pattern. By 1989, it was clear that another phenomenon had begun to show up. Many counties in the eastern part of North Carolina had reported rates that by then were somewhat higher than counties in the more western parts of the state. By 1990 this pattern became even more pronounced

as the heaviest reporting of AIDS cases in the state included not only the previously defined Piedmont Urban Crescent but many more rural counties in the eastern part of the state as well.

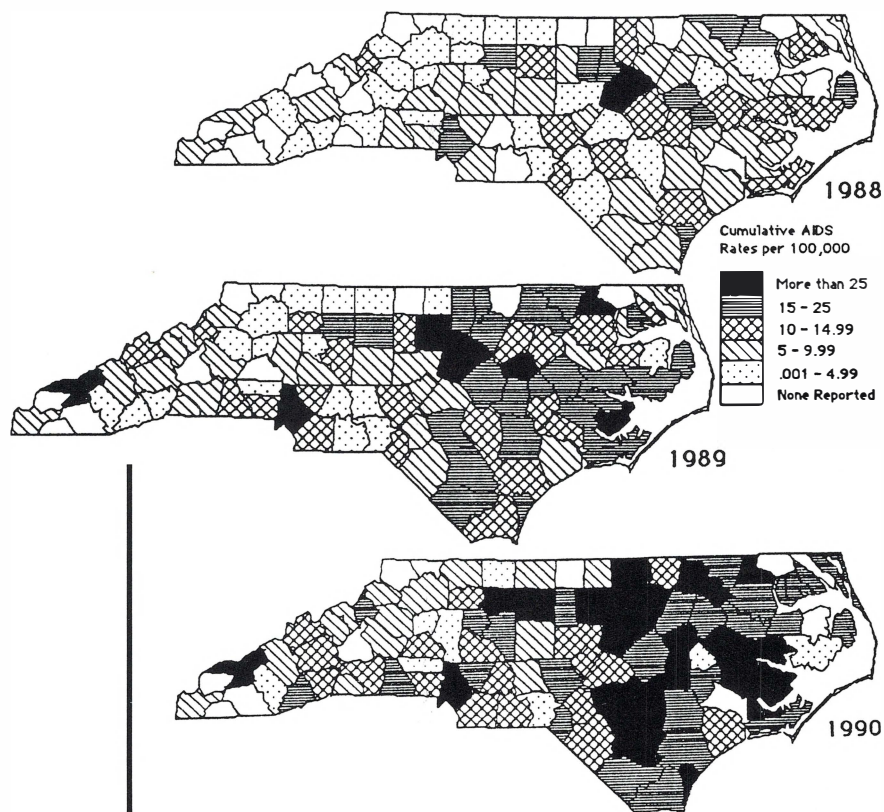


Figure 2. North Carolina: AIDS, the second wave stage, 1988, 1989, 1990.

AIDS and Metropolitan Counties

As the national AIDS epidemic continued to increase in intensity during the late 1980s it became increasingly apparent that within many parts of the country metropolitan areas had functioned as nodes for diffusion of AIDS into surrounding regions. Many parts of the United States more urbanized than North Carolina had experienced the AIDS epidemic much earlier, as previously indicated. In Ohio, for example, concentrations of AIDS cases within metropolitan regions were already thoroughly widespread by 1990. The same was true in California where AIDS had spread outward from the Los Angeles and San Francisco metropolitan areas to include such other urban centers as San Diego, Oakland and Anaheim. Likewise, in Texas and Florida the disease was already more widespread than within North Carolina by the late 1980s. The Miami metropolitan area had reported about 30% of the cumulative number of AIDS cases

by 1990 and another 16% had been reported from Fort Lauderdale. By 1990, the West Palm Beach and Tampa areas had also reported more than 10% of that state's cases of AIDS, with more than 5% reported from Jacksonville and Orlando. The Texas concentrations were still centered somewhat around Houston and Dallas by 1990, but other Texas cities were experiencing decreased reporting of AIDS. These included San Antonio, Austin and Fort Worth.

In general, by the early 1990s about 80% of all of the AIDS cases that had ever been reported within the United States were within metropolitan areas of a half-million people or more. Within states where the disease had become endemic during the early 1980s, AIDS was clearly more widespread than for some parts of the country. Still, urban concentrations within North Carolina could be identified. The information contained within Table 1 consists of reporting and computed AIDS rates for the most metropolitan counties within North Carolina for the time period 1985 to 1990. By 1990, about 55% of the reported AIDS cases in North Carolina were from the three largest metropolitan areas. The Raleigh and Charlotte metropolitan areas each contained about 22% of the total AIDS cases reported. Greensboro accounted for about 15% of the cases of AIDS, and the remaining 42% were distributed throughout the rest of the state. The information contained within Table 1 also presents an interesting comparison with respect to rates of increase during the study time period. One metropolitan county, Durham, was the only county reporting a cumulative AIDS rate more than the national average by the end of 1990 (67.6 as compared to 64 nationally). Interestingly, most of that increase took place from 1988 to 1990. Wake County (containing Raleigh) ranked second within the state by the end of 1990 with a rate of 52 per 100,000. By contrast, Mecklenburg County containing Charlotte the largest city of North Carolina, had a cumulative rate of 42.2 per 100,000 by the end of 1990, a rate of about two-thirds the national average.

The conventional wisdom that a systematic relationship between the size of urban places and the magnitude of the disease problem does not exactly hold true for the Carolinas. The Durham

County situation also appears to be somewhat complex. The cumulative rate for Durham County nearly doubled from 1988 to 1989. Duke University with its major medical school and research center is located in that county. Durham County also has the highest ratio of physicians to general population in the state. However, there are also some very low income urban ghetto type areas within Durham County. There appears to be some relation between the recent increase of numbers of AIDS cases in that county and the presence of the medical-research complex.

A combination of low income urban, medical research complexes and universities appears related to the increasing incidence of AIDS in North Carolina's urban centers

The medical school argument, however, must be approached with a great deal of caution. It should be noted that Orange County, containing Chapel Hill, also has experienced somewhat substantial recent increases in the reporting of AIDS. Forsyth County, housing the medical school at Wake Forest University, reported a cumulative rate of about half that of the United States through 1989. Recent reporting shows some rather dramatic increases within that county also. The circumstances within Durham County however is probably better understood when viewed in combination within AIDS reporting for Wake County. Wake County includes Raleigh with some poor urban ghetto areas as well as North Carolina State University. When many aspects of the entire Research Triangle Area are considered, including, the several medical research complexes contained within universities and the Triangle along with the presence of a large manufacturer of AIDS medication, the geographical concentrations and build up of AIDS in the Triangle Region counties should be no great surprise. It is suggested here that many already afflicted with AIDS have been attracted to this large treatment complex.

County (Central City)	1990 Population	1985 Cases	1985 Rate	1986 Cases	1986 Rate	1987 Cases	1987 Rate	1988 Cases	1988 Rate	1989 Cases	1989 Rate	1990 Cases	1990 Rate
Mecklenburg (Charlotte, NC)	511,433	11	2.200	15	3.000	64	12.800	115	23.000	170	34.000	221	42.2
Wake (Raleigh, NC)	423,380	7	1.750	20	5.000	52	13.000	102	25.500	156	39.000	208	52.0
Guilford (Greensboro, NC)	347,420	3	.909	8	2.424	23	6.967	37	11.212	67	20.313	121	36.7
Cumberland (Fayetteville, NC)	274,566	4	1.482	11	4.074	24	8.888	40	14.815	56	20.741	71	26.3
Forsyth (Winston-Salem, NC)	265,878	1	.385	7	2.692	22	8.461	42	16.154	64	24.615	98	37.7
Durham (Durham, NC)	181,835	0	0	7	4.118	23	13.529	38	22.353	72	42.353	115	67.6
Buncombe (Asheville, NC)	174,835	2	1.118	3.	1.765	5	2.941	9	5.294	15	8.823	25	14.7
New Hanover (Wilmington, NC)	120,284	2	1.739	3	2.608	10	8.699	18	15.652	27	23.478	35	30.4

Table 1. Cumulative Reporting of AIDS Case and Rates per 100,000 in North Carolinas' Most Metropolitan Counties: 1985-1990*

Source: U.S. Bureau of Census, North Carolina Department of Environment, Health and Natural Resources.

*Populations based on numerical extrapolation between 1980 and 1990 Census figures.

AIDS and Poverty in North Carolina

The assumption is made here that during the first several years of the infusion stage of AIDS in North Carolina, the disease was spread primarily by bisexual and homosexual males. Thus, scattered counties, some parts of larger cities, and flamboyant resort areas such as Wilmington and the area around Asheville showed up with some early reporting. During the second wave, more and more cases of AIDS could be attributed to needle sharing during IV-drug abuse as well as prostitution. The disease subsequently became more and more of a problem in some ghetto portions of the larger cities. Such a sequence of events appears to have taken place within the Charlotte metropolitan area. Mecklenburg County contains the city of Charlotte where most of the early AIDS cases were located. It should be noted that the disease spread quickly to some poverty pockets within Charlotte as well as to York County, South Carolina ghetto areas. In many respects, a geographical distance decay relation can be identified within Mecklenburg County. This AIDS decline with distance

Charlotte has functioned as a core area for a geographical diffusion pattern that follows a typical distance decay relation

from Charlotte is similar to that reported in many metropolitan areas of the United States as early as 1989 (Gardner et al.). A similar circumstance was uncovered for Los Angeles (Bowen and Mladenich, 1990). The pattern seen within the Charlotte area underscores broader aspects of the infection disease complex within the state. It now appears to be emerging in the early 1990s as a monumental social problem. As with most other cities, Charlotte has functioned as

a core area for diffusion into the surrounding hinterland.

Within North Carolina, in general, the second wave of AIDS diffusion included all of the phenomena identified within Charlotte within a broader context in the entire Piedmont urbanized corridor. The basic difference within North Carolina as compared to other areas however was the tremendous diffusion of AIDS into poor rural counties. By 1990, a broad band of rural counties in Eastern North Carolina had AIDS rates equal to or in some instances higher than the rates found in the Piedmont. Among these counties are some of the

But in its progression into the poor, rural counties of eastern North Carolina the AIDS epidemic has shown extraordinary though not unexpected strength

poorest and most disadvantaged areas in the state, including Bladen, Halifax, and Hertford counties.

To those familiar with the region, the spread of AIDS into rural Eastern North Carolina is not unexpected. It is a consequence of traditional economic and social relations in this largely agricultural area. Drawn by the lure of higher wage jobs and economic opportunities, the urban centers of the Piedmont and the smaller urban areas of the Coastal Plain have historically attracted the rural poor. Although

their jobs and residences are in cities, such as Raleigh, Charlotte, Norfolk, Elizabeth City or Wilmington, many out-migrants continue

to have strong family ties "back home." With relatively short travel distances and an excellent highway system, regular movement between rural and urban areas is easy.

During the 1980s, a period when economic restructuring resulted in high unemployment in the manufacturing sector and a stagnating agricultural economy, the movement of rural residents to cities in search of work, and the return of unemployed urban poor to rural areas was stimulated. At a time when HIV was spreading in urban ghettos, the transference of the disease into rural Eastern North Carolina was accelerated by the negative economic conditions.

As AIDS continues to build up within urban areas of North Carolina, as well as the eastern coastal plain, two major aspects of social deprivation stand out. The first is a poverty-related syndrome

Once introduced into a community caught up in the poverty-syndrome the AIDS virus is easily transmitted

consisting of the complex association among such problems as unemployment, depression, alcohol and drug abuse, infant mortality, prostitution and the overall diffusion of disease including the resurgence of tuberculosis (Pyle, 1990). Once introduced into a community caught up in the poverty-syndrome, the AIDS virus is easily transmitted within the group. Consequently, it is inevitable that AIDS

rates will continue to increase within ghetto areas of many North Carolina cities.

The second general facet of the problem, clearly not unique to North Carolina but still very real, consists of a similar poverty-AIDS complex scattered among the multitude of rural settlements within the Coastal Plain. HIV carriers returning home from urban ghettos are the likely sources for the diffused virus. Disadvantaged rural communities suffering from the poverty-related syndrome are conducive environments for the disease. AIDS is spreading at a very rapid rate in many rural coastal North Carolina counties. In this regard, North Carolina is not unique. The general trend throughout the U.S. in the early 1990s is that the high rates of increase in HIV infection are occurring in rural areas.

Given this problem, a conceptual model of the continued diffusion of AIDS within the Carolinas theoretically takes the form of a "U-shaped" curve as seen in Figure 3. Thus, high rates of AIDS expansion will continue within some of the poverty pockets of larger urban centers of the Piedmont. The "newer frontiers" for AIDS diffusion will continue to become more pronounced as poverty areas of the eastern Coastal Plain begin to reel from the impact of the epidemic. As more and more of the original AIDS patients unfortunately continue to transpire, newer victims will be younger and younger and the male to female ratio will approach unity.

The dual nature of the AIDS poverty-syndrome is additionally highlighted by lower reported AIDS rates from suburbs, small towns

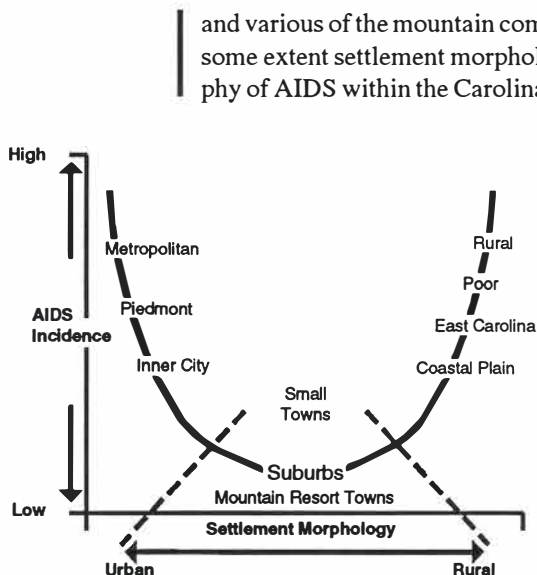


Figure 3. AIDS Incidence in North Carolina in Relation to Settlement Morphology

The theoretical U-shaped AIDS diffusion curve emphasizes continuing expansion of the virus within the larger urban centers and the emergence of the 'newer frontiers' of AIDS in the rural poverty areas.

and various of the mountain communities. These data suggest that to some extent settlement morphology does seem to reflect the geography of AIDS within the Carolinas. However simplistic this model, it still points to the need to consider such aspects of settlement pattern when developing mathematical models for the diffusion of AIDS within North Carolina. Definitely, many of the classic aspects of spatial diffusion, i.e. (1) downward hierarchical movement; (2) distance-decay relationships; and (3) the numerical attraction of population mass with respect to distance form additional nodes, appear to have functioned within North Carolina during the 1980s.

Public Policy Implications

Given the characteristics of the HIV and the manner in which it is spread, the diffusion of the virus into young, sexually active populations has had and will continue to have profound effects on disadvantaged groups and communities in North Carolina as well as other parts of the U.S. In communities already wrestling with the problems of poverty and disadvantage, AIDS is a cruel complicating factor. In communities already underserved by the health care system, the introduction of AIDS and the costs associated with the care and treatment of HIV positive patients may become an unaffordable expense.

For middle class and wealthier communities the problems faced by AIDS affected neighbors cannot be ignored. The disease is not something that will "burn itself out" or "go away." Effective, responsible treatment of AIDS will require all citizens to work together.

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A GEOGRAPHY FIELD TRIP: THE HAW RIVER VALLEY

Kevin J. Patrick, Phil H. Page, Bill Welsh

Kevin J. Patrick and Phil H. Page are geography graduate students, Bill Welsh is an Associate Professor of Geography, University of North Carolina at Chapel Hill

Field study is the way in which the student is brought into a direct contact with an area's geographical elements. This way the student can personally observe critical linkages between physical and cultural environments

Field study is an essential, in many instances critical, facet of the geographical learning process. It is the way in which the student is brought into actual contact with geographic elements that have been identified, or can be studied, through library research, remote sensing, and statistical inquiry. Field study involves first-hand encounter with the complex linkage between human patterns —the activities and artifacts of people— and the physical environment —topography, drainage, weather/climate, and vegetation.

