SOCIO-7: Forests and the Quality of Life

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How do forests and their uses influence the quality of life in the South?

1 Key Findings

- The forest products industry is concentrated in areas where economic opportunities are relatively limited.
- The forest products industry provides good paying jobs relative to other economic sectors in areas where the forest products industry is located.
- Indicators of social conditions are generally associated with factors having a positive influence on quality of life in areas of concentrated employment in the forest products industry.
- Concentrated employment in the pulp and paper sector and the primary wood products sector is associated with various indicators of an increasingly "industrialized" forest.
- Concentrated employment in the forest related recreation and tourism sector is associated with various indicators of more "natural" forest conditions.
- Concentrated employment in the forest related recreation and tourism sector is associated with better economic conditions in rural areas of the South, relatively higher levels of economic development and more rapid population growth.

2 Introduction

Quality of life is a multidimensional concept that is akin to, and often used interchangeably with, the terms "well-being", "welfare" and "standard of living". The term "quality of life" refers to a summary measure of well being in society, where the locus of well-being is in individual members of society. This frame of reference presents analysts with substantive difficulties principally because there is no generally accepted theoretical model to guide analyses. The lack of a theory of what exactly constitutes "the good life" derives from the fact that the psychological processes by which people identify and integrate the important domains of their lives are generally unknown (Wish 1986, Mukherjee 1989). Thus, the specific components that should be included in a quality of life assessment are ambiguous, the appropriate weights to place on

components are unknown, and indicators are typically chosen based on intuition (Bayless and Bayless 1982, Diener 1995) and ease of data collection (Power 1980). Further, the means by which individual well-being can be meaningfully aggregated to represent social welfare is not a simple matter (for example, see Arrow 1983), and how well off one is in society relative to others may be more important than any absolute measure (Easterlin 1974).

To give the reader a better sense of how the quality of life concept has been treated in major studies, we briefly review some well-known indices. Then, we consider the types of analyses to which social indicators, in general, can contribute. We then consider the specific indicators that will provide insight into how forests contribute to the quality of life of individuals and society in the South. Component indicators are grouped under economic, social, demographic and amenity domains.

2.1 Quality of life indicators

One of the most widely known indicators of the quality of life is the Human Development Index of the United Nations Development Program (1998). The Human Development Index combines national indicators of income, life expectancy and education into a single number. First, a standard score is computed for each component indicator by country (where the standard score measures the difference between a country value and the maximum value divided by the range of values across countries). Next the standard component scores for each country are summed. This procedure results in a measure that allows countries to be ranked by the summary index and allows comparisons to be made across countries regarding quality of life.

In the United States, there is concern among social scientists that "more" does not unambiguously imply "better", that social costs may increase along with economic growth, and that economic measures alone provide a biased estimate of how well the people of the United States are doing. A number of indicators of social progress have been developed that adjust standard economic measures to account for social and environmental conditions. One such model is the Genuine Progress Indicator, which includes measures of such things as personal consumption, income distribution, value of housework and parenting, cost of crime, loss of old-growth forests, and loss of leisure time (Cobb and others 1995a,b). Values for the component indicators are summed up to produce a summary measure which is tracked over time to indicate trends.

In the private sector, the quality-of-life concept is used to rank the best places to live, work or do business based on multidimensional scales of well-being (for example see Boyer and Savageau 1981; Garoogian and others 1998; Morgan Quinto Corporation 1998). These indices use arbitrary methods for selecting and combining component indicators for wide-ranging measures of quality of life such as income, pollution, taxes, quality of public schools, number of women-owned businesses, and percent of adults who are binge drinkers.

Thus, we can see that summary measures of the quality of life are used to make comparisons, either across different places at a given point in time or over time for given locations (Dasgupta

1999). These data allow analysts to evaluate trends, anticipate future conditions of social well-being and determine how well certain locations are doing relative to other places. However, significant methodological issues remain regarding how to select component measures and the appropriate weights to be placed on components in creating a summary index. In this Chapter, we attempt to bypass some of these methodological problems by using an array of indicators that are not meant to be additive but rather provide a pluralistic view of the elements that reasonably enter into an assessment of forests and quality of life. A disaggregate approach, which focuses attention on a set of component indicators, is also used in assessments of the social health of the nation (for example, see Miringoff and Miringoff 1999).

2.2 Component indicators

Component indicators can be categorized in three types: (1) descriptive, (2) criterion, and (3) subjective (Land 2000). Descriptive social indicators are used to understand the main features of society and the changes that are taking place in social conditions (Sheldon and Parke 1975). Criterion indicators focus more attention on the linkages between social indicators and policies that directly affect social welfare (for example see U.S. Department of Health, Education and Welfare 1969). Subjective indicators are used to measure psychological variables such as happiness and life satisfaction using survey methods (for example see Veehoven 1996).

In this Chapter, we focus our attention on descriptive indicators. We do so because there is a very limited amount of prior research linking quality of life indicators and forests, and the forest policy controls that could be used to influence quality of life in the South are not well established. We also review some subjective indicators, drawn from the literature on nonmarket valuation, which will help guide the analysis. Thus, this Chapter is intended to be instructional, in the sense of providing a framework for thinking about linkages between quality of life and forest uses and conditions in the South. This chapter also is exploratory, in terms of drawing some preliminary conclusions about such linkages.

2.3 Indicators relevant to forested areas: economic indicators

To begin our exploration of potential quality of life indicators, then, we note that a number of recent studies have shown that income is highly correlated with various indices of the quality of life across nations (Diener 1995; Dasgupta 1999) and across U.S. States (Ferriss 2000). Of course, correlation does not imply causation. However, these results suggest that economic variables are useful in providing measures of well-being and should invariably be included in quality-of-life analyses.

