EFFECTS OF DEMOGRAPHIC AND ECONOMIC FACTORS 
ON FOREST AREA CHANGE: NORTH AND 
SOUTH COMPARISON

Ralph J. Allig, Theodore Howard, and Joseph Buongiorno

Abstract.—Recent area changes for major land uses and 
forest ownerships in the Eastern United States are examined along with 
factors causing the changes. Competitive relationships among land 
uses are considered in terms of physical and economic characteristics 
for each region. Forest uses in a region are subjected to various 
degrees of competition from built-up uses resulting from demographic 
and economic growth. A recent trend is toward increased reversion 
to forestry from agricultural uses, because of depressed conditions 
in the agricultural sector.

Keywords: land use shifts, forest ownerships

INTRODUCTION

In our interdependent economy, changes in area of forest land are shaped by 
a complex of competing demands for land arising from various sectors. 
Prospective area changes are important for predicting future supplies of timber 
and other forest outputs. This paper discusses factors related to land use 
changes in the South and North, including major determinants such as regional 
population changes. The possible correlations between timberland area changes 
and changes in the availability of timber are outside the scope of this paper.

Overall trends in timberland area have been similar in the North and South 
in recent decades, according to Forest Inventory and Analysis (FIA) surveys by 
the USDA Forest Service (e.g., Sheffield and Knight 1986). According to the 
most recent FIA statistics, timberland area in the North decreased by 3 million 
acres or 1.5 percent between 1970 and 1977. Timberland area in the South 
declined by 10 million acres or 5 percent between 1970 and 1985.

1/Project Leader, USDA Forest Service, Southeastern Forest Experiment 
Station, Research Triangle Park, NC; Assistant Professor, University of New 
Hampshire, Department of Forest Resources, Durham, NH; Professor, University of 
Wisconsin, Department of Forestry, Madison, WI.

2/More recent regional statistics are available for the South because they 
were compiled for the study pertaining to the South's Fourth Forest (USDA Forest 
Service 1987).
Because most of the land in the East is privately owned, decisions about forestry and competing land uses are largely determined in private markets. Shifts in use on such private lands in the East tend to be more frequent compared to other parts of the United States. That is, the same parcel of land may move back and forth between uses over several decades. This is due in part to the relative suitability and economic attractiveness of many acres for alternative uses in the East.

CHANGES IN TIMBERLAND AREAS

Timberland area in the East reached a modern peak of 361 million acres around 1962, then fell to 354 million acres in 1977 (Table 1). Most of the increase in eastern timberland area between 1952 and 1962 took place in the South. In the South, a major boost to timberland area in the late 1950's and 1960's was the abandonment of many acres of cropland. Between 1950 and 1964, the area of cropland harvested in the South dropped by over 25 million acres. Conversely, timberland area increased by over 4 million acres over that same time span. Between 1964 and 1982, area of cropland harvested in the South increased by 10 million acres, while timberland area dropped approximately 13 million acres. Overall, the South gained 4 million acres of timberland between 1952 and 1962, and lost 15 million timberland acres or 8 percent between 1962 and 1985.

Table 1.-Changes in timberland area in the North and South. Statistics compiled by the USDA Forest Service (1982, 1987).

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Million acres</td>
<td>Percent change</td>
</tr>
<tr>
<td>OWNERSHIP:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonindustrial private forest</td>
<td>-5.8</td>
<td>-4.7</td>
</tr>
<tr>
<td>Forest industry</td>
<td>+3.9</td>
<td>+27.9</td>
</tr>
<tr>
<td>National Forest</td>
<td>-0.5</td>
<td>-4.9</td>
</tr>
<tr>
<td>Other public</td>
<td>-0.3</td>
<td>-1.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>-2.7</td>
<td>-1.6</td>
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<tr>
<td>SUBREGION:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>+4.4</td>
<td>+6.0</td>
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<tr>
<td>North Central</td>
<td>-7.0</td>
<td>-7.2</td>
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<tr>
<td>Southeast</td>
<td></td>
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<tr>
<td>South Central</td>
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Timberland area trends have differed somewhat among the subregions of the North and South (Table 1). In the Lake States, timberland declined steadily between 1952 and 1977. In the Northeast, timberland area increased by over 4
million acres or 6 percent from 1952 to 1977. Except for the Seaboard States, all Northeastern States have had recent increases in timberland. In contrast, all Southern States, except several in the South Central Region, have had a decline in timberland area since 1977.

Most forest area statistics represent net area changes, and it is difficult with current data to sort out the exact pathways of land use shifts. Although there was a net diversion of forest land to agricultural land in the 1970's, it appears that many agricultural acres are now being idled (Wall 1986), and that some of these acres will revert to forest. The agricultural sector currently has substantial surplus capacity, and agricultural incomes have dropped in recent years in relation to other land use incomes. Diversions to urban and related uses continue to claim many forested acres. New water impoundments and the placement of timberland in reserved status account for most of the remaining diversions.