This article resulted from an informal, voluntary field trip organized by graduate students at the University of North Carolina-Chapel Hill. The study area was the Haw River Basin, selected because of its long association with one of the Piedmont's more prominent economic activities, the cotton textile industry. The focus of the field trip was in the Alamance County portion of the drainage basin (Figure 1), where the textile industry has its greatest impact. Preliminary field studies and library research revealed a three-tiered structure to textile industry landscapes in the Haw River Valley. The oldest tier is associated with the initial industrialization of the valley by cotton textile mills attracted to water-power sites along the banks of the Haw, from 1837 to 1880 (Figure 2). A shift to steam power, and later to electricity, created a second tier of textile plants, from 1880 to 1930, along the Southern Railway that bisects Alamance County through Mebane, Graham, and Burlington. A third tier of more contemporary plants is clustered at the interchanges of Interstate 40/85 along the southern margins of Burlington and Graham.

Field Trip Preparation

To be effective, a field trip requires a substantial amount of preparation in researching background information, selecting routes, scheduling stops, and field-checking sites. A number of such working details are presented here to show how this particular field trip was put together, and to provide possible guidelines for other groups planning similar activities.

The first practical step was to determine the level of interest in the field trip. This was done by polling potential participants, who were also asked to choose from a list of possible field trip dates. From this information the appropriate size vehicle was reserved for the agreed-upon date. Individuals volunteered for specific research responsibilities based on their area of expertise. The division of labor

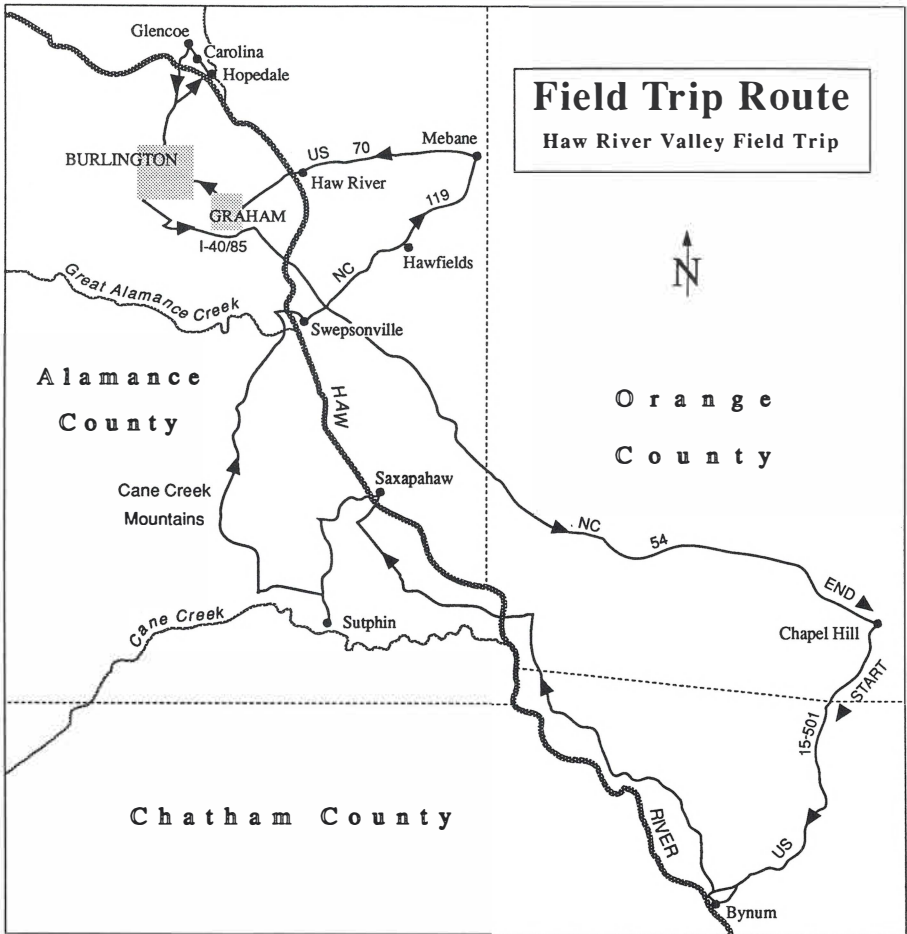


Figure 1. Haw River Valley field trip route.

among the three co-leaders on this trip was as follows; the conceptual framework and cultural geography was handled by one person, social geography by another, and physical geography by the third.

Field trip preparation involves several critical steps: research for background information, selection of route, scheduling appropriate stops, and prior field checking of sites

Most of the field trip preparation time was spent doing library research, but it was necessary to "ground truth" library findings with the study area by taking periodic trips into the field. Due to the lack of literary documentation, the recent past poses a challenge to the field researcher. What is read in the literature may not be what is seen in the field, as more current, and possibly yet to be explained, landscape features may be encountered. Newspapers, periodicals, and first-hand accounts from local residents were used to help bridge this informational gap. For physical geography it

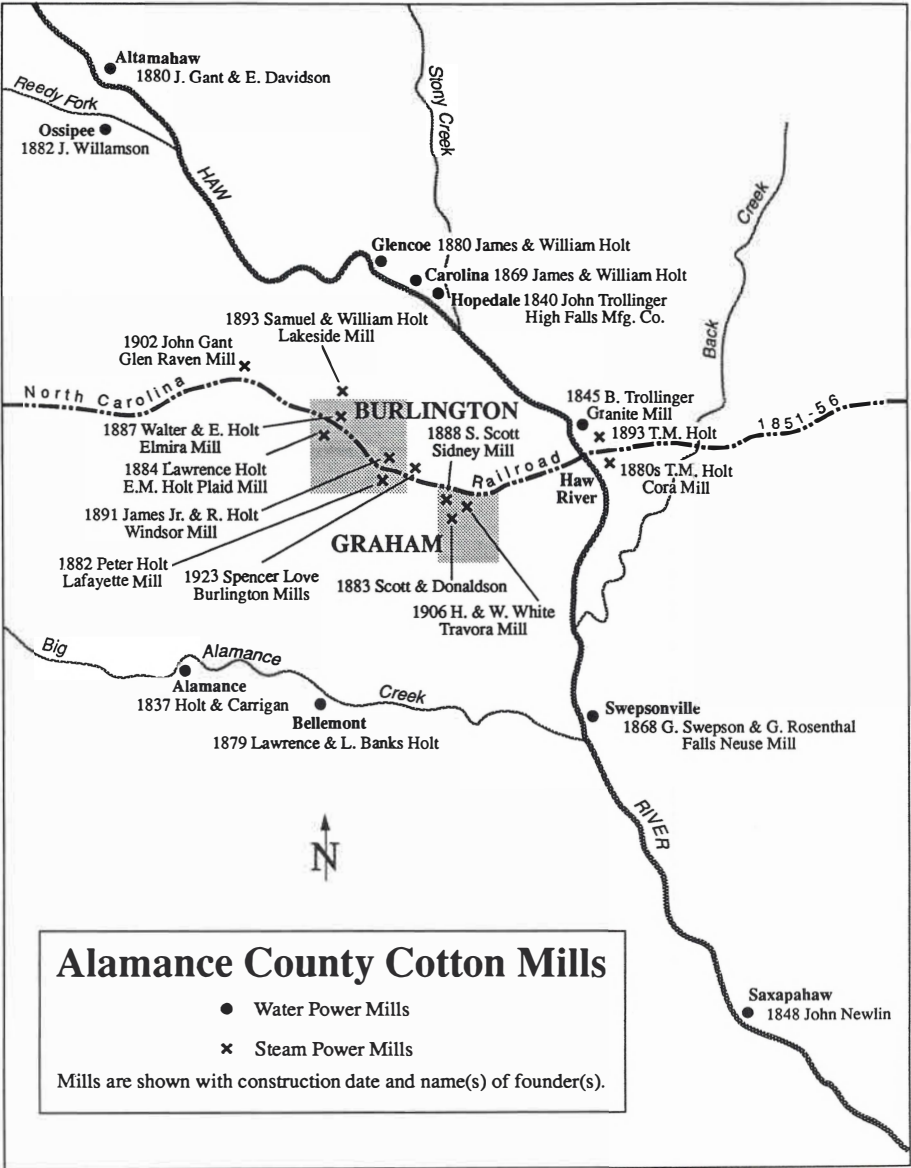


Figure 2. Alamance County cotton mills

was a matter of finding vistas and sites that illustrated processes common to the region. Sites that expressed geomorphic, pedogenic, biogeographic, and fluvial processes had to be ferreted out, then dovetailed with cultural artifacts. For example, there seemed to be an association between geologic contact zones and mill sites along the Haw. Another pertinent relationship was the link between soil

Routing the field trip is very much like arranging photographs for a show. Pertinent images are arranged in a meaningful sequence in order to achieve the desired effect

fertility, farm productivity, and the migration of impoverished rural people toward the economic opportunities of the mills. Fieldwork was critical in locating sites that expressed these man-land linkages.

Once the relevant background materials were assembled, the field trip route had to be decided. Routing a field trip is analogous to arranging photographs for a show. The sites (images) have already been established, visiting them in a specific order (sequencing) will produce the desired impact. For the Haw River Valley field trip a simple, arbitrary plan of starting downstream and going upstream worked well. Most of the physical geography sites came

early, setting the physical environmental foundation for the field trip. The sequencing of cultural landscapes reflected the chronological orientation of the three-tiered structure of the textile industry in the Haw River Valley. The first cultural sites visited were mill villages established at water-power sites; followed by an examination of railroad-oriented landscapes; and finally, a tour through the Interstate corridor. Using a sketch map, must-see sites, like the view of Haw River from a railroad bridge, downtown Burlington, and the abandoned mill village at Glencoe, were identified as key foci. Redundant, or less enlightening sites were weeded out, and alternative sites and routings were established on a time-available basis.

The field trip packet is a guide to the experience, a record of the organizers' landscape interpretations to help guide the participants, and a resource for later review

A dry run, taken a week prior to the actual field trip, was mandatory. It gave the trip leaders needed travel times, site familiarity, and confidence. Timing is critical; once darkness falls the trip is over, so the trip was scheduled to fit within an 8:00 am to 6:00 pm time frame. Plenty of slack time was built into the schedule, and site stops were frequent. Too much driving time between stops will lull even the most ardent student asleep. Also during the dry run, an agenda was set for each site to emphasize its characteristics and show how it fit into the broader regional picture.

Another important issue was the lunch stop. Burlington and

Graham are blessed with plenty of grills and cafes with local flavor, but unfortunately, this trip was scheduled for a Sunday when the downtowns are literally closed. As one restaurant owner put it, "on Sunday we all go to church around here." Eating places along the secular Interstate solved the problem.

The last step in preparing the field trip was to put together a field trip packet, including maps and site descriptions. The field trip packet is a guide to the experience, a record of the organizers' landscape interpretations that can be used to help orient field trip participants, as well as a resource to be reviewed at a later date. The remainder of this article is a modified version of the Haw River Valley

field trip packet, presented here as both a product of the field trip preparation, and as a synoptic geographical view of the role of the textile industry in shaping the human landscapes of the Haw River Valley.

The Haw River Valley Field Excursion

CHAPEL HILL TO BYNUM: Alamance County lies within the Piedmont physiographic province. Nearly all of the bedrock underlying the field trip area is part of the Carolina Slate Belt. The Slate Belt is a large metamorphic terrace believed to have developed during the Taconic or Appalachian Orogeny, about 480 million years ago (Horton and Zullo 1991). The rocks consist of volcanic-sedimentary (volcaniclastic) formations, composed of interbedded slates, breccias, tuffs, and flows. These rocks vary from acidic or rhyolitic, to basic or andesitic in chemical composition, and generally have a well-developed cleavage, which gives them a slate-like appearance (Stuckey, 1965). Slate Belt is intruded in places by igneous granitic plutons and dikes. The dikes are primarily composed of diabase, a dark-gray to greenish-black, fine-to-medium-grained rock. These igneous intrusions post-date the regional metamorphism by about 200 to 300 million years, and caused local contact metamorphism in the rock surrounding the plutons (Horton and Zullo, 1991). Some of these dikes are exposed along the field trip route. Look for greyish-green, well rounded boulders along ridgetops.

Some disagreement exists over the geomorphic history of the Carolina Piedmont. Conflicting theories seek to determine whether the Piedmont is actually a dissected peneplane—that is, a surface which was eroded practically flat in the past, then subsequently uplifted causing streams to begin downcutting. There is general agreement, however, that the Piedmont is more or less in geomorphic equilibrium at this time, with gradual uplifting being offset by erosion (Horton and Zullo, 1991; Beyer, 1991).

BYNUM: During the early period of Piedmont industrialization the Haw River was a locational draw for textile manufacturers seeking water-power sites. Like most water powered cotton mills, the Bynum Manufacturing Co. located at a site already utilized by an earlier grist mill to take advantage of a pre-constructed mill dam. The company started manufacturing thread in 1872 and built a mill village of fourteen houses and a company store. During the early 20th Century, isolated riverine mill villages typically generated their own electricity before being tied into a regional power grid. This was also these for Bynum which was electrified by power generated at the mill in 1922. The electric turbine visible at the end of the head race dates to 1940. Whereas most cotton manufacturers sold off their mill houses in the 1930s and 1940s, Bynum remained a company town until 1977. Since 1972 the Tuscarora Co. has used the mill to produce

synthetic blend yarn.

It is important to remember that most Piedmont textile workers were farmers before they came to the factories. Bynum is a perfect example of the typical isolated mill village (Figure 3a) that drew its employees from local farm families who had been driven from farming due to disastrous crop-lien practices and wild fluctuations in cotton prices after the Civil War. When they came to the mills (DeNatale, 1980), Bynum residents brought with them rural culture, such as local agricultural practices, folk medicine beliefs, and social activities.

BYNUM TO SAXAPAHAW: Situated to the south of the bright-leaf tobacco belt, and north of the cotton belt, the agricultural economy of Alamance County was dominated by corn, wheat, and oats for much of the 19th and 20th centuries. Poor soil fertility and a lack of markets limited agricultural prosperity. Industrialization and the rise of

Piedmont cities, with their need for fluid milk, encouraged the expansion of dairying which currently dominates the agricultural landscape. Cattle grazing, poultry, and an occasional horse farm (activities that do not rely heavily on high soil fertility) are also evident.

The dark red soils visible in the bare fields are primarily ultisols. These are formed in humid areas on felsic (i.e. feldspar and silica, as is commonly found in granitic rock) parent materials unaffected by continental glaciation. Ultisols are highly weathered soils, acidic, and characterized by a high content of low activity clays, such as kaolinite. Alfisols are often formed in this region from weathering of mafic (i.e. magnesium and ferrous) parent materials, which tend to be alkaline or basic, as opposed to acidic. Alfisols

also tend to have a relatively high clay content. Base status is a primary difference between Ultisols and Alfisols; the former has decreasing base status with soil depth, the latter increasing base status with depth. Base status is a measure of soil fertility, and is determined by the amount of plant-available base elements (i.e. calcium, magnesium, potassium, sodium) in the soil. Therefore, Ultisols are generally less fertile than Alfisols (Boul, Hole and McCracken, 1989).

European settlement of the Piedmont has had a serious detrimental effect on soil and stream quality. An estimated 20-percent of

Spatial structure of urban places in the Haw River Valley I, Mill Village:

- irregular streets
- privately owned, unincorporated
- one industry dominant
- homogenous mill houses
- small, isolated population

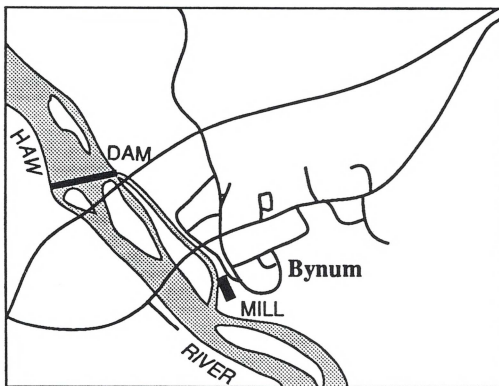


Figure 3a. Bynum: Haw River mill village, founded 1872

the North Carolina Piedmont has been essentially ruined for agriculture due to soil erosion resulting from poor land use practices in an area of intense rainfall and easily-eroded soils. This erosion led in turn to siltation of Piedmont streams and rivers. Declines in agriculture and better land use practices have reversed these trends somewhat, although sediment still continues to move into and clog larger streams such as the Haw (Horton and Zullo, 1991).