From a forestry perspective, forests provide jobs and income to people who grow, harvest and process timber as well as other non-timber forest products such as pine straw, wild edibles and medicines. Forests also provide natural settings for outdoor recreation. Whether providing inputs to the forest products or recreation industries, forests contribute to quality of life by providing income and employment, particularly in rural areas where other economic opportunities may be limited.

Some people have argued that the contribution of the productive aspect of forests to quality of life is greater than simply the jobs created in the forest products sector. They posit that the forest products industry is an important engine for economic growth in forested regions (for example see Schallau 1994). This view is formalized with the "economic base" model, which argues that, through the export of goods and services, basic industries bring in money from outside of the local economy. That money stimulates job creation in the local sector through spending on local goods and services.

Does the export of timber products outside of local economies enhance the quality of life for other participants in the local economy? This question is not easily answered. However, it is informative to consider some of the limitations of the economic base model that have been articulated by forest policy analysts about quality-of-life issues (Crone and others 1999; Niemi and Whitelaw 1999; Power 1996). It has been pointed out that if basic industries have a detrimental impact on the environment, the well-being of people who live there would decrease. Because impacts of industry on the natural environment are not included in economic base calculations, failure to account for such impacts imparts a bias to quality of life assessments. In addition, the economic base model focuses attention on the export of goods and services outside a region, but does not consider the flow of money generated by people who are attracted to an area because of its natural amenities (English and Bergstrom 1994). This omission includes people who visit an area for recreation and tourism as well as people who decide to move to an area because of the quality of the natural amenities found there.

2.4 Indicators relevant to forested areas: demographic and social indicators

A direct approach for considering the impact of environmental amenities on the quality of life would be to consider the impact of natural environments on the behavior of members of society. It is a historical truism that people migrate to improve their quality of life. In the United States, a number of recent empirical studies provided evidence that rapid rural population growth has not resulted from growth of extractive industries or manufacturing but, rather, has resulted from the attractiveness of natural environments (English, and others 2000; Deller, and others 2001). Johnson and Beale (1994) found that, during the early 1990's, the fastest growing counties in the U.S. were non-metropolitan counties that were destinations for retirement-age migrants or were recreation centers. Of the 285 counties identified as "recreational," 47 (16 percent) are in the South (Beale and Johnson 1998). Although some of these southern counties are attracting in-migrants because of their proximity to the coast, many southern recreational counties experiencing rapid growth are found in forested areas such as the Southern Appalachian Mountains and the Ozark-Ouachita Highlands. While a substantial body of research has sought to understand the benefits of outdoor recreation and leisure time (for example see Driver and others 1991; Driver and others 1996; Cordell and Bergstrom 1999), perhaps the simplest indicators of the impact of natural amenities on quality of life are measures of population change that reflect migration decisions.

Social indicator research has been applied to issues related to rural development (for example

see Richmond and others 2000) and forest-dependent communities (for example see Parkins 1999). A widely cited study conducted in the Northeastern United States designed to evaluate the influence of forest-based industries on rural communities concluded that "Forest communities are among the least prosperous of all rural communities; standards of health and happiness tend to be lower than average; while family status is high, divorce rates are very high, housing and public services and amenities are poor; economic stability is low, with high seasonal unemployment, high rates of population turnover and poor wages and earnings" (Drielsma 1984). This "snapshot" of forest communities suggests that people living in those communities are not living "the good life". Although, social scientists are hard pressed to identify exactly what constitutes "the good life", there is broad agreement that social factors must be included in any assessment of quality of life. Thus, we selected a number of social indicators (described below), based on well-known studies of quality of life in the United States, to guide our assessment of social conditions in forested areas.

2.5 Indicators relevant to forested areas: forest amenities

2.5.1 Nonmarket valuation, willingness to pay and "real income"

During the later decades of the twentieth century, natural resource and environmental economists formalized the view that the natural world provides benefits to members of society that are not accounted for in markets, and that people are willing to pay for enhancements in the quality of natural environments (for example see Krutilla and Fisher 1985, Freeman 1993). The theory and measurement of nonmarket values provides a useful perspective for understanding some of the linkages between forests and the quality of life. We briefly review the salient aspects of the theory as well as published empirical studies to shed some light on the types of forest indicators that should be used in our assessment.

The theory of nonmarket valuation and "willingness to pay" is based on a concept referred to as "consumer surplus", or the value of a consumptive good above and beyond what is actually paid for it. This concept can be represented by the metaphor "real income": "When the existence of a grand scenic wonder or a unique and fragile ecosystem is involved, its preservation and continued availability are a significant part of the real income of many individuals" (Krutilla 1967, page 779). In a footnote to this remark, Krutilla goes on to state that "These would be the spiritual descendants of John Muir, the present members of the Sierra Club, the Wilderness Society, National Wildlife Federation, Audubon Society and others to whom the loss of a species or the disfigurement of a scenic area causes acute distress and a sense of genuine relative impoverishment." Using a somewhat different metaphor, Niemi and Whitelaw (1999) compare consumer surplus to a "second paycheck" that people receive as a bonus resulting from a high-quality natural environment. In a similar fashion, Power (1996) equates local economic well-being with the sum of money income (adjusted for the local cost of living) and the value of noncommercial environmental qualities.

In an attempt to analyze and quantify "real income" derived from natural environments, economists partition total value into the sum of "use" value and "non-use" value. In a forestry

context, use value refers to the set of values derived from the direct use of forest environments for activities such as timber harvesting, recreation, hunting, fishing, wildlife viewing and wild food collection. Non-use values are values not associated with current use and include such "non-uses" as maintaining the option to personally use part of the natural environment in the future (option value), leaving part of the natural environment for others to use in the future (bequest value), and the knowledge that part of the natural environment will continue to exist even if the individual holding this value never contemplates using it (existence value)(Krutilla 1967).