LAND USE FACTORS

Demography, physiography, and cultural factors are important determinants of land use patterns (Alig 1986). The South has several distinct physiographic regions: the coastal plain, piedmont and interior highlands, delta, and mountains. The Coastal States of the Northeast are densely populated and heavily industrialized. In contrast, land in northern New England, upstate New York, central Pennsylvania, and West Virginia, is largely devoted to forestry and agriculture.

Studies of land use shifts in the South (e.g., Alig 1986, Parks 1986) suggest that increases in personal income and population, which fuel expansion of built-up areas, cause reduction in forest area. Because built-up uses generally command the highest market values per acre, they occupy the top of the economic use hierarchy. Accordingly, demographic factors have played important direct and indirect roles in land use change in the East. An example of an indirect impact is the conversion of timberland to agricultural uses, prompted by pressures to replace cropland that has been converted to uses at the top of the hierarchy—urban and developed uses.

Relationships between changes in population and changes in forest area for the South have been estimated by Alig (1986). Urban and rural population increases were statistically related to increases in urban and built-up areas, and to decreases in forest area. Alig's findings for the South are consistent with Parks' (1986) finding for North Carolina: as population density or concentration in urban areas increases, there is a significant decrease in the area of land in forest.

Area of urban and related developed uses in the North, as estimated by the Bureau of the Census (1984), increased by 4.4 million acres between 1970 and 1980. Census data for 1980 show that the North's rate of urban land consumption of was 0.252 acres per urban person. These land consumption values vary notably by Census subregion (Table 2).

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>New England</td>
<td>.349</td>
<td>+0.0</td>
</tr>
<tr>
<td>Mid-Atlantic</td>
<td>.176</td>
<td>-0.4</td>
</tr>
<tr>
<td>North Central</td>
<td>.271</td>
<td>+2.2</td>
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<tr>
<td>South Atlantic</td>
<td>.344</td>
<td>+6.3</td>
</tr>
<tr>
<td>South Central</td>
<td>.409</td>
<td>+6.3</td>
</tr>
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</table>

Between 1970 and 1980, Census data show that urban area in the South increased by 5.5 million acres or 47 percent. The urban land consumption for the South in 1980 was 0.372 acres per urban person. Area of rural built-up area must also be considered. One-third of the South's population is located in rural areas, in contrast to one fourth for the North (Alig and Healy 1987).

Changes in population between 1970 and 1980 have been quite different in the North than in the South (Table 2). Two of the three northern Census regions had little population growth or a decline, while both southern regions had relatively large population increases. The South as a whole gained over 10 million more people than the North since 1970. The population increases were spread over both regions of the South.

The land use equations for the South also indicate a positive relationship between increases in personal income and increases in built-up areas (Alig 1986). Personal income in the South has risen steadily relative to the U.S. average, rising from 68 percent in 1950 to 86 percent of the U.S. average in 1980. Personal income in the North has been above the U.S. average, but its lead dropped from 111 percent of the U.S. average in 1950 to 105 percent in 1982.

Government programs undoubtedly have played important roles in shaping land use patterns in the East. Government agricultural programs have affected forests in several ways. The major programs that have caused increases in tree planting have been the Soil Bank Program of the 1950's and 1960's and the Conservation Reserve Program of the 1985 Farm Bill. As with the earlier Soil Bank Program, over 90% of the tree planting under the Conservation Reserve Program nationwide over the next several years is expected to be in the South. The Soil Bank Program resulted in about 2 million acres of forest plantations in the South, many of which were retained until harvest (Alig et al. 1980). Current estimates are that the area of tree planting under the Conservation Reserve Program will exceed that of the Soil Bank Program by 1 to 2 million.
acres. Both programs were designed primarily to divert surplus land out of agricultural production; highly erodible land is targeted in the Conservation Reserve Program. Other impacts on forestry from the Conservation Reserve Program are discussed by Moulton and Dicks (1987) in this Proceedings.

Government agricultural programs have indirectly affected forest area by altering relative land rents through commodity price supports and other agricultural production subsidies. Through such programs, land use incomes for agriculture have been enhanced relative to potential incomes from other land enterprises such as forestry. Direct federal payments totaled more than a third of net farm income in 1986, and this proportion was expected to grow in 1987 (Wall 1986).

OWNERSHIP AREA COMPARISON

In both the North and South, most of the timberland is privately owned. About 82% is in private hands in the North and 91% in the South. The distribution between private and public ownership has not changed appreciably in either region in the last quarter of a century. There have been considerable shifts among the major classes of private owners—farmers, forest industry, and other private owners—however.

Farmer

The area of forest land owned by farmers has declined a great deal since 1962. Some of this farm forest has been purchased by forest industry, and some by miscellaneous private owners.

Although the Conservation Reserve Program of the 1985 Farm Bill is shifting some highly erodible farm land into tree cover, thereby augmenting the shrinking farm forest category, the extent of expected tree planting will not be large relative to the overall area of farm forest. The number of acres eligible for tree planting under current legislation is less than 10 percent of the existing farm forest area. Thus, efforts in the Conservation Reserve Program are not expected to reverse the overall downward trend in farm forest acreage.