Old field succession in the North Carolina Piedmont is one of the more celebrated and studied examples of plant community dynamics, partly due to the distinct, dramatic, and rapid successional patterns which are evident here. This enables us to view the phenomenon at various stages along the route. Plant succession is a

"Old field succession" is occurring on abandoned land, formerly cultivated; the process or stagewise change in vegetation cover may eventually result in a climax forest of mostly hickory and oak trees

directional, cumulative change in the species that occupy a given area, through time. Primary succession is the establishment of plants on land not previously vegetated, for example, the colonization by plants of land scoured bare by retreating glaciers. Secondary succession is the invasion of land that has been previously vegetated, the pre-existing vegetation having been partially or completely destroyed by natural or human disturbances such as fire, wind, logging, or cultivation. Unlike primary succession, secondary succession occurs on sites where much of the soil and many plant

propagules (i.e., seeds, rhizomes, roots etc.) still exist. As a result, secondary succession can, in some cases, progress 5 to 10 times as fast as primary succession (Barbour, Burk and Pitts, 1987).

The North Carolina Piedmont is a gently rolling region with a mosaic of hardwood forests, pine forests, recently abandoned fields, and cultivated fields. Secondary succession occurs on the abandoned, formerly-cultivated fields, hence the name, "old field succession." The succession process leads toward a climax forest comprised mostly of hardwoods (eg. oaks and hickories) with a few scattered pines in the overstory (Barbour, Burk and Pitts, 1987).

The abandoned old fields are quickly colonized by a relatively large number of annual and perennial herbs, dominated by crabgrass and horseweed. The second year after abandonment, new species are added, and the dominant species shift to aster and ragweed. By the third year, species richness declines due to almost complete dominance of large clumps of the perennial grass broomsedge. Broomsedge continues to dominate for several more years as pine seedlings become established and increase in size and height. Eventually, the pines overtop and shade the broomsedge, thus ascending to dominance. In any given field, the pines tend to be all of one species: shortleaf pine on the drier sites, and loblolly pine on the moister sites. These pines tend to grow quickly, but since they are relatively shade intolerant, new generations of pines don't become established in their

own understory. Instead, hardwoods become well-established in the understory, and after a time, begin to out-compete the pines and obtain dominance. Secondary succession can stop at the pine stage if low intensity ground fires sweep a site every several years (Barbour, Burk and Pitts, 1987).

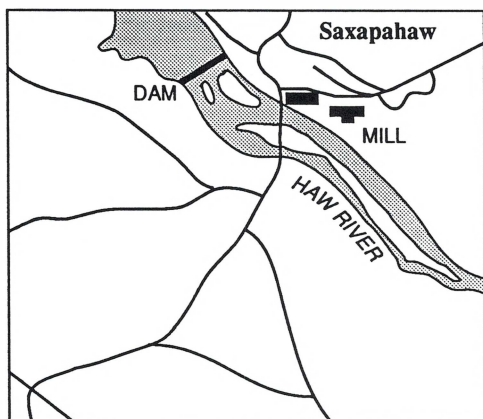


Figure 3b. Saxapahaw: Mill village, founded 1848

SAXAPAHAW: Quaker John Newlin built the original cotton mill in 1848. In 1873 the mill was brought into the Holt textile dynasty when patriarch Edwin M. Holt bought it for his son-in-laws John Williamson and James White. The mill operated as White-Williamson & Co. from 1884 to 1927, when it was sold to the Sellars Manufacturing Company (Figure 3b). Part of the plant is presently being operated by Dixie Yarns. The company store dates to the 1920s when it was operated by Sellars. The institution of the mill company store is part of a troubled history of oppression and

paternalism associated with mill villages like Saxapahaw, in which the practices of mill owners that were supposed to be beneficial for their workers may have reinforced their poor socioeconomic status. Mill owners sometimes issued workers paychecks in the form of credit at the company store. However helpful this may have been for obtaining groceries and supplies, it also kept the workers tied to that mill and company store and prohibited them from using their limited pay elsewhere (Hall et al, 1989).

LINDLEY'S MILL: While the Haw attracted the larger water-powered cotton mills and their associated villages, lesser tributaries, like Cane Creek, remained important as power sources for grist mills, saw mills, and smaller cotton and woolen mills that required less horsepower. Lindley's Mill dates back to the mid-1700s and was water-powered until the 1970s. The current building and unused waterworks are 20th century constructions. The grist mill took advantage of a site inside an incised meander curve, with dam located on the upstream side of the meander feeding a race that cuts across the neck and drops down through the mill site located along the creek bank on the downstream side. The mill currently imports high-protein grain from the Midwest to produce flour for

While the Haw River attracted the larger cotton mills, smaller grist, saw, cotton and woolen mills remained wedded for a longer time to tributary rivers like Cane Creek

specialty breads served in restaurants in the Triangle area and elsewhere on the East Coast.

CANE CREEK MOUNTAINS: An erosional remnant, the

Cane Creek Mountains, is one of the Piedmont's lesser monadnocks. Thompson Mill Road passes over a saddle between Bass Mountain to the east and higher elevations to the west. While the topography is visually muted, high points are accentuated with radio towers. At roughly 240 feet above sea level, the saddle marks the highest point on the field trip and affords a quick glimpse northward into the Haw River Valley.

GREAT ALAMANCE CREEK: Upstream at Alamance Edwin M. Holt built the first cotton mill in Alamance County in 1837. In 1853 the mill produced the first dyed fabric south of the Potomac, refining a popular pattern called "Alamance Plaids." By 1900 descendants of E. M. Holt and their kin controlled 25 of the county's 29 textile mills, and employed 25% of the county's labor force. Downstream from Alamance is the mill village of Bellemont, built by E. M. Holt's sons Lawrence and L. Banks in 1879.

SWEPSONVILLE: In 1868 George Swepson and G. Rosenthal built the Falls Neuse Mill at Swepsonville to compete with the Holts in producing Alamance Plaids. Style changes favoring gingham

caused a softening of the market for Alamance Plaids, but the Holts blamed Swepson for glutting the market, and a feud ensued. Up until the early 20th century, raw cotton arrived at Swepsonville by boat, shipped down the Haw from the railroad depot at Haw River three miles away. Virginia Mills (renamed after G. Swepson's wife in 1895) operated in Swepsonville until being destroyed by fire in the 1980s, leaving a largely empty mill site next to the remnants of the dam (Figure 3c).

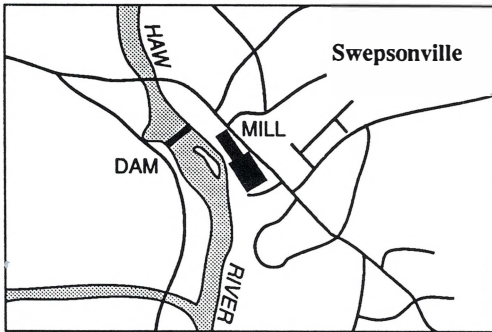


Figure 3c. Swepsonville: Mill village, founded 1868

HAWFIELDS: This interfluvial area between two Haw River tributaries was settled in the 1750s by agriculturalists who took up land along the Trading Path between Hillsborough and Salisbury. The first-order hamlet that developed to serve neighboring farms was abandoned in the 1850s when the North Carolina Railroad was built a mile north. Attracted by the potential prosperity of a railroad town, its residents moved to what became Mebane. The legacy of this low order central place is retained in the church and convenience store that occupy the site today. Nearby is a Honda parts plant, characteristic of the Japanese companies who are currently attracted to the Piedmont Crescent along I-85 because of the accessibility and lower land and labor costs.

MEBANE: Mebane was founded in 1855 as the Mebanesville

Spatial structure of urban places in the Haw River Valley II, Railroad Town:

- grid pattern
- public, incorporated
- diversified industry
- varied, privately built and owned houses
- larger population, linked to the outside by railroad

depot on the newly constructed, state-owned North Carolina Railroad. The mill villages of the Haw River were frequently built with irregular street patterns, reminiscent of rural farm villages (Hall et al, 1989). Railroad towns like Mebane, however, have more urbane roots, laid out in a grid pattern of streets oriented parallel and perpendicular to the tracks (compare Figures 3a, 3b, 3c, 3d, and 3e). Mebane is larger and contains a more diversified industrial base than the mill villages. Although Dixie Yarns has a Mebane plant, the furniture industry is dominant, with White Furniture and Kingsdown Mattress operating sizable plants in town. The housing stock, having been constructed largely by private contractors, is also more diversified, and contains the large and varied houses of a 19th century professional and managerial class, built in the high styles of the period. Politically, Mebane, with a history of local government, is incorporated, while the mill villages, with a collective history of industrial paternalism, still are not.

HAW RIVER: The only Haw River mill village to be served by the railroad, Haw River is much larger than the rest, containing two cotton mills, and at one time, a hosiery. The irregular street pattern,

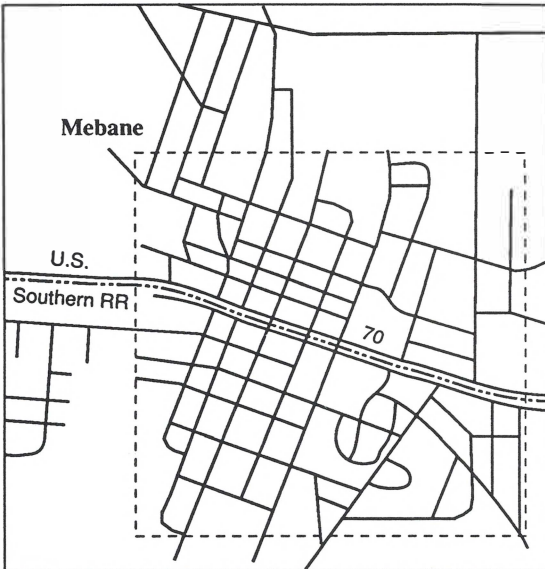


Figure 3d. Mebane: Railroad town, founded 1855

and mill house residential landscape, however, is compatible with other villages (Figure 3e). Mill houses in the Haw River Valley reflect vernacular forms, based on hall and parlor, and Carolina I-house designs, typically with an attached kitchen in the rear.

The Granite Mill was built by Benjamin Trollinger in 1845. Trollinger influenced the routing of the N.C. Railroad by building the bridges at Haw River, Back Creek and Eno River. He eventually lost his cotton and grist mills to Thomas M. Holt who expanded the mill, and built the nearby steam-powered Cora Mill in the 1880s. The Granite Mill has been manufacturing finished corduroy

for Cone Fabrics since the 1930s. The Cora Mill became the Tabardrey Mill in the 1940s, and is now being operated by Kingstree Knitting Co. Unlike the other mill villages which were bypassed by the main

road immediately before or after World War II, Haw River still sits astride U.S. 70, although a bypass is currently being constructed to the north.

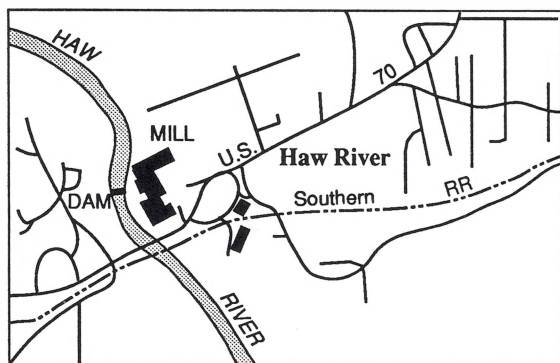


Figure 3e. Haw River: Mill village, founded 1845

The long history of mill construction in Haw River provides examples of mill working environments through the years. Though the specifics of the working environment have changed through time, it is fair to say that until well into this century, the mill environment was nearly intolerable due to cotton dust, high humidity and temperature, noise, work routines, and poor sanitation. Mill workers often could not hear for

half an hour after leaving work, and many ended up with permanent hearing loss from a life in the mills. Byssinosis, or brown lung disease, a respiratory ailment derived from years of exposure to cotton dust, was common among textile workers in the area (Beardsley, 1987, Hall et al, 1989).

GRAHAM: When Alamance County was created in 1849, Graham was chosen as the county seat because of its centrality. The town was laid out with a traditional cardinal grid pattern with a small courthouse square located at the intersection of the principal north-south and east-west streets. The town became the hub of a radial regional road pattern that was altered after the arrival of the railroad. Graham's citizenry rejected the railroad and the potential noise and dirt it would create. As a result, the N.C. Railroad was built north of town, and the company shops planned for Graham were built two miles west instead.

BURLINGTON-GRAHAM RAIL CORRIDOR: With the adoption of the Corliss steam engine, textile mills no longer required isolated water power sites, and began to locate in the larger towns along the railroad. Burlington's first real estate development, Piedmont Heights (1911), was built as a working class neighborhood astride the Alamance Street Railway and proximate to the Southern Railway line. In 1923 Burlington Industries built its inaugural Pioneer Plant in the neighborhood, also constructing 70 mill houses in the bungalow style popular in the 1920s and 1930s.

Located between Pioneer Plant and Piedmont Heights is Glen Hope Baptist Church, home to the congregation of Preacher George Washington Swinney. Swinney was a textile worker himself, before he felt the the call to the ministry. He had a profound effect on the local

In the Haw River basin the role of individuals, in shaping local culture and in molding the local cultural landscape, is critical to an understanding of the region. Here the names of Edwin M. Holt, George Swepson, Benjamin Trollinger and George Washington Swinney have all figured prominently

area; he is credited with cleaning up the moral environment of Piedmont Heights. It is unclear whether Swinney was truly a friend of the workers, or if he was in league with the mill ownership, which provided some financial support for his church. He was highly popular among the members of his congregation, but practices such as holding evening services every night during a strike may have been calculated to reduce participation in the strike (Hall, et al, 1989).

During the 1920s the hosiery industry, eventually dominated by Burlington Industries, surpassed the cotton textile industry in Alamance County, creating a different cultural landscape. Unlike the earlier cotton mills which were powered by water or steam, hosiery plants were powered by electricity. In addition to locating in the cotton mill-dominated industrial rail corridor, hosiery plants were also located with respect to highway transportation, the

influence of which expanded during the 1920s. Contrary to the paternalistic cotton mills, hosiery manufacturers rarely built mill villages, but took advantage of local, urban-based labor forces with access to public transportation and automobiles. Most of the hosiery workers owned homes built by private developers.

COMPANY SHOPS: Located at the midway point on the N.C. Railroad, the town of Company Shops was founded in 1855 with the building of the railroad's maintenance and repair facilities. After the shops closed in 1886 the town was renamed Burlington and grew with the expansion of the cotton and hosiery industry. Much of the downtown dates to the prosperous textile production years of the 1920s. As a railroad town, the street pattern of Burlington is oriented toward the tracks which cut across the city on a northwest-to-southeast angle, skewing the grid pattern off the cardinal compass directions evident in the street pattern of nearby Graham.

Characteristic to the neighborhood of Fountain Place/ West Davis and West Front streets are large historical revival and bungalow style homes of the upper-middle managerial class that emerged with the industrial expansion of the early 20th century. Fountain Place, with its globular street lights and fountain located on an island in the middle of the street, reflects the early 20th century influence of the

The town of Company Shops was renamed Burlington with the demise, in 1886, of the NC Railroad maintenance facilities. Burlington's subsequent emergence as a center of industrial wealth has left a visually impressive historical architecture

City Beautiful Movement. Piedmont Way, the main boulevard through working-class Piedmont Heights, has similar roots, although a more spartan appearance that mirrors the social status of that neighborhood.

HOPEDALE-CAROLINA: In 1840 John Trollinger built the High Falls cotton mill at a nick point in the Haw River near its

confluence with Stony Creek. Controlled by G. Rosenthal after 1883, the mill was brought into the extended Holt family when James Williamson took control in 1904, renaming it the Hopedale Mill. Copland, the current owner, has produced synthetic fabrics and hosiery goods at Hopedale since the 1940s.

Upstream is the abandoned Carolina Mill started by James and William Holt in 1869. The mill village "on the hill" is clustered around an early 20th century standpipe. The final power shift for Alamance County textile mills from water and steam to electricity began in the 1910s. Freed from water power sites, water for processing is still important, specifically ground water untainted by pollution.

GLENCOE: Glencoe (1880), Altamahaw (1880), and Ossipee (1882) were the last Alamance textile mills to be built using water-powered machinery. All three were built or ultimately controlled by the Holt family. When the Glencoe Mill shut down in 1954 the village was abandoned. What remains is the shell of a 19th century cotton mill village. It is a near pristine, but decaying, relict landscape that the county would like to turn into an outdoor museum, but funds have yet to be procured. The mill buildings have been leased as storage space, and a carpet outlet and small lace manufacturer occupy the main building. The early 20th century water-powered electric turbine still produces electricity which is sold to Duke Power. Old field succession at different stages may be observed in what appear to be abandoned garden plots in and among the former mill houses.