Non-use values thus represent psychic benefits based on standards such as altruism and ethical behavior that transcend a purely materialistic outlook (Krutilla 1967; Randall and Stoll 1983; Kopp 1992). Empirical tests seeking to distinguish altruistic behavior from self-interest are notoriously difficult to conduct (for example see Deacon and Shapiro 1975; Holmes 1990; Popp 2001). However, we regard it as plausible that people hold such values, that altruistic and ethical motivations do influence human behavior toward the conservation and protection of forest environments, and that values transcending narrow self-interest affect the quality of life.

2.5.2 Empirical evidence of willingness to pay for forest conditions

A number of recent studies have concluded that non-use values of forest ecosystems are important sources of value to society, although forest use values are, of course, also important (Walsh and others 1990; Haefele and others 1992; Holmes and Kramer 1996; Kramer and others *forthcoming*). Determining the relative importance of use versus non-use value is a tricky matter and has not been resolved. However, non-market forest valuation studies have indicated that social welfare is greatest when forest protection and forest use (including timber harvesting) are balanced (Garrod and Willis 1997, Boyle and Teisl 1999, Boyle and others 2001). It is natural to wonder, then, what balance of forest use and protection in the South would optimize social well-being. To date, research has not provided this answer and it remains an important problem for researchers to investigate.

Although we conclude that a balance of forest use and protection is implied by these studies, recent evidence suggests that people are concerned about the particular methods that are employed for timber harvest. In a recent study of timber harvesting preferences of Maine residents, it was found that harvest prescriptions that left 153 or 459 trees live trees per acre greater than 6 inches in diameter at breast height (d.b.h.) were significantly preferred to prescriptions that left no trees greater than 6 inches d.b.h. after harvest (Boyle and Teisl 1999, Boyle and others 2001). This research finding is in concert with the announcement made by the Chief of the USDA Forest Service in 1992 that the agency would drastically reduce the area subject to clearcutting (Backiel and Gorte 1992). This action was in response to public concern regarding harvesting practices on Federal forests.

Widespread public concern over clearcutting as a timber harvesting and regeneration method suggests the potential for ideological tension in the South between people holding those concerns and people who grow, harvest and process timber and timber products (Devall 1993,

AFPA 1994). That is, we see no *a priori* reason that public concern with clearcutting on public forests will not manifest as concern over even-aged management practices on private forests. Because private forests produce public goods, in terms of benefits such as clean water, wildlife habitat and scenic views, the perceived impairment or loss of such benefits will cause a loss of "real income" to people who value such public goods. Thus, indicators of timber harvest intensity and the extent of even-aged management will likely be useful indicators of forest quality related to the quality of life for people whose "real income" is influenced by forest conditions.

2.5.3 "Real income" and way of life

Finally, we note that most analyses of quality of life have been based on a utilitarian framework (Cobb 2000). That is, well-being is measured by a "market-basket" approach, in which quality of life is a function of the things that people have. The “market basket” includes not only traditional market goods but also amenities such as clean air and water and natural forest amenities. A different view is that quality of life arises from the "capability" for being and opportunities for doing which are circumscribed by individual and social conditions. "The capability approach to a person's advantage is concerned with evaluating it in terms of his or her actual ability to achieve various valuable functionings as part of living" (Sen 1993, page 30). In developing countries, for example, the capabilities to find employment or to be well nourished are functions that are often limited by existing economic conditions. In developed countries, the capabilities to breathe clean air in metropolitan areas or to walk around safely at night are basic functions that are being lost (Gaertner 1993).

Extending this view of quality of life to rural America, it is evident that the ability to enter into a way of life based on farming or logging is a basic function that is being lost in modern society. To some people, the loss of these opportunities causes a diminution of the quality of life. Likewise, the capability for living in a natural landscape, particularly in the Eastern United States, has become limited in modern society. Although such life qualities are hard to measure, we think that an approach based on "capabilities" merits further thinking and development and that these issues should be kept in mind when considering forests and the quality of life in the South.

3 Methods

3.1 Defining "forest dependence"

One of the concerns brought forward by the public was a better understanding of the linkage between "forest dependency" and various indicators of the quality of life. In general, the concept of forest dependency is focused on the degree of concentration of a particular industry in a particular area. In particular, job dependency is viewed as the ratio of employment in a specific economic sector to the total employment in an area.

Given this framework, analysts often proceed to a determination of "dependent communities" by

identifying communities that exceed a given, arbitrarily imposed, dependency threshold. For example, in a recent study of rural areas in the United States, farming-dependent counties were defined as counties that had 20 percent or more of labor and proprietor income derived from farming (Cook and Mizer 1994). In another study, recreation dependence was defined as having at least 10 percent of total employment in eating and drinking establishments, hotels and other lodgings and amusement parks (Ross and Green 1985).

3.2 Linking forest dependence with other indicators

For purposes of this Chapter, we prefer to treat "forest dependence" as a continuous variable and focus attention on job (rather than wage) dependency. This perspective allows us to examine how variation in the level of concentration of forest related employment relates to variation in quality of life indicators. This is accomplished using Pearson's correlation coefficient (for example, see Kalbfleisch 1985). In so doing, we must stress that correlation does not imply causation, but rather indicates whether an increase in some variable is associated with an increase or decrease in another variable, or if two variables are independent. Further, this method allows us to determine the strength of the relationship between two variables. The correlation coefficient is constrained to fall between 1 and -1 and the closer the coefficient is to 1 in either direction, the stronger the linear relationship. Finally, the statistical analysis allows us to determine whether or not correlations are statistically significant (that is, significantly different from 0).

In evaluating linkages between industrial concentration (forest dependence) and various quality of life indicators, relevant comparisons can only be made between areas where specific industries are located. We therefore excluded areas that do not support particular forest related industries from the correlation analysis.