INTERSTATE 40/85 CORRIDOR: Changes in the location of Alamance County textile plants reflect technological changes in power sources and transportation. During the initial water power stage mills were scattered at isolated riverine locations. Mills built during the steam power stage were clustered at trackside locations. The final electric power stage is characterized by decentralized mill locations with highway orientations, specifically I-40/85. A corridor of modern single-floor textile mills exists in industrial parks and at interchanges along I-40/85 on the southern margin of Burlington and Graham. They are not associated with a complement of mill houses, but the surrounding landscape is dominated by tracts of modest brick ranchers built after World War II.

As is evident from this fieldwork experience, direct, on-site observations provide excellent training for understanding dynamic and ongoing changes in an physical and cultural landscapes

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THE IMPACT OF RETIREMENT MIGRATION ON CARTERET AND BRUNSWICK COUNTIES, N. C.

D. Gordon Bennett

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The elderly represent the fastest-growing segment of the American population. Today, one in eight people are 65 and over; by 2030, one in five will be (U. S. Bureau of the Census 1984, 1990). Over the last three decades, retirees have moved increasingly to the Sunbelt. North Carolina has been a major receiver primarily during the last two. The kind of impact these retirees are having, particularly on sparsely populated, nonmetropolitan counties, is of particular interest to planners and other decision makers.

Background

Elderly migration during the 1970s was 50 percent greater than during the 1960s, twice the increase for the general population (Longino et al, 1984). During the 1970s, North Carolina was one of the ten most rapidly growing states for elderly immigrants (Serow and Charity, 1988). Whereas long-distance migration of most people is based on economic reasons, long-distance movement of the elderly is related primarily to retirement, financial and physical well-being, climate, and ties to the chosen location (Heaton et al, 1981; Aday and Miles, 1982; and Swanson, 1984). For North Carolina, the increased number of elderly immigrants has been associated with the emergence of retirement areas beyond the traditional ones in Florida and Arizona (Bohland and Rowles, 1988) and by 1980, this state had become one of the two most popular destinations in the eastern Sunbelt (Biggar et al, 1984).

North Carolina has over the past two decades become one of the more popular destinations for retirees

Longino states that North Carolina was one of the four major receivers of retired migrants from nonadjacent states, that this elderly immigration is changing the character of the state and that "over time it may resemble Arizona and Florida more and the other southern states less" (1984, 123). During the 1970s, elderly immigrants to North Carolina rose 129 percent, and the state shifted from 17th to 7th place as a destination for retirees (Flynn et al, 1985). Wiseman et.al. (1989) reports that North Carolina is the newest and most rapidly-growing retirement center and that the figures for 1990 will likely show that it has become the 4th or 5th most popular retirement destination (1984).

Such a rapid increase in retirement migration to North Carolina suggests that the elderly are likely having an increasing impact on areas to which they move. McCarthy and Morrison indicate that "Retirement and recreation have emerged as important growth-related (and probably growth-inducing) activities in nonmetropolitan areas" (1979).

It is critical for local decisionmakers, and for the retirees themselves, to better understand their impact in the receiving communities

Longino and Biggar feel that there is much speculation, but little knowledge, about the impact of elderly immigrants on receiving communities. They caution that “one must consider the particular location when asking about the characteristics of older migrants who relocate,” and that “It is only at this scale that one can talk meaningfully and usefully about migration impacts” (1982). Aday and Miles note that elderly migration has significant implications for policy makers since retirees who migrate to rural areas “will no doubt foster economic development” (1982). Bryant and El-Attar state that “in planning for future needs, communities will require additional research findings on the quantity and quality of elderly immigrant to their areas” (1984).

Purpose

The purpose of this paper is to determine (1) the characteristics of the retirees moving into Carteret and Brunswick Counties in North Carolina, (2) the reasons they moved here and the areas from which they moved, (3) the economic impact that these retirees are having on the receiving counties, and (4) environmental and other concerns of these retired newcomers.

Methodology

Although the elderly have migrated to various sections of the South Atlantic states for retirement, the counties along the coast have been among the most popular destinations. Seven nonmetropolitan counties along the South Atlantic Coast, known to have experienced increasing inflows of retirees during the last three decades, were chosen for investigation, with the results of the two counties selected in North Carolina, Carteret and Brunswick, evaluated in this paper.

A sample of retiree households in Carteret and Brunswick counties was interviewed for this study

A random spatially-stratified sampling technique was employed to identify 50 retiree households in each county for personal interviews. Only those who had moved from outside the county for the express purpose of retiring were included in the sample. Those who had moved to the county specifically to work or to serve in the military were excluded.

The Study Area

Carteret (Morehead City area) and Brunswick, in the southeastern corner of the state (Figures 1 and 2), have similar populations of over 50,000 each. But during the 1980s, Brunswick grew faster than did Carteret (Table 1).

The approximately 7,500 elderly in each county accounted for a greater proportion of the population in 1990 (14-15%) than in 1980.

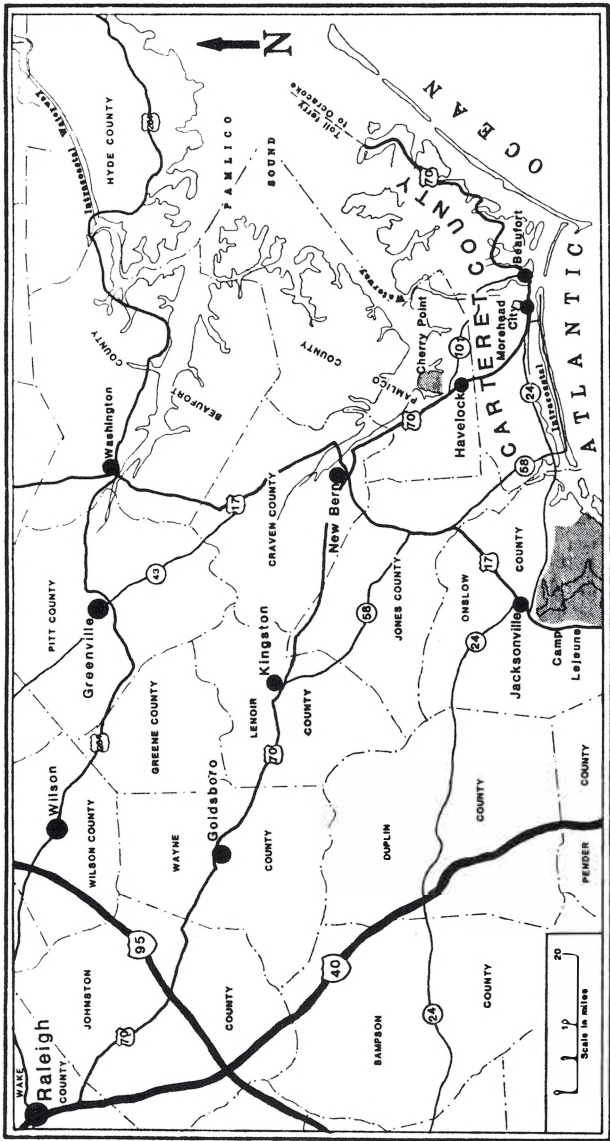


Figure 1. Carteret County and surroundings

This group grew faster than the population as a whole and accounted for about a fourth of their total increase. The rates of growth for the elderly and the total population were much higher than for the State as a whole (Table 1).

Characteristics of the Retirees

Although all of the elderly in these two counties are not retirees who have moved here from elsewhere, the latter is a growing proportion. Moreover, about two-fifths of the retirees are younger than 65, while only about a seventh are 75 or over. In fact, persons 55-64 in

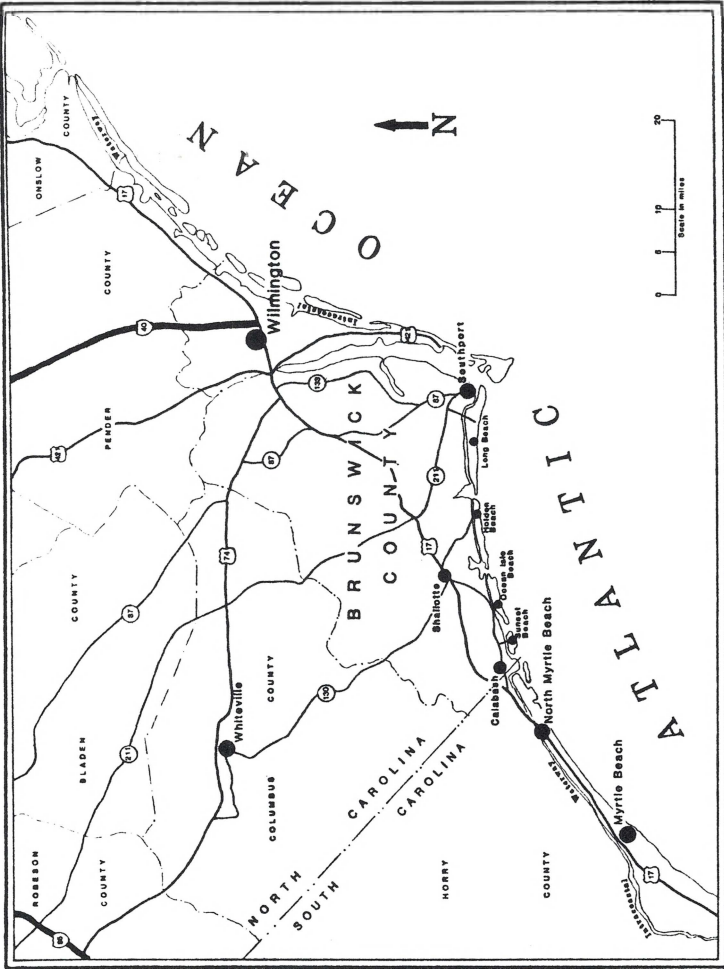


Figure 2. Brunswick County and surroundings

these two counties grew much faster than the state as a whole.

Almost four-fifths of the retiree households in these two counties are composed of two persons, with nearly all these being husbands and wives. Only about a seventh of the households are people living alone.

The retirees in these two counties are disproportionately in the upper-middle and upper socioeconomic groups, with Carteret's gen-

Area	Total Population	65 & Over	55-64
Brunswick County	36%	95%	69%
Carteret County	28%	58%	30%
North Carolina	13%	33%	7%

Table 1. Percent Population Change, 1980-1990

erally being in a higher category than those in Brunswick (Table 2). Most held managerial or professional positions before retirement. so a large proportion had a college education and in fact, a rather high percentage of Carteret's held a graduate degree.

Retired newcomers tend to be better educated and have higher incomes than do local retirees

The income and value of homes of the retirees reflect their education and previous occupation (Table 2). Over a third of the retiree households have incomes of \$40,000 or more. A much higher proportion of the retired newcomers' residences are of high value compared to all owner-occupied residences in these counties or in the State as a whole. In addition, over three-fourths of these retirees' homes have no

mortgage. Most of the retirees who have a house payment use it as part of a tax-saving strategy.

Characteristic	Brunswick	Carteret
Managerial/Professional Occupation	65%	77%
Graduate Degree	30%	32%
College Graduate	5%	20%
Less than High School Education	18%	0%
\$40,000 or More Annual Income	28%	40%

Table 2. Characteristics of Retirees in Brunswick and Carteret

Retiree Source Regions and Reasons for Choosing Locations

Approximately three-tenths of the retirees to Carteret and Brunswick moved there from another part of North Carolina, which was the main source region for both counties (Figures 3 and 4). It is of interest to note that retirees from within the same state did not rank first for any of the other five counties in the larger research project. The second major source region for the two North Carolina counties was the northern New Jersey-to-Massachusetts corridor, which accounted for about a fourth of their retired households. The North, as a whole, was the origin of about 60 percent of the retirees in the two counties.

Sixty percent of the incoming retirees came from northern United States

The majority of retirees to these counties are relative newcomers, with about half of those in each county having lived there for five years or less. About a fourth of the retirees in each of these two counties looked along the South Atlantic

coast for a place to settle because of the recreational opportunities available, as compared to the other five counties studied, where climate was the main factor. This is understandable since Brunswick and Carteret are the northernmost of the counties studied and since they had the largest share of their retirees having moved there from within the same state.

When asked why they chose to retire where they did, the main reason given was that they have friends or relatives in the area (20%).



Figure 3. Previous residence of retirees in Carteret County

However, the low cost of living tied with friends and relatives as the main reason for choosing Brunswick (the only one of the seven counties in the larger study for which this was a major factor—and the only one with an annual median retiree household income under \$30,000). The next most important reason for choosing either Carteret or Brunswick was recreation (16%).

The Economic Impact of the Retirees

The initial and most obvious impact of most retirees on a community and county was the purchase of a home when they moved

The major economic impacts include the purchase of a residence and related household goods

to their chosen retirement location. Although some rented for several months while searching for or building a home, about half of the retired newcomers built a new home when they came to the county. Most of the rest bought an existing home (or condo), while less than a tenth continued to rent. As



Figure 4. Previous residence of retirees in Brunswick county

indicated above, the value of the homes was rather high, especially in Carteret, where the median value was nearly \$150,000 as compared to almost \$125,000 in Brunswick. The values were much higher than those for all owner-occupied residences for these two counties and for the state as a whole (Table 3).

Area	% Under \$100,000		% \$150,000+		% \$250,000+	
	Retiree	Total	Retiree	Total	Retiree	Total
Brunswick County	32%	74%	28%	10%	2%	2%
Carteret County	26%	71%	48%	14%	13%	4%
North Carolina	NA	77%	NA	9%	NA	2%

Table 3. Housing value, 1990

With the exception of property, during the previous year retirees in Carteret were twice as likely as those in Brunswick to have made other major purchases of \$10,000 or more within the county. Carteret's retirees were also more than three times as likely to have spent \$600 or more on clothing in the county.

Although one reason for the differences in amounts spent on major purchases and clothing is the higher income of the retirees in Carteret than Brunswick, another very important factor is the much greater number and variety of stores in Carteret, together with the location of Brunswick between Wilmington and Myrtle Beach. Indeed, both counties experienced considerable economic leakage from them because of the dearth of goods and services desired by the retirees, but Brunswick's situation was particularly serious. A builders' supply store and a small Roses store at one end of the county and a large tourist-oriented gift store at the other were the main general retail outlets in the Brunswick County.

With retirees seeking goods and services in larger towns of adjacent counties, both Brunswick and Carteret experiences considerable economic leakage

Whereas approximately half of the retired households in Carteret said they did not need any other stores, only about a fourth of those in Brunswick felt this way. Indeed, over a third of Brunswick's retirees stated that a major department store, such as Belk's, was the most needed store in the county and nearly another three-tenths indicated the need for a major discount store. It is rather surprising that a county with over

50,000 people, including a sizable and growing retiree population, had neither a major discount nor a department store. It is worth noting that soon after the initial report of this research project was submitted to the Economic Development Administration, Wal-Mart announced that it would build a store in Brunswick County—coincidentally, near one of the two recommended sites. The paucity of home furnishings stores in both counties also resulted in many retirees travelling to neighboring counties, or beyond. Curiously, although the Belk store in Carteret had undergone extensive remodeling recently, the retirees still complained about the variety, style, and quality of clothing carried by that store.

Usually, retirees in tourist areas do not want any more hotels. However, retirees in Brunswick pointed out that there was not anywhere in the county a major hotel/motel facility where friends and relatives could stay. This is particularly surprising in view of the rapid expansion of golf courses (now over 15). Even the beaches of Brunswick are noted primarily for cottages, plus a few condos and small older motels. Many retirees enjoy "eating out." Two-fifths of those in Carteret and a fifth of the ones in Brunswick eat out three or more times a week, with three-fourths of the former and two-thirds of the latter spending \$14 or more per couple per meal, including three-tenths each who spend \$20 or more. Despite the number of seafood houses in each county, retirees in both counties specified their desire

Entrepreneurs should know that retirees desire more retail stores, lodging places, and restaurants

for a Red Lobster, which are advertised regionally on television stations. They also wanted a good Chinese, a gourmet, and a cafeteria/family restaurant.

Medical care is already a major part of the lives of many retirees, with nearly half of these households in Carteret and over a third of those in Brunswick having spent \$1,200

or more during the previous year on doctors and hospitals and over a third and a fourth, respectively, having paid this much for medicines. Considering that a third or more of the retirees in these two counties are already 70 years of age or older, that another third of the men are in their late sixties, and that retirees are continuing to enter these counties at a rapid rate, it seems likely that there will be an increased need for radiation treatment and heart surgery.