3.3 Forest related sectors

We focused attention on four forest related sectors that are referred to as the "primary wood products sector", the "secondary wood products sector", the "pulp and paper sector" and the "forest-related recreation and tourism sector". The primary wood products sector includes subsectors: (1) forest products (stumpage, pulpwood, fuelwood, Christmas trees and fenceposts), (2) logging camps and logging contractors, (3) sawmills and planning mills, (4) hardwood dimension and flooring mills, (5) special products, and (6) veneer and plywood. The secondary wood products sector includes sub-sectors: (1) millwork, (2) wood kitchen cabinets, (3) structural wood members, (4) wood containers, (5) wood pallets and skids, (6) prefabricated wood buildings, (7) wood preserving, (8) reconstituted wood products, (9) wood products not included elsewhere, (10) wood household furniture, (11) wood TV and radio cabinets, (12) household furniture not included elsewhere, (13) wood office furniture, (14) wood partitions and fixtures,(15) furniture and fixtures not included elsewhere, (16) paperboard containers and boxes, (17) paper coating and laminated packaging, (18) coated and laminated paper, not included elsewhere, (19) paper bags, (20) die-cut paper and board, (21) sanitary paper products, (22) envelopes, and (23) stationary products. The pulp and paper sector includes the

subsectors: (1) pulpmills, (2) papermills, except building paper, and (3) paperboard mills.

The forest-related recreation and tourism sector is more difficult to define than the other forest-related sectors because the attribution of recreation and tourism activities to use of the forest is not straight forward and data are not available to directly link recreation and tourism to forest-based activities. Prior studies that attempted to identify recreation dependent areas used arbitrary dependence thresholds (Ross and Green 1985) or more sophisticated criteria (Beale and Johnson 1998). One study demonstrated a statistical linkage between a number of variables, including public and private forest land, and export employment in tourism-related sectors (English and others 2000). However, none of these studies provides a means of identifying specific areas in the South that have forest-related recreation and tourism employment. Consequently, it was necessary to construct data that were consistent with the objective of identifying such areas.

For purposes of this Chapter, the recreation and tourism sector is comprised of four subsectors: (1) hotels and lodging, (2) eating and drinking, (3) amusement and recreational services not included elsewhere, and (4) sporting and athletic goods not included elsewhere. A linkage between forests and recreation and tourism activity was then specified by imposing the criterion that forest land, as a percent of total land area, must equal or exceed the average for the South (58 percent). Admittedly, the 58 percent threshold is arbitrary. A second criterion was included to exclude metropolitan areas from the forest-related recreation sector. Imposition of these two criteria excluded areas such as Disney World, Myrtle Beach, metropolitan areas and developed areas along interstate highways from the analysis of forest-related recreation and tourism.

3.4 Linking forest dependence and economic structure

A second concern brought forward by the public was to develop a better understanding of the linkages between different uses of the forest and economic structure. To maintain consistency with our focus on industrial concentration, we examined the correlation between forest dependency (industrial concentration in the four-forest related sectors described above) and industrial concentration (the ratio of employment in each industrial sector to total employment in an area) in ten sectors: (1) agriculture; (2) mining; (3) construction; (4) manufacturing; (5) trade; (6) wholesale; (7) retail; (8) finance, insurance and real estate; (9) service; and (10) government. Again, it is important to emphasize that correlation (estimated using the Pearson correlation coefficient) does not imply causation. However, correlation analysis does allow patterns to be observed linking the degree of industrial concentration in forest related sectors and other industrial sectors. A description of such patterns provides preliminary evidence for future research into cause-and-effect relationships describing economic structure. Such research was beyond the scope of this Chapter.

3.5 Specific indicators used in the analysis

3.5.1 Income per job

Specific quality-of-life indicators were selected based on consideration of the issues discussed in the Introduction. To provide an indication of the economic benefit received by people working in forest-related industries, total income per sector was divided by the number of jobs per sector for the four forest-related sectors described above. These measures are not wage rates, but represent average income per job. Income per job may be low because wage rates are low or because the "typical" job is only part-time. Income per job was also computed for all jobs in the areas where the forest related sectors were located. This step allowed a comparison to be made between average income per job in the forest related sectors and the "typical" job in those areas.

3.5.2 Social and demographic indicators

To evaluate social indicators in areas with forest-related employment, a subset of social, demographic and economic variables was selected from two recent quality of life studies (Diener 1995, Ferriss 2000). From the socio-economic and demographic indicators used in those studies, six indicators were selected: (1) infant mortality rate, (2) violent crime rate, (3) median household income, (4) unemployment rate, (5) poverty rate, and (6) percent graduating high school.

Evidence in the literature that rural population growth is influenced by the supply of natural amenities caused us to include a measure of population growth in the analysis. Inclusion of a variable measuring the percent change in population allowed us to evaluate the relationship between the degree of industrial concentration in forest-related industries and population dynamics.

Social cohesion is a concern in considering quality of life. Three indicators of social cohesion and the potential for collective social action, used in other quality of life studies (Drielsma 1984, Wish 1986, Hamilton 1993, Hamilton 1999), were included: (1) percentage of owner-occupied housing, (2) divorce rate, and (3) percent voting in recent presidential elections (an indicator of the potential for collective action).

3.5.3 Indicators of forest condition

Five variables were selected to provide a general description of the forest landscape: (1) forest land as a percentage of all land, (2) pine-forest acreage as a percentage of total forest acreage, (3) upland-hardwood acreage as a percentage of total forest acreage, (4) bottomland hardwood acreage as a percentage of total forest acreage, and (5) oak-pine acreage as a percentage of total forest acreage. Correlations of the degree of industrial concentration in various forest related sectors with these descriptive variables provided us with a general sense of the forest types within which the sectors were concentrated.