Over a tenth of the retirees in the two counties combined viewed inadequate medical facilities and doctors as the main problem they faced. More than a tenth of the retirees in each county thought there

Inadequate specialized medical services and facilities are viewed as the major quality of life problem

was primarily a need for a cardiologist/ heart surgeon, while a general practitioner and a dermatologist (because of the rising incidence of skin problems caused by overexposure to the sun) were also thought to be needed. Certainly, as the elderly population continues to increase, more doctors and specialists who can treat their infirmities will be needed.

Another medical need is for radiation treatment at local

hospitals so that those with cancer would not need to make a four to six hour round trip each time they need therapy.

Although two-fifths of the retired households in each county had used the hospital during the previous year, only two percent had used the ambulance. The shortage of medical facilities in Carteret County could become much worse with Duke University closing its Sea Level hospital in the eastern part of the county. In addition to hospital and doctor needs, the expanding retiree populations in both counties present an opportunity for the creation of a life-care community in each one. A third or more of the retirees are already 70 years of age or over. Land for such a project can still be obtained at reasonable cost.

Even though retirees participate in many kinds of open-space recreation, they spend the most money on golf, with 18-26 percent paying \$70 or more a month on this sport. Whereas retirees in Brunswick spend more on golf than do those in Carteret, the latter spend appreciably more on boating and on clubs (besides golf) and organizations, especially political and religious ones.

The annual economic impact of each retiree in the two counties for these goods and services—plus car, food and utility expenses—was computed to be about \$35,000, including one-time housing purchases. The amount spent on each category, except car care and utilities, was

greater for retirees in Carteret than for those in Brunswick. If the purchases of additional goods and services by the retirees and their numerous overnight guests had been included, the economic impact would have been even greater.

Economic impact of each retiree is about \$35,000 annually; they are also eager community work volunteers

In addition, nearly four-fifths of the retiree households in Carteret and half of those in Brunswick contributed volunteer work in their counties. The average retiree in Carteret donated the equivalent of \$700 (@ \$5/hr) in service to his/her community, compared to \$500 in Brunswick County.

Retirees and Environmental Concerns

Since friends and relatives, open-space recreation and the physical environment were major factors attracting retirees to Carteret and Brunswick Counties, officials need to be aware that these are important to continued retirement migration to these areas. The maintenance of a largely unpolluted area with great fishing and other water activities will be of major importance in attracting additional retirees, as well as tourists.

Maintaining a largely unpolluted environment and providing ecology friendly public services will be of major importance in attracting additional retirees

Numerous retirees, as well as town and county officials, realize the need to find an ecologically-safe wastewater disposal system for homes, business, industry, and farms. Most of them seem to favor county-wide sewer systems, but many retirees and other citizens fear the high cost of constructing such a system. This is a realistic problem for those

retirees and other citizens who have annual incomes below \$20,000. Some retirees feel they will have to move if the added cost is too great. Perhaps the initial assessment could be based on property evaluation for existing residences with tie-ins to future homes based on the same scale. Whatever the initial cost, the price to the community will be much greater if major pollution problems develop from overworked septic systems in increasingly populated areas with high water tables. In the spring of 1990, the N. C. Division of Marine Fisheries closed several areas to shellfishing in both counties. State Representative Bruce Etheridge has stated that "We could destroy the chicken that lays the golden egg if we don't enforce the environmental laws and improve the coastal environmental areas" (Almanac, May 19, 1990).

The lack of adequate sewage disposal is a growing problem for both Carteret and Brunswick Counties. A 1987 bond referendum for a county-wide sewer system was defeated two to one. Nearly 90 percent of the plats approved in Carteret County in 1988 and 1989 were served by individual septic tanks. After much study, the spreading of treated sewage on farmland appears to be the best solution. Negative results from further delay could include declining property values and tourist revenues if further limitations in fishing these waters occurs.

Unfortunately, residential pollution is only one factor—and a rather minor one—compared to the pollution caused by agriculture, forestry, and manufacturing. Unless runoff or disposal regulations are imposed on all these contributors, efforts to lessen residential pollutants will only result in a partial solution to the problem.

One of the greatest limitations to development of any kind in these two counties are the vast areas of wetlands which cannot be developed. But whereasthese wetlands preclude certain sections from development, their preservation increases the likelihood that one of the

major factors attracting both retirees and tourists to these areas will remain. Protection of the wetlands also improves the chance for recreational and commercial fishing to continue.

It has been estimated that over half of the undeveloped land in the two counties falls under the federal wetlands designation limiting development. Fortunately, most industrial development in these counties is far removed from the retirement and tourist areas. The seemingly negative aspect of restricting development, including the number of retirement and second homes and tourist accommodations, will,

nevertheless, result in the preservation of the beauty and recreational opportunities of these counties and, thus, their continued attraction for both retirees and tourists. Moreover, the land values and, therefore, the tax base will be greater than they would have been if the wetlands had been destroyed by development. Indeed, local officials should use this opportunity to advertise these areas as among the few pristine coastal stretches left along the South Atlantic coast.

Unfortunately, the recent change in the stance by the federal government on the definition of wetlands will cause these areas to be greatly reduced in size. Although this might serve to profit a few developers in the short run, it could well cause many potential affluent retirees to disregard these areas as retirement destinations in the long run.

The Rising Cost of Living

Another main problem facing the retirees—and other citizens—in these counties is the rising cost of living, especially in medical care and taxes. The revaluation of property, which comes only every seven years, can be a jolt in a resort/retirement area where demand for waterfront lots and the building of hotels, condos and golf courses for tourists push up all real estate values. Since there is a considerable difference in the rate of change in property values from one location to another, average figures for counties are meaningless. However, the overall upward trend of real estate values for persons on low or fixed incomes is of great importance. Fortunately, these two

Though the extensive and protected wetlands may appear to be a limitation to the development of residential sites, this conditional preservation is a more potent force as a source of attraction

counties still have among the lowest tax rates in the state.

One additional aspect of rising land values and taxes in these counties is the increased squeeze on those indigenous landowners with low-to-moderate incomes. Increasingly, they are being forced to sell their property for greatly inflated sums just to pay their taxes. As this trend continues, the population will be increasingly composed of those with the financial resources to migrate here for retirement purposes.

As the number of retirees and tourists increase rapidly, traffic becomes a greater problem on the narrow two-lane roads characteristic of much of these counties. This is particularly true at the peak tourist summer season and spring holidays.

Although several high-rise bridges have been constructed in recent years connecting several of the islands with the mainland, if a hurricane were to necessitate a speedy evacuation during the tourist season, it is problematical whether everyone could be evacuated in time. Some of the island residents have even fought the construction of new high-rise bridges because they fear that these structures will bring even more development and tourists.

Summary and Conclusion

The total, and especially the elderly, populations of Carteret and Brunswick Counties grew much more rapidly than the state during the 1980s. The retirees in these two counties are relatively young and have a much higher socioeconomic level than the overall population of these counties or the state. Although much discussion of the growing elderly population in the nation is negative, the retirees who have migrated to these two counties have had a major economic impact. These findings agree with Longino's assertion that "migrants who concentrate in counties that offer appropriate life-style settings for amenity migrants will have an overall positive economic impact on the locality" (1990). Moreover, the socioeconomic level of those in Carteret is higher and, thus, the economic impact is greater than is the case for retirees in Brunswick.

Retirees have also had impacts on the environment and taxes. Although they have been a factor in the increased impress on the environment, most retirees are very supportive of environmental safeguards. Moreover, even though they have been a factor in the rising cost of waste disposal and taxes, most of them have the financial ability to pay not only for the needs they create but also for the needs of those with lower incomes, including indigent medical care. This agrees with the conclusions of Glasgow and Reeder that "retirement migration has become an economic boon to nonmetropolitan areas" and "has not been a local fiscal burden" (1990). The vigor and

The rising cost of living, especially in medical care and local taxes, poses a particular problem for services with fixed incomes

educational level of the retirees also make them an especially valuable asset to their community through their participation in a wide variety of volunteer activities.

Immigrants who concentrate in countries that offer appropriate life-style settings will have an overall positive impact on the locality

The retired immigrants to both Carteret and Brunswick Counties represent a growing affluent market for a variety of businesses. The considerable economic leakage from these two counties results from the lack of adequate stores and merchandise sought by the retirees. Local officials should attempt to attract developers and stores to meet these retiree needs and, thus, increase jobs and sales and property taxes. This should be done in an environmentally-sound manner in order to preserve the attractiveness of these areas as retirement destinations.

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IMPROVING ENVIRONMENTAL LAND USE DECISION-MAKING IN SMALL COMMUNITIES AND RURAL AREAS

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Environmental issues bombard American communities and regions daily. The ability of planners and public officials to successfully resolve or mitigate these issues relates to the way American communities make land use decisions. This paper describes an approach to planning that better integrates environmental considerations into the land use decision-making process. The methodology described below is not simple, nor are the issues that it addresses simple issues, but it illustrates the type of systematic approach needed to successfully resolve existing — as well as minimize future — issues involving the environment and land use decision-making.

Four general observations attest to the fact that commitment to environmental planning is not always easy. First, although the reason for planning is to improve decision-making, many do not even recognize the general need for planning, let alone the specific need for environmental planning. Second, it is not common planning practice to incorporate environmental considerations in the land use decision-making process on a comprehensive basis; instead, environmental considerations are usually included on a key factor basis. Third, although many perceive that environmentalism is mostly negative and anti-growth, environmental planning actually identifies both opportunities and constraints relating to land use decision-making. Fourth, the amount of environmental information already available is mind-boggling and sometimes difficult for lay persons and planning professionals alike to assimilate, apply, and integrate into the decision-making process.

These observations indicate the complexity as well as the promise of environmental land use planning in actual practice. Small communities and rural areas often face the greatest obstacles in embracing environmental planning. The reality of limited resources, and both real and perceived aversions to planning in general, typify many small communities and rural areas. Innovative resource combinations often help overcome such obstacles. One example is a planning partnership formed between undergraduate planning classes at the Department of Geography and Planning at Appalachian State University in Boone, North Carolina and small communities within its service region. The planning classes conduct, as class projects, environmental analyses to help small communities better integrate environmental considerations into the land use decision-making process.

Though they may be difficult to apply in small communities and rural areas, environmental considerations of land use decision making are critical aspects of the planning process

Small communities in North Carolina may be helped in their planning efforts by linking with an academic institution that has a planning program

The identification of specific communities to serve is a function of several factors. Typically the community is experiencing growth pressures; it is difficult for the community to deal with growth pressures owing to political complexities and realities; the community genuinely desires to improve land use decision-making; and the community is sensitive to environmental issues, but lacks the resources to undertake an environmental analysis.

Three planning objectives guide the research efforts: to promote an environment conducive to anticipated land uses; to minimize conflicts between natural processes and land use decisions; and to promote the flexibility needed to accommodate future change.

The methodology used is neither new nor unique (Belknap and Furtado, 1967; Hopkins, 1977). However, its application to small communities and rural areas is not common planning practice.

The physical and cultural environment consists of eight components: climate, geology, hydrology, physiography, soils, vegetation, land use, and wildlife. Only the land use component is a cultural component; all other components are physical environmental.

Students are assigned to eight work groups, one work group for each environmental component. The task of each work group is to inventory and analyze existing conditions within its respective component, in particular to identify both opportunities and constraints relating to each of four alternative land uses: urban, agriculture, forestry, and recreation. Opportunities and constraints are matches and mismatches between natural processes and alternative land uses. For example, flooding is a natural process that is a significant constraint to urban land uses; however, flooding is an opportunity (but with some limitations) to agriculture, forestry, or recreation land uses.

Interdisciplinary research assistance is available from several sources. Students seek assistance from both faculty members at Appalachian State University and also from local public officials (e.g., Soil Conservation Service office personnel) who are technical experts within specific fields that relate to the analysis components. Periodic in-progress reviews monitor student work group progress and provide each work group an opportunity to share findings with the rest of the class.

The initial assumption is that the entire study area is undeveloped. This assumption allows one to objectively develop and apply planning criteria based solely on environmental merit. Planning criteria become the building blocks of the later suitability analysis and vary from project to project based on the analysis of existing conditions. Figure 1 is an example of planning criteria developed

- A. Valley floors offer least constraints to urban, agricultural, and active recreational development
- B. Encourage low density development on valley walls
- C. Limit urban and agricultural development on valley walls without forest cover
- D. Limit agricultural activities to slopes less than 15 percent
- E. Limit commercial forestry activities to slopes less than 25 percent
- F. Limit urban development on ridge areas above average elevation for study area
- G. Intensely manage critical and sensitive areas
- H. The entire study area offers few constraints to passive recreational activities

Figure 1. Physiography planning criteria

during one class project for the physiography component.

The suitability analysis relates research findings to each of the alternative land uses. It is common practice to accomplish the suitability analysis using a matrix. Matrices will vary in complexity but typically include a range of suitabilities. An example of a simple, three-tiered range of suitabilities is: most suitable, suitable, and least suitable. Figure 2 is an example of two simplified matrices (for forestry and agriculture land uses) using the three-tiered range of suitabilities. Note that each suitability classification also has a

FORESTRY SUITABILITY MATRIX			
	Most Suitable (3)	Suitable (2)	Least Suitable (1)
Forestry productivity	Good	Fair	Poor
Slope	3-14%	0-2, 15-25%	>25%
AGRICULTURAL SUITABILITY MATRIX			
	Most Suitable (3)	Suitable (2)	Least Suitable (1)
Slope	3-14%	0-2%	>15%
Agricultural productivity	Hi	Med	Lo

Figure 2. Suitability matrices

numeric value. In this case, the most suitable classification has a value of three, the suitable classification a value of two, and the least suitable classification a value of one. The assignment of numeric

values facilitates later mapping of component characteristics.

It is possible to map most data recorded in a suitability matrix. Figure 3 schematically portrays the several different steps in the mapping process. Each rectangle in Figure 3 (Items 1-12) portrays the same study area, but with different data characteristics. Items 1, 2, 5, and 6 in Figure 3 illustrate how numeric values taken from the

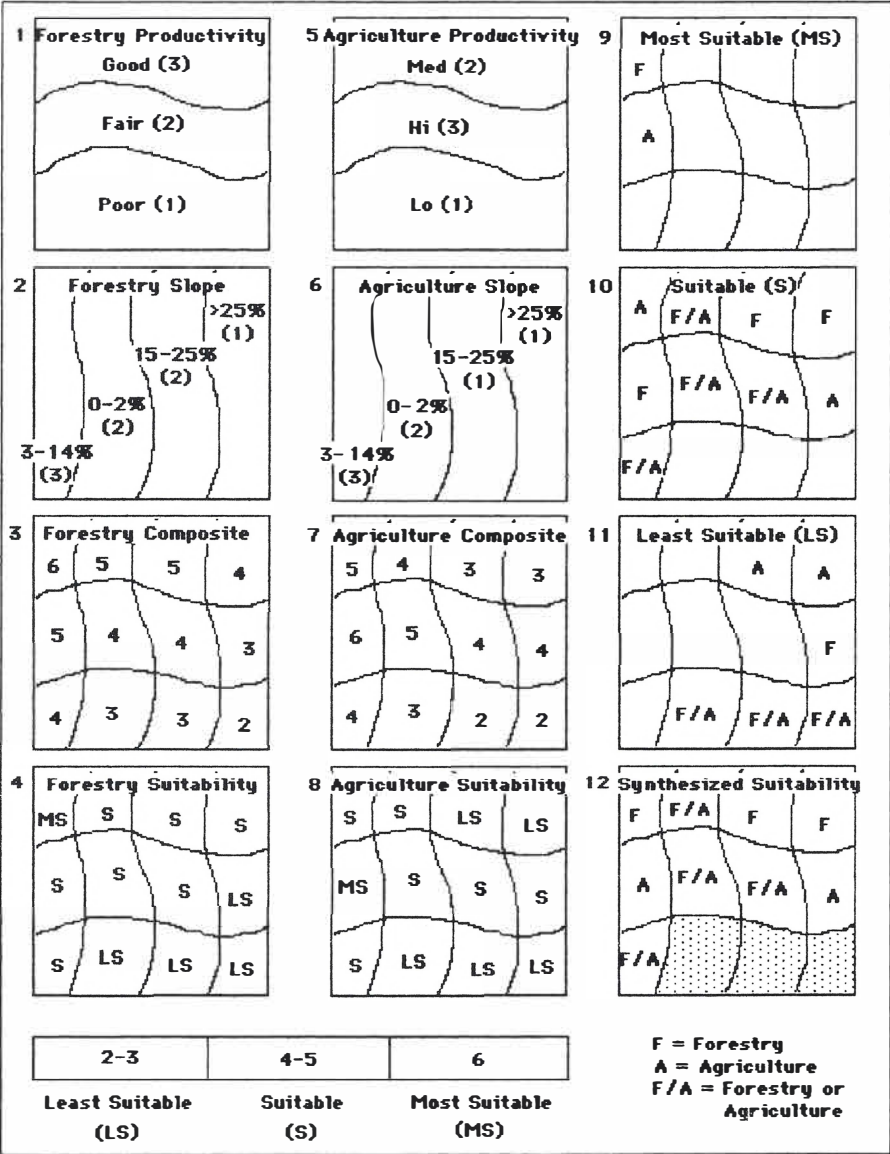


Figure 3. Mapping and analysis

suitability matrices in Figure 2 facilitate mapping of analysis characteristics. The assignment of numeric values to each of the three suitability classes allows multiple environmental characteristics to be combined and mapped as a composite (Items 3 and 7 in Figure 3). For example, Item 3 values in Figure 3 are the result of overlaid additive values from Item 1 and Item 2 in Figure 3. It is often useful to further establish value ranges that translate the composite back to the three-tiered suitability classifications (Items 4 and 8 in Figure 3). This in turn allows for suitability differentiation throughout the study area (Items 9-12 in Figure 3) and a synthesis that summarizes the application of planning criteria for each alternative land use (Item 12 in Figure 3).