The review of the literature linking willingness to pay and forest condition led us to include

variables that would indicate the degree of naturalness of forest ecosystems. Although "naturalness" may be impossible to define with precision, some aspects can be specified. Anderson's (1991) definition of natural was based on the idea that forests that are more natural would change little if removed from human influence and are made up of a high proportion of native species. Noss and Cooperrider (1994) used this idea to define a gradient of forest ecosystem naturalness that ranged from primary natural forests (virtually uninfluenced by human disturbance), to secondary natural forests (natural regeneration after human disturbance), to plantations (in most, but not all, cases, human planting after human disturbance).

Using these ideas as broad descriptors of the degree of naturalness, we decided that the following indicators of human disturbance in forest ecosystems should be included: (1) plantation acreage as a percentage of all forest acreage, (2) the change in plantation percent between the two most recent forest surveys, (3) pine removal to pine inventory ratio, (4) pine growth to pine inventory ratio, (5) hardwood removal to hardwood inventory ratio, and (6) hardwood growth to hardwood inventory ratio. The first indicator provides information on the extent of intensive forest management in an area, while the second indicator provides information on the growth or decline of intensive forestry. Removal of pine or hardwood as a proportion of the standing inventory provides information on harvest intensity. Growth as a proportion of standing inventory provides information on the age distribution of forests. Because young forests generally grow more rapidly than old forests, a high (low) growth/inventory ratio would be found in areas with younger (older) forests.

4 Data Sources

Four sources of data were used in the analyses. All units of observation were at the county level.

First, data on forest variables were obtained from the Forest Inventory and Analysis (FIA) unit of the Southern Research Station. Data were not available for all southern counties at the same point in time, so data from the most recent survey were used to provide the most current representation of forest conditions. For one variable, change in plantation acreage, the two most recent forest surveys were used to compute the percentage change. Because Kentucky was not included in forest surveys conducted by the FIA unit of the Southern Research Station, forest variables for this State were not directly comparable with those of other Southern States. Kentucky data, therefore, were not included in the analyses.

The reader should be alerted to the fact that FIA data were sampled in a way to meet sampling error standards at the State level. As data are subdivided into smaller geographical units, such as the county level used in this Chapter, the sampling errors increase and the reliability of the estimates decrease. This condition may impact the analysis reported in this Chapter primarily by increasing the size of the standard errors associated with the Pearson correlation coefficients where such correlations were estimated using forest variables. Increases in the standard errors associated with correlation coefficients suggest that some relationships that may exist did not meet the 10-percent significance threshold for reporting in this Chapter. However, we do not

believe that this effect biased the estimated correlations or caused some correlations to appear statistically significant when, in fact, they are not.

Data on employment and income were obtained from the IMPLAN Database (Minnesota IMPLAN Group 1997). To make these data as comparable as possible with data from the most recent available Census data that were available when the analysis was undertaken (1990), we used 1993 IMPLAN data. Employment data in the IMPLAN Database were created from the Bureau of Labor Statistics ES202 data, the County Business Pattern data provided by the U.S. Department of Census, and the Regional Economic Information System data provided by the Bureau of Economic Analysis. It should be noted that these data are based on where people worked (where the industrial sectors were located), not on where they resided. However, across the entire South, a discrepancy between the county where people worked and where they resided should not be an important issue.

Data on a number of social and economic indicators were obtained from 1990 Bureau of Census data sets. These indicators included median household income, unemployment rate, poverty rate, and percent of owner-occupied housing. Of course, these data were based on where people resided.

Finally, data on a number of other social variables were obtained from the State and County Data Book, which was available on the Internet (http://fisher.lib.virginia.edu/ccdb/). In an attempt to align these data with the Census data, we chose the most recent data that were closest in date to the 1990 Census. Thus, data from the 1994 State and County Data Book were obtained for the following indicators: crime rate (serious crimes per 100,000 population; 1991), percent graduating high school (persons 25 years and older, percent high school graduate or higher; 1990) infant mortality rate (deaths of infants under 1 year per 1,000 live births; 1988), percent voting in the most recent presidential election (votes cast for president; 1992, divided by voting-age population; 1992) and percentage population change (population, percent change 1980 to 1992).

5 Results

5.1 Linkages between forest dependency and forest condition

Correlations between the degree of industrial concentration in forest related industries and indicators of forest condition are shown in Table 1. The strength of the correlation is greater as the value of the correlation coefficient approaches 1 or –1. A positive value indicates a positive correlation while a negative value indicates a negative correlation. Correlation coefficients are only shown for values that were statistically different from 0 at the 10 percent significance level. For each statistically significant correlation coefficient, Table 1 shows the number of observations (counties) that were used to compute the statistic.

The pulp and paper industry is located in 179 southern counties. Results indicate that the pulp and paper sector is concentrated in heavily forested areas with high concentrations of pine

acreage, plantation acreage, new plantation acreage, and high pine growth to standing inventory ratios. Taken together, these forest indicators suggest that increasing concentration of the pulp and paper industry is correlated with an increasingly "industrialized" pine forest. Conversely, the pulp and paper sector is increasingly scarce in areas with higher concentrations of hardwood acreage, particularly upland hardwoods. However, in hardwood forest areas, this sector is found in increasing concentration in areas where removals of hardwoods, relative to their standing inventory, are high. Thus, although this sector is scarcer in hardwood forest areas than in pine forest areas, in hardwood forest areas where the pulp and paper industry is concentrated, there is a corresponding increase in hardwood harvest intensity.

The primary wood products sector is located in 978 southern counties. It is concentrated in heavily forested areas with relatively high concentrations of pine acreage, plantation acreage and new plantation acreage. Conversely, this industry is relatively scarce in hardwood areas, particularly in areas with high concentrations of upland hardwoods. However, concentrations of the primary wood products sector were found in areas with relatively extensive acreage in oak-pine forests. Also, within hardwood forests, increasing concentrations of the primary wood products sector were correlated with increases in harvest intensity as well as increasing forest growth rates. In sum, these indicators suggest that increasing concentration of the primary wood products industry was associated with an increasingly industrialized forest, much as was found for the pulp and paper sector.

The secondary wood products sector is in 872 southern counties. It is concentrated in heavily forested areas, primarily in areas with high proportions of upland hardwood forests. This result is consistent with the importance of furniture, millwork, wood containers, pallets and skids to this sector. These products are made primarily from hardwoods.

The forest-related recreation and tourism sector is in 414 counties. It is concentrated in areas with high proportions of hardwood forests, particularly upland hardwood forests. In hardwood forest areas, this sector is more concentrated where forests are growing relatively slowly (indicating they are older) and where harvest pressure is less intense. In areas of pine forests, concentration of this sector is negatively correlated with extensive forestland use in plantations and with new plantations. Also in pine forests, this sector is more concentrated in areas with low rates of pine growth (indicating older forests) and with less intense harvest pressure. In sum, these indicators suggest that increasing concentration of the forest-related recreation and tourism sector is associated with increasingly "natural" forests.

5.2 Linkages between forest dependency and social, economic and demographic indicators

Correlations between the degree of industrial concentration in forest related sectors and social, economic and demographic indicators are shown in Table 2. The pulp and paper sector is concentrated in areas where median household income is relatively low, a relatively high percent of the labor force is unemployed, a relatively high proportion of the population is living in poverty, and a relatively low proportion of the population have completed high school. Overall,

these indicators suggest that this industry is concentrated in areas with limited economic opportunities. However, areas of concentrated employment in this sector are positively correlated with the proportion of residences that are owner-occupied and the proportion of the population that vote in presidential elections. They are negatively correlated with the crime rate. Thus, these indicators of social cohesion, safety and potential for collective action are positive indicators of quality of life. However, the degree of industrial concentration in this sector is negatively associated with the rate of population growth. This indicator suggests that net migration to areas of concentrated employment in the pulp and paper sector is lower than net migration to areas with lower concentration of employment in this sector.

Social conditions where the primary wood products sector is concentrated are similar in many respects to social conditions in areas where the pulp and paper sector is concentrated. The primary wood products sector is concentrated in areas where median household income is relatively low, a relatively high proportion of the population is living in poverty, a relatively high percent of the labor force is unemployed and a relatively low proportion of the population has completed high school. Areas of concentrated employment in this sector are positively correlated with the proportion of residences that are owner-occupied and the proportion of the population that votes in presidential elections. They are negatively correlated with the crime rate. Although the divorce rate is lower in areas of concentrated employment in this sector, infant mortality rates are greater. Similar to the result for the pulp and paper industry, the degree of industrial concentration in this sector is negatively associated with the rate of population growth.

Economic conditions in areas where the secondary wood products sector is concentrated are not as bad as where concentrations of the pulp and paper or primary wood products sectors are located. Although areas where the secondary wood products sector is concentrated have relatively low levels of median household income and relatively high proportions of the population that have not completed high school, significant correlations with unemployment rates and the proportion of the population living in poverty were not found. A relatively high proportion of owner-occupied housing is correlated with higher concentrations of employment in this sector, and crime rates and the rate of divorce are negatively correlated with industrial concentration in this industry. However, similar to the other wood products sectors, we found that the degree of industrial concentration in this sector is negatively associated with the rate of population growth.

The forest-related recreation and tourism sector is concentrated in areas that are economically more favorable than areas where the wood products sectors is located. An increase in the concentration in the forest related recreation and tourism sector is correlated with increases in median household income and with declining rates of unemployment and poverty. Although crime rates are higher and the proportion of owner-occupied homes is lower in areas where this sector is concentrated, the rate of population growth increases with increasing concentration in this sector. Recall that the results shown in Table 1 indicated that this sector is concentrated in upland hardwood forest areas that are generally older and under less intense harvesting pressure. Thus, our results are consistent with the conclusions of other studies that found rural

population growth was highest in areas with high levels of natural amenities and concentrations of the recreation and tourism industry. Presumably, these results are largely due to net migration to these areas by people seeking a better quality of life.

5.3 Linkages between forest dependency and economic structure

Table 3 shows the correlation analysis of the degree of concentration in forest-related sectors and other economic sectors. Increasing concentration of the pulp and paper industry is positively correlated with the agricultural sector. This is not surprising, as many of the pine forests in the South are found where agricultural fields were abandoned. Also, the processes of planting, fertilizing, vegetation control and harvesting used to manage pine plantations are similar to common agricultural practices. Thus, pine plantations are probably more in conformance with what local people consider acceptable cultural practice in agricultural areas than they would be in many nonagricultural areas.

Increasing concentration in the pulp and paper industry is negatively correlated with a number of economic sectors, including manufacturing, wholesale, retail and finance, insurance, and real estate. The generally rural location of the pulp and paper sector probably explains the relative scarcity of the wholesale and retail sectors. The relative scarcity of the finance, insurance, and real estate sector also probably reflects the lower level of economic development in areas where the pulp and paper sector is concentrated.

Two factors that are sought in locating pulp and paper plants are an available water supply (used in processing) and good access to transportation networks so that wood fiber can be procured efficiently and products can be readily shipped to market. Because the manufacturing sector also relies on good market access, it is perhaps surprising that a negative correlation was found between the pulp and paper sector and the manufacturing sector. However, this result may reflect a situation where, in locations that are close to a suitable supply of wood fiber, the pulp and paper industry is more competitive in the labor market than are other manufacturing sectors. Average income per job in the pulp and paper sector is considerably higher than average income for the "typical" job in areas where that sector is located (Table 4). Large amounts of industrial capital are invested in the pulp and paper sector, increasing labor productivity.