Suitability differentiation and synthesis depend on a hierarchical precedence determination. Most suitable determinations take precedence over suitable and least suitable determinations, and suitable determinations take precedence over least suitable determinations. It is not uncommon for areas to be either more, equally, or less suitable for more than one alternative land use (i.e., based on environmental merit relating to the suitability analysis). For example, in Figure 3 some areas are suitable for either forestry or agricultural land uses (as illustrated in Item 10 in Figure 3), and some areas are least suitable for both forestry and agricultural land uses (Item 11 in Figure 3).

The synthesized suitability map incorporates all environmental analysis components except existing land use. Overlaying the synthesized suitability map with the existing land use map allows for evaluation of both past land use decisions and future land use alternatives based on environmental merit (Figure 4). While it is generally not practical to correct past land use decisions that were less than prudent, this type of decision-making should not be perpetuated when objective patterns of analysis demonstrate better choices for the future. Figure 4 also clearly identifies undeveloped areas that have either distinct or equal advantages (again, based on environmental merit) to satisfy future land use requirements. When the amount of land becomes a valuable tool that identifies specific location choices or options reflecting areas best suited for each alternative land use.

The above methodology effectively and systematically incorporates environmental considerations into the land use decision-making process. It adds objectivity to the land use decision-making process. Citizen planners, professional planners, and developers can all make use of this methodology, and the supporting data base, as a basis for making better land use decisions. The methodology, although complex in application, is both systematic and defensible. Ultimate decision-making and plan approval are political, and such decisions rest with the governing body. As with all methodologies,

some plan recommendations will always be politically unpopular. However, because the overall methodology is systematic and defensible, it facilitates plan approval by the governing body.

The amount of environmental information is usually very extensive, and it often helps to store, integrate, and analyze data using a computerized Geographic Information System (GIS). GIS can map and visually portray both separate and combined characteristics for each environmental research component and sub-component, thereby greatly facilitating the suitability analyses.

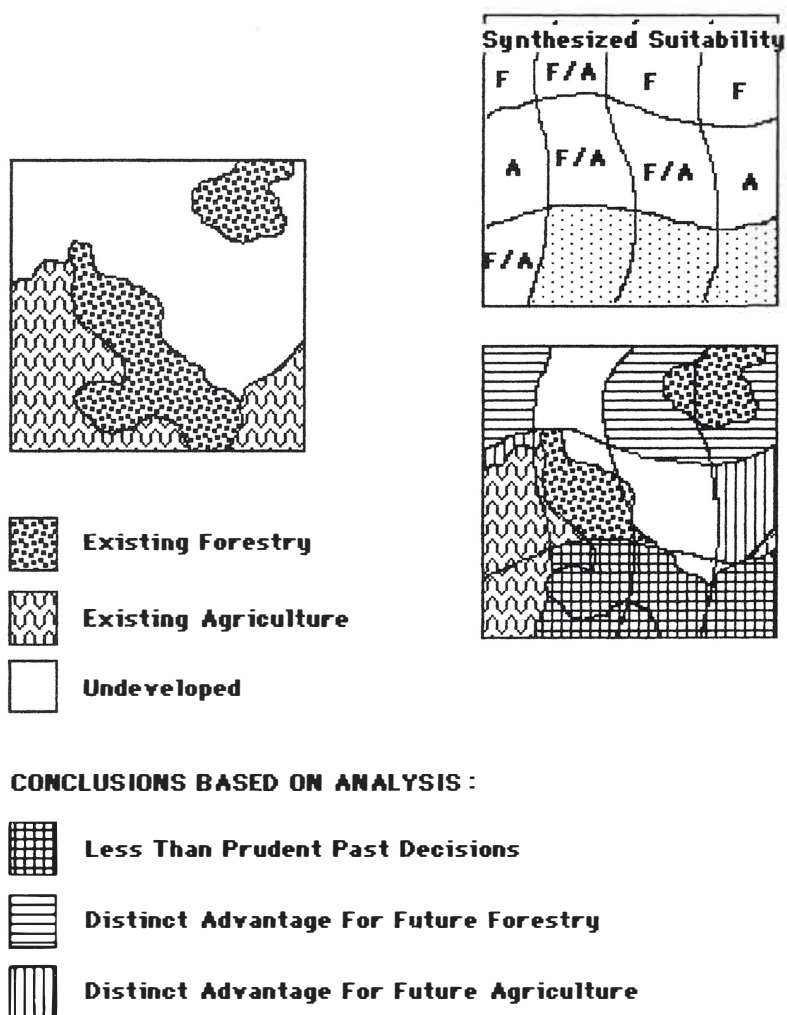


Figure 4. Land use analysis

The Development of a synthesized land use suitability map effectively incorporates environmental considerations, is objective, and facilitates plan approval by the local governing body

Students learned by doing throughout this project. The students only vaguely understood what an environmental analysis meant when the project was first initiated. Yet, they learned about each analysis component, and accomplished together as a team what they only vaguely envisioned at the onset. These students were similar, in terms of technical expertise and knowledge of environmental analysis, to members of planning commissions and planning boards in most American communities. Any community, town, city, county, or region can replicate the achievement realized by these students. The concepts of planning, even complex applications such as environmental analysis, do not have to remain vague and abstract. In short, the applied planning research demonstrated by this methodology illustrates how to better understand the complex and interdependent world in which we live, and how to use this improved understanding in making necessary land use decisions.

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**NO BLURRED EDGES; NO CROWDED MIDDLE: VOTES FOR JESSE HELMS
IN 1984 AND 1990****Jerry Ingalls and Jamie L. Strickland**

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Introduction

In 1984, North Carolina politics took center stage in one of the "meanest, ugliest, and most divisive" U.S. Senate campaigns ever run (Southern Exposure, 1985). In 1990, the attention of the national and international media was once again drawn to North Carolina and a highly emotional, antagonistic, but none-the-less classic, contest of political opposites. In the race for the U.S. Senate, Harvey Gantt, a black, self-styled and unabashedly liberal, former mayor of Charlotte, North Carolina's largest city, was pitted against Jesse Helms, an incumbent, three-term senator who has been touted as the champion of conservative causes in the U. S. Even more than in 1984, the candidates in the 1990 election offered images and positions which were clearly opposite and away from the proverbial political middle; there were no blurred edges in this election. There could hardly have been a clearer choice.

Despite a long and rich heritage of innovative work at the national and sub-national level, American electoral geography has delved comparatively less into the issues of political, economic and, more particularly, racial cleavages in state elections (Archer and Shelley, 1986). However, from the analysis of patterns of racial

American electoral geography has traditionally not been aggressive in investigating issues of political, economic and especially racial cleavages in state elections

voting in elections for mayor in large American cities (O'Loughlin and Berg, 1977; O'Loughlin, 1980), votes for referenda centered on race (Brunn and Hoffman, 1970), and from classic analyses of southern politics such as V. O. Key (1949) and Earl Black and Merle Black (1987), race is clearly one of the polarizing issues in American electoral politics, particularly in the American South. Thus, it seems reasonable to suggest that race was at least one of the major factors in the choice offered voters in the election for U. S.

Senator from North Carolina in 1990. However, racial politics was hardly absent from the election of 1984. Less clear is what, if any, role race may have played in accounting for the differences in votes for Jesse Helms in 1984 and 1990.

The Research Issues

This paper provides an exploratory glimpse into similarities and differences in the patterns of voting for candidates for the U.S. Senate during the elections of 1984 in which Jesse Helms took on Jim Hunt, and 1990 when Helms and Harvey Gantt locked in electoral combat. While in many ways the elections were similar, we expected

to find major differences based in large measure on the differences in the two Democratic candidates. Our objectives were first to measure and second to account for differences in the votes for Jesse Helms during these two elections. To accomplish these objectives we first examined the patterns of Helms' support in both years and focused at length on devising a method by which we might systematically compare votes in 1984 with those in 1990. We then analyzed the relationship between a dependent variable which measured the difference in support for Jesse Helms in 1984 and in 1990, and a set of selected social, economic, demographic, political and regional variables. The independent variables were chosen both to explore the impact racial cleavages might have had on variations in the Helms vote in 1984 and 1990, and to examine the strength of other possible factors in accounting for the different votes for Helms.

Helms and the North Carolina Electorate in 1984 and 1990

After announcing uncharacteristically late in 1989, Gantt made North Carolina history by winning the Democratic primary, thereby becoming the first black candidate for the U.S. Senate in North Carolina in recent history. In addition, he defied conventional wisdom and the predictions of political pundits by making the election closer than most expected. In fact, the 1990 election which Helms won by 5.1% was about as close as any Helms victory. Helms won by 3.9% in 1984; 10% in 1978; and 8% in 1972.

In both elections, 1984 and 1990, Helms was accused by opponents and detractors of using negative advertising and making inflammatory comments about his opponents in order to swing the vote in his favor. In the 1990 race, Helms unleashed a barrage of television ads in the final days of the campaign in an effort to win over undecided white voters and create enthusiasm and increase turnout among his supporters (New York Times, 1990). Perhaps the most effective of these ads was one showing the hands of a white man holding a crumpled piece of paper, which the viewer was led to believe was his application rejection or termination notice. Mean-

while, the voice-over suggested that quotas, affirmative action and, by implication, Harvey Gantt were to blame. In the state press this became known as the "quotas" ad.

It is quite tempting to build on such advertising images and on the sharp black and white contrasts of the 1990 Helms victory and to speculate, as does a plethora of popular literature, on the impact of "negative" advertising, race and racial politics. However, it is unclear exactly how Helms fashioned his victory or precisely what role these or many other potential factors may have played. Was it Harvey Gantt, the black candidate, which prompted most of

It is quite tempting to speculate on the impact of 'negative' advertising, race and racial politics; however, it is not clear precisely what role these factors, among many others, have played in Helms' victories

the 10% of the electorate who remained undecided until the week before the election to move, overwhelmingly, to Jesse Helms on election day? As suggested above, race could well have been a major factor. But what role could other factors have played in influencing voters: rural vs. urban setting; agricultural vs. manufacturing setting; variations in income and poverty; variations in the vote across classically defined regions of the state; or variations in population growth? This research explores the impact of all of these factors in accounting for variations in support for Helms.

The Dependent Variable

There were several alternative ways to compare Jesse Helms' success in 1984 and 1990. These included: 1) measuring and comparing the percent of votes for specific candidates—Gantt, Helms or Hunt; 2) measuring the differences between the levels of support for the two Democrats and the support for Helms (the differences in the percent vote for Helms and his opposition); or 3)

measuring the difference in the margins of Helms' victories over his opposition in 1984 and 1990. We chose to use the latter.

Again, it was most tempting to focus attention on levels of electoral support for Jim Hunt versus support for Harvey Gantt, the potential magnet for any negative back-

lash against a black candidate. However, we felt that this focused the research on the issue of race and, in many ways, presumed race was a, if not the, factor. Furthermore, simply analyzing the vote for Gantt, Hunt or Helms may not tell us what we need to know. Our primary question was whether the vote for Helms followed the same pattern in 1990 as in 1984, and if it did not, what were the reasons? While race might indeed be a major element, we were unprepared to reject other factors without determining their role. Accordingly, we chose to analyze the vote for Helms as a percent of the total vote in both 1984 and 1990. More specifically, we chose to analyze the differences in the margins of Helms' victory over his opposition in 1984 and 1990.

Approaching the analysis in this way assumed the two elections were comparable. While there are some important differences—the race of Helms' opponents and the length of the campaigns are two examples—the elections of 1984 and 1990 were quite similar in these ways:

1. Senator Helms won both elections by relatively narrow margins.
2. Both elections involved very high levels of campaign expenditures. Helms spent \$15.2 million in 1990 and \$16.9 million in 1984; his opponents spent \$7.7 in 1990 and \$9.5 million in 1984.

This is a study of the differences in the margins of Helms' victories in 1984 and 1990

3. The patterns of the percentage of total vote by county for Helms are similar.

On this latter point, when we compared the patterns of vote for Helms in 1990 and 1984 using the same data intervals, we noted little substantive spatial variation in these patterns. When we compared the pattern of electoral support for Helms, it remained relatively constant across all four of his senate races, even if this pattern of Helms support is not necessarily the one shared by other Republican candidates competing in state wide races (Ingalls 1990).

But simple pattern analysis of percent of vote for a candidate can be misleading. For example, despite the consistency in Helms' voting support, it is quite feasible that the margin of victory in a county can change from one year to the next while the county remains in the same map classification interval. Indeed, a simple correlation of the percent of vote for Helms in 1984 and 1990 yielded a correlation coefficient of .803. There were obviously marked differences in the level of support for Helms across the state even if there were not obvious differences in the pattern of voting.

Thus in comparing 1984 and 1990 votes for Helms, we chose to use the difference in the margin of Helms' victory over or loss to his opposition: Hunt in 1984 and Gantt in 1990. As can be seen from the examples given in Table 1, using either the actual percent of vote for Helms or using differences in actual percent of vote for Helms in 1984 and 1990 yielded quite different results from those obtained when we computed the percent of the margin of Helms' victory/loss. Examples in Table 1 show Helms lost Washington County in 1984 and won it in 1990 but the margin or shift was almost 25% overall; he lost Mecklenburg both times, but by a much larger margin in 1990. It is worth noting at this point that Harvey Gantt was from Mecklenburg County. It is apparent from these examples that our dependent variable of victory/loss margins allowed us to detect the degree of shifts in partisanship.

=====						
Actual percent vote			Difference in percent margin of Helm's victory			
	'90	'84	Diff	'90	'84	Diff
=====						
North Carolina	52.5%	51.7%	0.8%	5.1%	3.9%	1.2%
Selected Counties						
Mecklenburg	41.8%	49.2%	7.4%	-16.4%	-0.8%	-15.6%
Washington	52.4%	39.9%	12.5%	4.8%	-20.0%	-24.8%
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Table 1. Measures of Helms' victory margins, 1984 and 1990

Source: Computed from official North Carolina election returns

The Pattern of Margin Difference in Helms' Victory

Figures 1 and 2 indicated the striking dissimilarities in the two potential measures of margins of victory or loss. Figure 1, which measured the margins of victory in the election of 1990, seemed to suggest that Helms' greatest margins of victory came from the

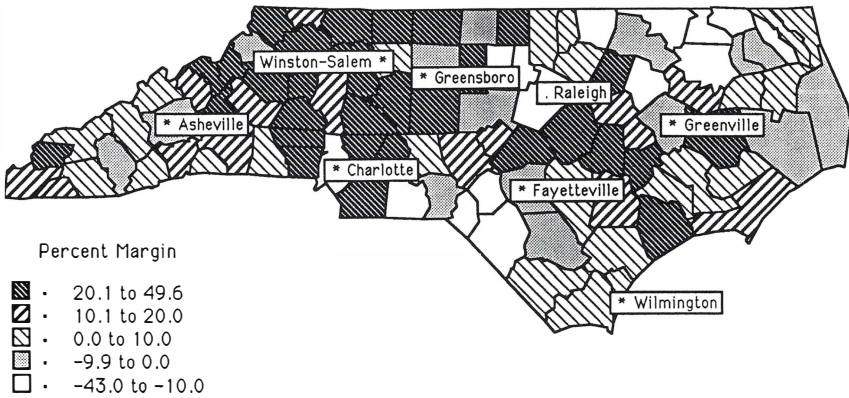


Figure 1. Margin of Helms' victory, 1990

western piedmont, central and northern mountains and the western part of the coastal plain. This pattern virtually duplicated the base of traditional Helms support we found when we simply mapped the percent of the total vote Helms received in each election. However, when we examined Figure 2, which measured the differences in the

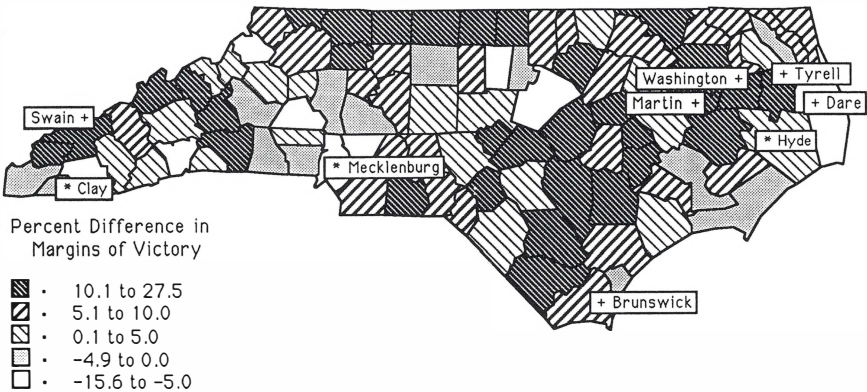


Figure 2. Difference in Helms' margin of victory, 1984 and 1990

margins of victory from 1984 to 1990, we noted a much different picture. Helms increased markedly the margins by which he defeated his opposition. He expanded his margins of victory in the coastal plain and tidewater areas, in the central and southern mountains and

in a line of counties bordering Virginia. At the same time, the level of support for Helms eroded markedly in some larger urban centers such as Mecklenburg/Cabarrus (Charlotte), Wake (Raleigh) and Catawba (Hickory) Counties, as well as in some counties with large college communities, such as Orange (UNC-Chapel Hill) and Watauga (Appalachian State) Counties. In these urban settings were the overwhelming majority of black voters (70%) as well as an electorate of white voters to whom a former urban mayor might appeal.

There were striking differences in the margins of Helms' victory in much of the more rural, agricultural and traditional parts of the state. Here, for the most part, Helms increased the margin of his victory over his opposition by more than 10%. This opened speculation over the potential impact that an ad campaign linking Harvey Gantt to federal laws inducing job quotas could have had in these rural, agricultural settings. Such ads could have dealt a heavy blow to Gantt's candidacy. However, in rural, agricultural areas of the state, being black could also have been a heavy blow to Gantt's candidacy. As suggested in a plethora of literature ranging from V.O. Key (1949) to Matthews and Prothro (1966), to recent efforts by Black and Black (1987), being black may not be a winning formula as a candidate in a state-wide, at-large election.

Given the uniqueness of an election where a black, liberal candidate was pitted against a white, conservative candidate, it was again tempting to speculate on the impact of race. How much of the change in support for Jesse Helms from 1984 to 1990 could conceivably have come from a reluctance of some voters to accept a black candidate in the race for the U.S. Senate? Unfortunately, at this scale of analysis, we have little prospect of separating Gantt the liberal, urban candidate from Gantt the black candidate. While we may not be able to measure the impact of Gantt's liberal label, we may gauge the impact of race with county level demographic measures.

Even at this level of pattern recognition and analysis, it is clear that the changing spatial variation in Jesse Helms' support levels could easily have been a function of many other influences. In order to more systematically determine the relationship between various social, demographic, economic and political factors and the change in margins of Helms' victory or loss we turned to regression analysis.

The Regression Analysis

Table 2 provides a list of variables which both the literature and pattern analysis of Figures 1 and 2 suggested could account for the spatial variation in the level of support for Jesse Helms. These variables were used in a multiple regression analysis in which the

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dependent variable was the percent increase or decrease in the margin of Helms' victory or loss in 1984 as compared to that in 1990.

The multiple regression yielded a multiple R of .640 and a squared multiple R of .409. In effect, these ten variables could account for only 41% of the total variation in the dependent variable.

Percent Farm, 1980
Percent Change in GOP Registration, 1984-1990
Number of incidents of Racial or Religious Bigotry or Organizing per 100,000 population, 1987-1990
Percent Agricultural Employment, 1980
Median Family Income, 1980
Percent Manufacturing Employment, 1980
Percent Population Change, 1980-1990
Percent Black Population, 1990
Percent Change in Black Population, 1980-1990
Percent of Total Population of State, 1990

Table 2. Independent variables used in regression model

Stepwise regression, with an alpha to enter of .015, entered only two of the ten variables in a model that accounted for about 39% (R-squared of .391) of the variation in the dependent variable. The two variables which entered the equation were percent agricultural employment, 1980 and percent population change, 1980-1990. Apparently, these two variables account for all but a small fraction of the explanation provided by all ten variables.

A second multiple regression analysis using only the two variables, percent agricultural employment, 1980 and percent population change, 1980-1990, was executed in order to analyze the residuals. In general, the largest negative residuals were Mecklenburg County in the piedmont, as well as Hyde and Clay counties in the tidewater and southern mountains, respectively. The largest positive residuals were Brunswick, Dare, Martin, Tyrrell and Washington counties in the tidewater or eastern most segment of the coastal plain and Swain County in the southern mountains (Figure 2). The coastal plain and tidewater counties typify the small, rural, agricultural counties which have been bastions of Democratic Party support. In this case, the Democrat was apparently less acceptable than was the candidate in 1984. We should note that Jim Hunt was from Wilson County which lies in the coastal plain just to the west of Martin County.

Implications and Conclusions

In many ways these regression results suggest a dichotomy that characterizes North Carolina politics in the last 20 to 30 years.

It is possible to conceive of the Gantt/Helms race as providing an example of the widening of the social, economic, political and demographic gap between North Carolina's rapidly growing urban centers and the rural, agricultural areas

Until the 1970s, North Carolina was more rural than urban. Since then the state has witnessed rapid population growth focused on a half a dozen urban centers. This growth produced a widening of the social, economic, political and demographic gap between the growing urban centers and the rural, agricultural areas in the coastal plain and piedmont regions. The Gantt/Helms contest could, like few other elections, capture the essence of this gap. More than the Hunt/Helms race, the 1990 contest could exemplify the changing mind of North Carolinians, with Helms exemplifying tradition and Gantt exemplifying change.

However, since the regression analysis could account for less than 40% of the variation, there are alternative reasons for the difference in the margins of Helms' victories. If the elections of 1984 and 1990 were similar in competitiveness, cost, national and state wide exposure, and organization and effectiveness of the campaigns, why then should the level of support for the one candidate who ran in both vary markedly? Is race the critical variable? At least at this scale of analysis, variables such as percent black

population, percent change in black population and a measure of racial or religious bigotry or organizing did not provide much assistance in explaining the variation in the dependent variable.

Research which has directly addressed racially motivated voting behavior indicated that race may not be the only factor influencing white voters. It has been suggested that the impact of race on the election of a candidate increases with the geographic scale of the election. Sonenshein (1990) indicated that urban demographics and structure were more conducive to the election of black candidates at the local level than at the state or national level. Other factors such as campaign style, previous political records, voter turnout, racial voting patterns and the current political climate have also been found to influence the success of black candidates (O'Loughlin and Berg 1977; Sonenshein, 1990; Citrin, Green and Sears, 1990). While demographic and scale issues were addressed in this paper, the level of analysis may well have blurred the impact of these variables. Precinct level analysis may well indicate a stronger relationship between such independent variables and the dependent variable we employed in this analysis.

Another possible factor—ininitely more difficult to measure without survey techniques—has been noted repeatedly in the popular literature. Harvey Gantt embraced the label of "liberal" with open arms; perhaps a little too openly for some people. The media ran several stories along this line throughout the campaign which might well have influenced the outcome. On November 4, the Sunday before the election, The Charlotte Observer (1990) ran a front page

story with Gantt proclaiming "'Liberal' Label Fits Fine." This suggestion, along with indications in the scholarly literature that a negatively perceived campaign style could be harmful to a campaign, regardless of race, could provide a point of departure for future study.

In part because of the scale (counties) of this analysis it is not clear that the aspects of race, negative advertising and the liberal label were major factors

Clearly we could not account for a major proportion of the explanation of why Helms' margins of victory and loss shifted markedly from 1984 to 1990 while the outcome was reasonably comparable. If race was an issue, it clearly cannot be detected at this scale of analysis. If negative advertising or liberal versus conservative tags were major factors, an entirely different, more behavioral research

design is warranted. Further analysis is needed in order to determine if these or other explanatory variables provide answers for this timely research problem.

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AQUACULTURE AND ECONOMIC DEVELOPMENT: POTENTIALS IN SOUTHEASTERN NORTH CAROLINA

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Economic development has largely bypassed much of the rural coastal plain of southeastern North Carolina. Few industries requiring skilled workers and paying high wages have been attracted to the region. Most new jobs created in the region have been in low skill, low wage industries that do little to foster economic advancement. To increase development in the region, it is imperative that new economic activities be put in place. These activities must be compatible with the natural and cultural resources of the region. One such activity that many believe has significant potential to enhance economic development is aquaculture, especially catfish farming.

Catfish farming may be one of those new activities that are critically needed in economically lagging southeastern North Carolina

This paper examines the feasibility of expanding aquaculture acreage in southeastern North Carolina by evaluating climate, soil and water resources required to support a large aquaculture industry. In this paper, southeastern North Carolina includes the counties of Bladen, Columbus, Cumberland, Hoke, Robeson and Scotland, but the focus is upon Robeson County because Robeson's economy, soils, climate, topography, and water resources are typical of the region. It is assumed that what is aquaculturally feasible in Robeson should apply to the region as a whole.

The Aquaculture Industry in the United States

Aquacultural specialists in many regions of the United States contend that aquaculture is an industry with much potential for expansion in the 1990s. Their optimism is based upon an expanding population, decreasing catches from the world ocean, and aquaculture's ability to provide a clean product grown under closely monitored conditions that limit pollution, unlike the catch from the rivers and oceans where there is no or very little quality control. Medical research showing that seafood is a "health" food also should contribute to increased seafood consumption in a very health conscious population. The health and nutrition concerns of an aging population and dietary preferences of many ethnic groups are also important factors affecting demand for seafood, a demand that most likely will need to be met by aquaculture rather than landings from the world ocean.

American aquaculture includes the production of many species, including catfish, trout, salmon, hybrid striped bass, tilapia, shrimp, oysters and other mollusks as well as alligators. But catfish

production accounts for almost half of the total industry output and represents the vast majority of aquaculture production and expansion during the 1980s. Catfish farmers in 1980 delivered 46 million pounds to processors, in 1989 the figure had risen to more than 343 million pounds (USDA, March 1990). Most of the production was concentrated in a handful of southern states. Mississippi leads in total sales while Arkansas is a distant second (Table 1). Although North Carolina currently ranks tenth in total sales, its rate of expansion of acres of operations (up 89.3 percent in two years) makes it one of the fastest growing states in the country. In a single year, from 1989 to 1990, the aquacultural water surface increased by more than 60 percent while yield expanded by approximately 120 percent (USDA, March 1990:32-33). Total sales increased from 883 thousand dollars in 1988 to almost 1.2 million in 1990 (Table 1).

State	Operations		Water Surface		Total Sales—all sizes	
	Number		Acres		\$1,000	
Mississippi	345	308	88,000	94,000	192,804	227,400
Arkansas	204	206	16,000	20,500	22,752	29,577
Alabama	352	350	13,466	18,600	23,811	24,062
Louisiana	150	200	8,000	11,500	12,531	15,225
Texas	148	145	1,656	3,640	1,136	5,997
Missouri	200	125	2,700	2,700	2,041	2,576
Florida	66	47	845	1,200	1,808	2,474
South Carolina 1/	—	29	—	1,450	244	2,381
Oklahoma	90	85	1,400	1,300	966	2,235
North Carolina	36	50	581	1,100	883	1,172
Other 2/	105	147	2,772	4,680	10,740	10,110

Table 1. Catfish: Number of operations, water surface area, and total sales: 1/1/89 and 1/1/91

1/Included in other states.

2/Includes California, Georgia, Idaho, and Kansas.

Source: *Aquaculture: Situation and Outlook Report*. USDA, Economic Research Service. March 1990, pp. 32-33; March 1991, p. 29.

To predict future expansion, however, it is more realistic to examine recent consumption rates rather than production rates. In 1989, per capita consumption of catfish in the United States was about 12 ounces while per capita seafood consumption was almost 16 pounds, up from 13 pounds in 1980. If catfish were to maintain its current percentage of total seafood consumption, an increase to about one pound per person, or an additional 160 million pounds of harvest annually would have to be realized (USDA, Sept. 1990:9). Such an increase would add about 75,000 acres of aquacultural water surface.

Aquacultural production is rapidly gaining on expected demand so that new market must be cultivated if water surface is to continue its present rate of expansion

The United States' catfish industry is expanding its capacity faster than this projected demand. For example, approximately 30,000 acres have been added to production during the past two years and more than 14,000 are under construction. If this trend in expansion continues, the major challenge to catfish producers will be to develop new markets rather than to increase acreage (USDA, Sept. 1990:9).

The potential agriculturalist should evaluate pond sites, water supply, soils, and market possibilities, and then examine the potential for profitability (Jensen). Most im-

portantly, persons considering aquaculture ventures should be certain that they have a market for their product and realize that aquaculture is an expensive undertaking. Start-up costs, including land purchase, pond construction, well drilling and equipment purchases quickly add to several thousand dollars per acre. According to farmers in the region, the average start-up cost in Robeson and surrounding counties exceeds \$6,000 per acre. Annual operating costs can exceed \$2,500 per acre. So the investment is high for the average \$1,000 per acre profit. And while risks are comparable to those of other crops, the management requirements are higher.

Resources Affecting Aquaculture in Southeastern North Carolina

The physical environment is at present a major delimiting factor in aquaculture's development. The industry requires a mild climate, level land, abundant supplies of high quality water, and soils suitable for pond construction.

The climate of southeastern North Carolina and Robeson County is humid subtropical, characterized by abundant rainfall during all months, a cool, moist winter and a long, hot summer. So the region's climate falls within the range normally identified as acceptable for catfish and striped bass production.

The study area's topography is generally level except along the marine terraces and interfluvies between stream floodplains where the land slopes up to 12 percent. Shallow, elliptical depressions, known as Carolina Bays, are found throughout the Coastal Plain region. Many of the bays could most likely be more effectively used for fish farming than for field crops. Some of the level land is not well suited to crop production because of poor drainage, especially when precipitation exceeds runoff and the water is ponded for several days. Thousands of acres of level to gently sloping land on the Atlantic Coastal Plain are topographically suitable for aquacultural use.

The development of an extensive aquaculture industry is contingent upon a dependable, high quality water supply. The water

The Carolina Bays, shallow, elliptical impressions on the land, appear to lend themselves well to fish farming

should be of such quality that it would not negatively affect the production operations (saline or high iron levels, or low oxygen levels) or contaminate the fish. In southeastern North Carolina, most of the water used in aquaculture could be extracted from geologic formations consisting of alternating layers of less permeable clay and sand. These Cretaceous aquifers such as the Black Creek, Cape Fear and Pee Dee, provide much water for irrigation and other purposes. Two recent studies (Ross, 1989, 1990) show that, in general, the quantity and quality of groundwater supplies within the region are acceptable for aquaculture and identify no contaminants that would affect either the growing operations or the fish. In fact, much of the region's water is ideal for catfish production. The Black Creek Formation, the largest in volume and areal extent, appears to be the most significant source of water for future aquacultural activities in the region.

Most of the region's soils are acidic and low in natural fertility and organic-matter content. The "A" and "B" horizons are usually up to five feet thick, and are underlain in most soil series by a clay or sandy clay loam "C" horizon and are very suitable for pond construction. These characteristics make it feasible for landowners to consider aquaculture as an alternative to field crop cultivation, especially in some of the less fertile soils.