The results in Table 3 show that the degree of industrial concentration in the primary wood products sector is positively correlated with concentration in the agricultural sector. Again, this correlation probably reflects the historical conversion of old fields to pine forests and cultural practices that are in keeping with the values of local residents. The negative correlation with wholesale and retail sectors probably reflects the rural location of this sector. The negative correlation with the finance, insurance and real estate sector and with the construction sector reflects the relatively low level of economic development in areas where the primary wood products sector is found. Because the primary wood products sector supplies inputs to the pulp and paper sector, a positive correlation between the two industries is not surprising.

Similar to the pulp and paper sector, the negative correlation of the primary wood products sector with the manufacturing sector may indicate that this sector is more competitive in the market for labor. However, as shown in Table 4, average income per job in the primary processing sector is only slightly higher than average income for the "typical" job in areas where the primary processing sector is located. However, many firms that comprise this industry such as logging contractors and sawmills are relatively small. The relative independence and way of life afforded by working in this sector may be particularly appealing to members of the workforce in these rural areas.

It is important to highlight the negative correlation between the pulp and paper and primary wood products sectors and the manufacturing sector. This finding suggests that the forest products industry contributes in a very significant way to the economic base and economic vitality of those areas. In the South as a whole, manufacturing comprises the largest sector in the economic base. The substitution of forest products sectors for manufacturing suggests that, in areas with concentrated employment in those forest products industries, local economies are highly reliant on the income and employment generated by the harvest and processing of timber and timber products.

Industrial concentration in the secondary wood products sector is negatively correlated with the wholesale and retail sectors, reflecting the relatively low population density in those areas. Relatively low levels of economic development in areas of concentrated employment in the secondary wood products sector are reflected in the negative correlations with the finance, insurance and real estate sector and with the construction sector. Because the secondary wood products sector uses inputs supplied by the primary wood products sector, it is not surprising to find a positive correlation between these two sectors.

The positive correlation between the forest-related recreation and tourism industry and the presence of upland hardwood forests that are older and under relatively less harvest pressure suggests that a negative correlation between this sector and the primary wood products sector would exist. This is what was found. Likewise, the concentration of the forest related recreation and tourism industry in these types of forests suggests a negative correlation with agriculture, which was also found. The higher level of economic development associated with this industry was reflected in the positive correlations with the finance, insurance and real estate sector and the construction sector. Further, the outputs of this industry are consumed directly by consumers. The positive correlation with the retail and wholesale sectors reflects complementary consumption within those sectors and the forest-related recreation and tourism sector.

Income per job in the forest related recreation and tourism sector was quite a bit less than income per "typical" job in the areas where that sector was found (Table 4). This finding may reflect the seasonality or part-time nature of some jobs in this sector. Also, we note that some people are willing to accept lower monetary compensation to work in an industry that is located in an area where the natural amenities supply other forms of compensation contributing to "real income".

6 Discussion and Conclusions

The forest products industry, comprised of the primary and secondary wood products sectors and the pulp and paper sector, is a critical component of the economic structure in many areas in the Southern United States. This industry offers good paying jobs in areas where other economic opportunities are limited. On average, income per job in this industry ranges from marginally higher (in the primary wood products and secondary wood products sectors) to much higher than income per job for the "typical" source of employment. By providing good-paying jobs, the quality of life was enhanced for people who worked in this industry. In addition, for some people who worked in this industry, quality of life was enhanced by a "way of life" associated with working either in the woods or producing the products made from harvested timber. And, of course, quality of life was enhanced for everyone who consumed products made from wood, ranging from paper products to fuelwood to fine furniture.

Through the export of wood products to other regions, the forest products industry also contributed to local economies by bringing income to economies where the forest products industry was located. Some understanding of the contribution this industry made to local economies can be gained by considering the economic base in areas where the primary and secondary wood products sectors and the pulp and paper sector comprised at least 10 percent of total employment. Using the standard assumption that agriculture, mining, nonwood manufacturing, and the forest products industry make up the economic base (Crone, Haynes and Reyna 1999), the forest products industry accounts for about 62 percent of employment in basic industries in areas where the pulp and paper industry comprises at least 10 percent of total employment. In areas where the primary wood products sector comprises at least 10 percent of total employment, the forest products sector accounts for about 54 percent of employment in basic industries. In areas where the secondary wood products sector comprises at least 10 percent of total employment, the forest products sector accounts for about 52 percent of employment in basic industries.

However, forests contribute to quality of life in the South in more ways than by providing income and employment. For many people, enjoyment of the amenities provided by natural forest environments enhances their quality of life. One way of evaluating the contribution of forest amenities to quality of life is to consider some of the characteristics associated with forest-related recreation and tourism (which was constrained to rural areas with a greater-than-average proportion of forest land). It was found that increasing concentrations of jobs in the forest related recreation and tourism sector is associated with increasing proportions of upland hardwood forests, increasing age of forests, decreasing timber harvesting pressure, and decreasing proportion of forest acreage in pine plantations. In general, these forest areas can be considered to be more "natural" in the sense that they have received less human-induced disturbance.

We found that increasing concentration of employment in the forest related recreation and employment sector is associated with better economic conditions (higher median household income and lower rates of poverty and unemployment). We also found that as the concentration

of employment in the forest-related recreation and employment sector increases, population growth also increases. This result suggests that people moved to such rural areas to enjoy the quality of life afforded there, including the amenities provided by the natural environment.

Competing uses of forests will likely increase as timber production intensifies in the South due to the region's competitive advantage in timber growing and as people continue to move to locations in the South that provide high levels of natural forest amenities. In some areas, these trends will intensify the social and ideological tension related to forest use. For example, we found that, in areas of concentrated employment in the forest products industry, the condition of forests more nearly represented an "industrial forest". That is, forests were more likely to contain higher proportions of pine plantations, to be younger and these forests received greater harvesting pressure. If areas where people live because of the amenities provided by natural environments come under increased pressure for timber harvest and intensified forest management, such people will suffer a loss in amenity value. As economists would say, they will suffer a loss in "real income". Such losses, including those of intrinsic values will be suffered by present and future generations.