Soils suitable and available for aquaculture in Robeson County alone total 8-9000 acres

A preliminary identification of the soil series best suited for aquaculture was made by comparing the agricultural productivity and engineering uses of each soil series. Soils with highest yields for important field crops such as corn, tobacco, cotton and soybeans were not considered viable for aquaculture since they were providing a good

return to the farmer.

Soils with low crop yields, but which are suitable for pond construction, were identified as the most likely initial candidates for aquacultural operations (Table 2). Two additional criteria: the limitations for pond reservoirs and the limitations for levees, were then considered. The limitations ranged from slight to severe. Soils

Series (lb.)	Acreage	Limitations		Crop yield		
		Ponds	Levees	Corn(bu.)	Soybeans(bu.)	Tobacco
Byars	3,157	Slight	Moderate	90	—	—
Coxville	31,934	Slight	Moderate	85	40	--
McColl	9,228	Slight	Moderate	85	40	—
Meggett	1,821	Slight	Moderate	—	—	—
Toisnot	2,307	Slight	Moderate	—	—	—

Table 2. Robeson County soil series suitable for pond construction

Source: Derived from Soil Survey of Robeson County.

with slight limitations for ponds and up to moderate limitations for levees, and with low agricultural yields, are deemed most suitable for aquaculture. In Robeson County those soils include Byars, Coxville, McColl, Meggett and Toisnot series. None of these are prime farmland, but they are well suited for pond construction. Almost 50,000 acres of these soils are present in the county. Of those at least 8 or 9 thousand are available for aquaculture. Thus if a substantial market ever materializes, and if farmers are interested in aquaculture, soils suitable for constructing ponds are widespread.

Robeson and surrounding counties should adjust quite well to aquaculture. Robeson is a rural county, with many of its 105,000 inhabitants economically dependent upon extracting a living from the soil. The people have a long tradition of working the land, and in doing it with some efficiency. In 1987, Robeson County led North Carolina in farm cash receipts (Watson 1989). In 1988, almost 30 percent of Robeson County's 606,000 acres were cultivated. Thus, approximately 140,000 of the 320,000 acres of farmland were not in production in 1988 (Ross 1982). About 12,000 acres were planted in tobacco, 53,000 in corn, 91,000 in soybeans, 28,000 in wheat and 11,000 in cotton. Forests cover about 50 percent of the county, within Much of it found in wetlands or poorly drained floodplains.

Other Considerations

What factors other than soil and water should be important to the individual farmer who is considering aquaculture activities? The first consideration is geographic (Davis 1990). For example, the ponds must be readily accessible to the farmer's house because aquaculture is a labor intensive industry and ponds must be placed where they are easily accessible and where trespassing is minimized. Second, the farmer does not want to use land that is more valuable for other crops. The farmer should be satisfied that aquaculture will yield more dollars for those spent than some other crop produced on the same land. And finally, the farmer must want to grow fish and be aware of the risks associated with the industry.

The image of quality can demand that premium price that will make it possible for the small producer in Southeastern North Carolina to successfully compete with producers elsewhere

Aquacultural operations presently operating in the region are small, ranging from four or five acres to about 50. Most future producers in Robeson County and southeastern North Carolina are going to be small, probably tending to operations of fewer than 30 acres and will most likely use family members as the major source of labor. These growers are not capable of competing with the large producers in Mississippi and Alabama, but instead should concentrate their market-

ing efforts toward local markets. Marketing strategists suggest that local outlets are "willing to pay a premium for fresh, high quality fish.

These (local) firms also may buy smaller quantities than more distant and perhaps larger processors. Local producers... have locational advantages, these advantages include the ability to deliver a very fresh, high quality product" (Easley 1987). Thus small growers should emphasize quality, which may be one of the keys to their success. In some respects, the image of quality can demand a premium price that makes it feasible for small producers in southeastern North Carolina to compete with larger but more distant growers.

Conclusions

Is aquaculture a viable industry in southeastern North Carolina? It appears that the region does have potential for a substantial aquacultural industry, though it will never rival that of the Gulf Coast states. But the proximity to the northeastern United States market and the apparent abundance of high-quality water and land resources provide the basis for a significant industry that could diversify the economic base of the region. The continued growth of the industry will depend upon sales to the northeast, but in the early stages the industry should concentrate on serving local markets such as restaurants, seafood markets and supermarkets. As experience is gained in production, processing, and marketing, the region could then begin to move into urban markets in the eastern United States. It is probably not realistic to expect any such expansion within the immediate future. However, if the demand in the United States continues to expand at current rates, southeastern North Carolina should expect to contribute significantly to the expansion.

Aquaculture fits into a secure environmental and economic niche in Sotheastern North Carolina

Aquaculture has an environmental and economic niche in southeastern North Carolina. Interested farmers should consider putting land that is not profitable for field or truck crops in aquaculture. Thousands of acres of such land are found along the numerous interflaves and in Carolina Bays. It is also recommended that the producers should initially concentrate on local markets, taking care not to produce more than local markets can consume. Rational

producers, using the existing natural resources of the region, can make aquaculture a profitable industry that could, early in the twenty-first century, become a major asset to the region's economic development.

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THE NORTH CAROLINA GEOGRAPHIC ALLIANCE: ACCOMPLISHMENTS AND OBJECTIVES

William Imperatore and Douglas Wilms

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North Carolina was designated a member of the National Geographic Society's Geographic Education Alliance Network in December 1986. Co-coordinated by Bill Imperatore of Appalachian State University and Douglas Wilms of East Carolina University, North Carolina was one of seven states in 1987 to begin various activities to enhance and promote geography instruction. The Alliance Network now has 42 states in it.

The underpinnings of what has become a nationwide effort was established by Gilbert M. Grovesnor, Chairman and President of the National Geographic Society who committed the full weight of the Society's international image and reputation, its capabilities to produce high quality instructional materials and substantial financial resources into an effort to revive geography instruction in the United

The National Geographic Society has provided a critical educational linkage to social studies teachers through its support of the North Carolina Geographic Alliance

States. This effort is in response to the appalling lack of geographic knowledge as revealed by several well publicized polls. The NCGA, an alliance of public school teachers, administrators, university professors, personnel of the State Department of Public Instruction and anyone interested in geography, is committed to the goal of reviving and enhancing geography in the curriculum by equipping social studies teachers with the strategies and materials to implement the state's curriculum.

North Carolina is somewhat unique in that the 4th through 7th grade social studies curriculum is geography based, and the opportunities for geography instruction are many. This is attributable to the positive view of geography held by the leadership in the Social Studies Section of the State Department of Public Instruction. Unfortunately, many social studies teachers are certified by teacher training programs which contain little or no geography per se, or the geography courses are not taught by a geographer. All of these teachers have considerable coursework in history, however, and in many instances that is what is stressed in the classroom.

In its first year the Alliance established liaisons between professional geographers at several colleges and universities across North Carolina and the state's regional social studies coordinators, for the purpose of identifying in-service workshop strategies for their respective regions. Five public school teachers were selected to attend an intensive four-week summer geography institute in Washington, D.C. hosted by the National Geographic Society. These intensively trained teacher-consultants would become the core of a

team of trained professionals who would help conduct similar summer institutes in North Carolina and spearhead other inservice training activities across the state. Also, an initial series of two-day geography conferences was begun, one in each of the eight educational regions, with a focus on the needs of fifth grade teachers. Schools across the state participated in Geography Awareness Week activities, with the help of Alliance members.

The NCGA's first two-week, resident Summer Geography Institute was held in the summer of 1988 on the campus of East Carolina University. Staffed with N.C. teacher consultants and

In further support of geographic education the U.S. President and the N.C. Governor proclaimed the first Geography Awareness Week in 1987

professional geographers, it was the beginning of a series of summer events that has gained a positive state-wide reputation for the Alliance. Patterned after the Society's institutes in Washington, teachers interacted with the Five Themes In Geography developed by the NGS, AAG and NCGE; were exposed to global geography content; were trained in the preparation of effective lesson plans based on the five themes, and received several hundred dollars each of teaching materials supplied by the National Geographic Society,

the Alliance, and several commercial firms such as Cram, Nystrom, Rand McNally, and Wiley. The second series of two-day conferences began that fall and focused on the needs of sixth grade teachers. For the second year, Geography Awareness Week was officially proclaimed by the President of the U.S. and the Governor of North Carolina.

The institute shifted location to Appalachian State University in the summer of 1989. Participants from across the state were treated to almost two solid weeks of rain (hey-its Cfb) but their participation and enthusiasm was undampened. Armed with their knowledge of the five themes, their workshop skills and loads of teaching materials, another group of North Carolina teachers returned to their classrooms that year with the goal of improving geography instruction on their minds.

The Alliance was no longer eligible to send teachers to the Washington institute, but was able to send two teachers to an Instructional Leadership Institute. These teachers were trained to be liaisons with the state's political structure. What was to be the final series of two-day geography conferences was begun. These focused on the needs of seventh grade teachers. It was decided these conferences were too short in length to achieve the kind of "bonding" and camaraderie as that among teacher participants in the summer institutes. Also, the regional content specialist positions across the state were eliminated and the number of regional centers was reduced from eight to five. One of our most valuable resources, the eight social studies coordinators, no longer existed. These folks provided

the meeting space, advertised the conferences, organized the participants, did presentations, and arranged the coffee breaks. We will miss them and their help and expertise greatly.

The decline in conference activity was made up by an increase in summer institute activity. The Alliance's first commuting institute was held on the campus of UNC Charlotte under the direction of Tyrell "Tink" Moore. And in the following year, 1991, the Alliance held two institutes: one for K-3 teachers held at UNC-Wilmington and directed by Frank Ainsley; the other was an advanced institute in weather and climate held at Appalachian where the rain gage was never empty. Both were residential institutes one week in length.

That same summer, two graduates of our previous institutes attended an intensive Instructional Technologies Leadership Institute in Atlanta. Funded by IBM, these folks were familiarized with the latest computer and CD ROM based technologies for teaching geography. Each received an IBM computer, printer, CDROM player, modem and a host of software technology. They will be a valuable resource in future summer institutes.

The summer of 1992 is seeing the most ambitious effort yet by the Alliance. Three summer institutes are being concluded. All are commuting institutes. A one-week non-traditional institute is held in Asheville and twelve-day institutes are in the Triad and Triangle areas with the latter under the direction of John Florin. This dispersion of the effort is partially in response to the state's budget crunch. For three years the state legislature provided \$50,000 to fund Alliance teacher training activities. Each year this was matched by an equal amount from the National Geographic Society. When it was obvious no state funding would be available for 1992, Doug Wilms raised more than \$50,000 from private foundations. Usually, these private funds are specified for use in a particular area of the state, hence the dispersion.

Since its inception, the Alliance has served the needs of almost 1,000 teachers directly. Since all participants in Alliance conferences and institutes are expected to do inservice for their colleagues, there is a considerable multiplier effect potential. But no accurate tabulation exists of the number of teachers impacted by activities carried out by the Teacher Consultants, ILI, ITLI and summer geography institute graduates. The Alliance newsletter now has more than 4,500 names on the mailing list. Because of the commitment of the National Geographic Society, these heady times for geography instruction are intended to continue in perpetuity.

Though much has been accomplished, there is much to do. The North Carolina Geographic Alliance will continue to evolve and grow in numbers and influence. Two summer institutes are already in the planning stages for the summer of 1993. One will be jointly

Institutionalization of the NC Alliance is reflected in the new 10th grade global studies requirement which may be satisfied by a world regional geography course

sponsored by the NCGA and the Eisenhower Foundation and will focus on environmental education. The second will focus on world regional geography for 10th grade world studies teachers. Because of the efforts of two of the former social studies coordinators, the Five

Themes In Geography have been incorporated into the grades 4th through 7th grade social studies curriculum. Moreover, institutionalization of the Alliance is reflected in the new Global Studies requirement at the 10th grade level which may be satisfied by a world regional geography course. The Alliance will continue to support the inclusion of a geography course requirement for high school graduates seeking entry into the state's university system. There is now a cadre of well trained and experienced teacher consultants whose role in Alliance activities will increase.

Members of the professional geographic community has been called on to participate in Alliance activities in the past and this will intensify in the future. An active steering committee is currently in place and functioning and meets twice each year. The Alliance is now part of the Learning Link network. A committee will select appropriate lesson plans and other materials for inclusion in this "free of charge" computer accessible data base. An annual meeting has been held each fall in Burlington. The meeting this year will be on October 17 and will feature concurrent sessions, a special speaker and loads of door prizes.

The major resource which would ensure continued Alliance activity is permanent funding. This can be accomplished by attaining status as a normally funded part of the state's educational budget and/or by acquiring funds for inclusion in the National Geographic Society's Geography Education Foundation. Earnings from this fund would support NCGA activities in perpetuity. Thanks to the leadership of the National Geographic Society, a permanent voice on behalf of the need for good geography instruction in the United States and North Carolina has been established.

**ABOUT THE COVER: WATERSHED PROTECTION AND
GEOGRAPHIC INFORMATION SYSTEMS****Art Rex**

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Introduction

The North Carolina General Assembly passed legislation during the 1989 session that entrusted the regulation of minimal environmental standards of watersheds to local governments. The goal of this legislation is to protect surface water supplies from pollution by managing development densities, allowable land use, industrial and residential discharge, and chemical qualities of the water.

Since adoption of this legislation many local governments are turning to Geographic Information Systems (GIS) for watershed identification and management. Pertinent databases are efficiently captured, stored, manipulated, analyzed, managed, and retrieved in such systems.

Technical issues

The front cover of this journal was created by utilizing the PC ARC/INFO and Earth Resource Data Analysis System (ERDAS) geoprocessing software. Digital Elevation Models (DEM's) were manipulated in the raster based ERDAS system and transferred into vector based PC ARC/INFO format. Overlaying of the stream database provided from 1:100,000 scale United States Geological Surveys (USGS) Digital Line Graphs (DLG's), and digitizing the extent of the watershed were accomplished within PC ARC/INFO. The combination of these three files (topography, streams, and watershed boundary) create a dramatic representation of Watauga County, North Carolina, and provide useful spatial information to local governments.

The Stream Hierarchy shown by varying line widths depicts the individual stream orders and should not be confused with the actual widths of the streams. The use of stream hierarchy highlights to the viewer the tree like, or dendritic drainage, pattern that exists in the

Geographic Information Systems are potentially very useful in dealing with the complex data bases required for appropriate watershed management

Blue Ridge Mountains. Overlaying the hydrography on the topography does not allow for the standard blue color for water to be used. This is due only because of plotter medium and limitations. This product was created by a standard plotter using felt tip pens. There are, however, more sophisticated and expensive printers and plotters available that allow for overlaying of colors more effectively. These data bases were created and intended to be produced at a scale of 1:63,360 or one inch equal to one mile. It should be noted that the scale on the front cover (approx. 1:350,000) does not allow the viewer

to study the full amount of detail that actually exists within the database.

The back cover utilized a 1988 MultiSpectral Scanner (MSS) satellite image of the area to classify land cover types within ERDAS.

This land cover layer was transferred to PC ARC/INFO format and clipped by the watershed boundary of Winkler Creek. Streams from the DLG were utilized and critical areas were delineated by buffering the point - mile buffer at which the water intake valve for Boone is located and within 200 feet of the stream.

Scale differences of the front and back covers demonstrate the improved readability of the larger scale

This file generated from the MSS satellite image represents clearly how accurate these data sources are. At this scale note the detail within the watershed. Also note that

the MSS cells are normally 79 x 56 meters and for this example those are doubled in size. This is due to the file that was used. It was clipped from the entire county file which was approaching the limitations of the personal computer. The image was georeferenced and rectified at the county level and perhaps this is the reason for the water on the back cover file around Boone Reservoir to not match up exactly with the 1:100,000 DLG. On the other hand notice that the area adjacent to Trout Lake shows no water on the landcover image, but instead open land. This is due to the time at which the MSS image was acquired. In June of 1988 Trout Lake had been drained for future repair, consequently there was no lake present for the satellite sensors to read. Thus we can see just how sensitive and valuable satellite information can be.

Acknowledgments and thanks are extended to the following:

1) Appalachian State University's Department of Geography and Planning, Geographic Information System and Image Processing Lab, which dedicated the use of the lab;

2) David Wray, a graduate student in the Department of Geography and Planning at Appalachian State University, without whose dedication and expertise the work would not have been possible;

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In sum, the examples provided on the cover of this issue clearly indicate the usefulness of GIS and the adaptability of available digital data to produce high quality analysis and output within a PC based environment.

WINKLER CREEK WATERSHED

LANDCOVER AND HYDROGRAPHY