Increasing concentrations of employment in the forest-related recreation and tourism sector are negatively associated with concentration of employment in the primary wood products sector. This result summarizes in some sense the social and ideological tension that exists between proponents of these two patterns of forestland use. On the one hand, it is clear that timber growing, timber harvest, wood products processing and the final consumption of wood products contribute to quality of life. On the other hand, the amenity values associated with forests likewise contribute to the quality of life. We suggest that research, education, and public discourse are the primary tools that can help identify and resolve issues related to future conditions and uses of forestland in the South.

7 Needs for Additional Research

The valuation of public goods provided by private forests in the South is an area of research that has not been explored but is clearly needed. This research needs to identify values associated with forestland use across various dimensions, such as forest type, geographic location, and population density. For example, concern has been raised in the South about the impact that timber harvesting and intensified forest management may have on forest landscapes and how such changes impact the provision of public goods from private forests. The degree of concern about timber harvesting and intensified forest management may not be evenly spread across people living in the South. A better understanding of the people who are concerned about human disturbances in natural forests, why they are concerned, and the particular areas where they are concerned, will help develop meaningful communication between stakeholder groups.

A better understanding of values produced by private forests could then be used to assess which areas in the forest landscape would provide the greatest contributions to sustainable economic growth and development. Any attempt to increase the quality of life in forest environments must consider the full spectrum of forest uses from natural forests to plantations. Further

research can help provide relevant information to local, regional, State and Federal agencies with the intent of designing land management plans that are in keeping with the values and goals of all people living in the South.

8 Acknowledgments

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10 Tables and Figures

Table 1--Correlation coefficients relating the level of employment concentration in forest related sectors with various indicators of forest condition (correlation coefficient only reported where statistical significance exceeded 10 percent; numbers in parentheses are the number of counties used to compute the correlation coefficient)

Variable	Pulp and paper sector	Primary wood products sector	Secondary wood products sector	Forest related recreation and tourism sector
Forest percent	0.19	0.40	0.14	-0.09
	(170)	(874)	(782)	(414)
Pine percent	0.20	0.26		
	(169)	(871)		
Plantation percent	0.25	0.29		-0.13
	(169)	(871)		(414)
Change in plantation percent	0.13	0.24	0.06	-0.14
	(169)	(871)	(777)	(414)
Hardwood percent	-0.17	-0.27		0.09
	(169)	(871)		(414)
Upland hardwood percent	-0.15	-0.19	0.11	0.10
	(169)	(871)	(777)	(414)
Bottomland hardwood percent			-0.13	
			(777)	
Oak-pine percent		0.10		
		(871)		
Pine growth/ inventorv	0.17			-0.17

inventory	(164)		(405)
Pine removal/ inventory			-0.15 (405)
Hardwood growth/ inventory		0.06 (871)	-0.21 (414)
Hardwood removal/ inventory	0.27 (169)	0.24 (871)	-0.19 (414)

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Table 2--Correlation coefficients relating the level of employment concentration in forest related sectors with various social, economic and demographic indicators (correlation coefficient only reported where statistical significance exceeded 10 percent; numbers in parentheses are the number of counties used to compute the correlation coefficient)

Variable	Pulp and paper sector	Primary wood products sector	Secondary wood products sector	Forest related recreation and tourism sector
Population change, percent	-0.13	-0.21	-0.12	0.21
	(179)	(978)	(872)	(414)
Unemployment percent	0.18	0.18		-0.14
	(179)	(978)		(414)
Median household income	-0.17	-0.29	-0.08	0.27
	(179)	(978)	(872)	(414)
Percent living in poverty	0.20	0.28		-0.26
	(179)	(978)		(414)
Infant mortality rate		0.06		
		(978)		
Serious crime rate	-0.25	-0.27	-0.11	0.29
	(179)	(978)	(872)	(414)
Owner-occupied housing percent	0.32	0.24	0.11	-0.15
	(179)	(978)	(872)	(414)
Divorce rate		-0.13	-0.07	
		(978)	(872)	

Percent voting-age population voting for President	0.26 (179)	0.20 (978)

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Table 3--Correlation coefficients relating the level of employment concentration in forest related sectors to the level of employment concentration in other economic sectors (correlation coefficient only reported where statistical significance exceeded 10 percent; numbers in parentheses are the number of counties used to compute the correlation coefficient)

Sector	Pulp and paper sector	Primary wood products sector	Secondary wood products sector	Forest related recreation and tourism sector
Agriculture	0.15	0.12		-0.28
	(179)	(978)		(417)
Mining				
Construction		-0.17		0.18
		(978)		(417)
Manufacturing (minus forest products)	-0.22	-0.13		-0.15
	(179)	(978)		(417)
Trade			-0.06	-0.11
			(872)	(417)
Wholesale	-0.23	-0.15	-0.14	0.17
	(179)	(978)	(872)	(417)
Retail	-0.26	-0.24	-0.19	0.38
	(179)	(978)	(872)	(417)
Finance, insurance and real estate	-0.32	-0.25	-0.18	0.15
	(179)	(978)	(872)	(417)
Service		0.05	-0.11	-0.08

		(978)	(872)	(417)
Government		0.21		
		(978)		
Pulp and paper		0.12		
		(978)		
Primary wood products	0.26		0.12	-0.25
	(179)		(872)	(417)

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Table 4--Comparison of income per job in forest related sectors and "typical" jobs in counties where forest related sectors were located

Forest related sector	Counties where industry located (number)	Forest related sector, income per job ($/year)	"Typical" job, income per job ($/year)
Pulp and paper	179	54,760.00	22,211.03
Primary wood products	978	19,300.36	19,193.03
Secondary wood products	872	21,844.66	19,549.69
Forest related recreation and tourism	414	9,881.54	18,492.17

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