Other private

By far the largest forest ownership class in the East is the miscellaneous private class, which includes all private forest owners other than farmers and forest industry. Such owners controlled over 42 percent of the timberland in the East in 1977.

Several important variables affecting area trends for the miscellaneous private forest class in the South are personal income and government programs (Allg 1986). Although increases in personal income tend to increase built-up land use (Allg and Healy 1987), they also boost demand for forest land by miscellaneous private owners, often resulting in purchases from farmers. Land purchases by the miscellaneous private class are often motivated by nontimber production goals, particularly in the mountain areas.

Forest industry

The South has approximately twice as much industrial land as the North. Over half of the North's industrial timberland is in Maine, which had a decline of 0.2 million acres of industrial timberland between 1971 and 1981. Industrial
area in both regions increased between 1952 and 1977, but the rate of increase has slowed.

Although the latest FIA survey data for the East do not show a significant slackening in the acquisition of timberland by industry, several factors now seem to be operating that reduce the attractiveness of industrial ownership of timberland. These include cash-flow considerations, other investment opportunities in a company's portfolio, opportunities for land leasing and long-term harvesting rights, and the increased substitution of intensive forestry practices for land acquisition. For forest industry, timberlands have become more of a financial asset than a strategic asset. Timberland now serves as collateral for borrowing, is monetized to provide capital to the firm, is spun off for defensive purposes in the face of possible corporate takeovers, and is sold.

Public

In 1977, 14 percent of the timberland in the East was in public ownership. This percentage has not changed much over the last several decades. Likewise, the shares of public ownership among the various types of public owners have not changed much over that same period.

One notable difference between the two regions is that a larger percentage of the timberland is in public ownership in the North (18%), than in the South (9%). Most of the North's public timberland is in the North Central States, where one third of the timberland in 1977 was in public ownership. Another difference between the North and South is the mix of federal versus other public owners. Approximately one-third of northern public timberland is in federal ownership, while the corresponding proportion for the South is four-fifths.

FUTURE LAND USE

Uncertainty that surrounds future changes in land use in both the North and South is compounded by major questions pertaining to the future course of agriculture. It is very uncertain when the agricultural economy may improve sufficiently to reverse current net losses of cropland. Many rural counties are in a state of transition because of the excess capacity in the agricultural sector. There has also been a sharp decrease in some other rural sources of employment, caused in part by foreign competition in a broad range of industries. The economic conditions are favorable for increased natural or artificial conversion of marginal agricultural land to forest.

Recent projections of forest area changes for the South were prepared for the study, "The South's Fourth Forest: Alternatives for the Future" (USDA Forest Service 1987). The projections suggest: (1) Industry will acquire additional land at a slower rate than in recent decades, (2) farm forest area will continue to drop significantly, and (3) the area in miscellaneous private ownerships will drop only slightly and will remain the largest forest ownership class.

Corresponding area projections for the North will be prepared for the 1990 RPA Assessment. They will be based on results of work in process at the University of New Hampshire for the Northeast and at the University of Wisconsin for the North Central Region. This research in process includes testing of a cross-sectional approach using county-level data and using rate of forest area change as a dependent variable. The integration of land rent and utility
maximization approaches is being tested in related work at the Southeastern Center for Forest Economics Research.

In addition to direct impacts on forest areas, economic and demographic changes have other substantial implications for forestry in both the North and South. For example, while much land will likely remain forested, impacts from developed uses may limit the land's usefulness in traditional commodity production. In addition to direct land conversion impacts from the expansion of built-up uses into forested areas, four diverse types of population effects impact forest management and investment potentials (Alig and Healy 1987). These include (1) influences on neighboring landowners about the future use of their land and a possible rise in their land property taxes; (2) composition of landownership may change, with an increasing proportion of landowners being primarily nonfarmers, (3) as expectations about future urban uses rise, land is typically divided into smaller parcels, which may have profound impacts on the economics of farming or forestry, even when the land is not physically altered in any major way (Healy and Short 1981); and (4) "juxtaposition effects"—spatially bounded externalities that affect adjoining or nearby land (Healy 1985), which may be either positive (e.g., a new reservoir raises recreational attractiveness of nearby forest land) or negative (e.g., new rural residents object to spraying of herbicides or to clearcuts or controlled burns on forest land) (Bradley 1984).

It is important to consider all major uses of the land when examining prospective timberland area changes because of the numerous linkages among uses on a fixed land base. External forces play major roles in forest area change. Because forest production in the East takes place in an open economy, area change implications associated with overseas markets for certain land products seem to be growing in importance. One notable difference between timberland area changes in the North and South has been the larger impact in the South of agriculture programs, such as the Conservation Reserve Program of the 1985 Farm Bill. Examples of factors that complicate analysis and deserve research attention are differences in production cycles and timing of incomes from land uses, nonmarket components of land use (e.g., erosion potential), aging of the population, and institutional factors (e.g., land use controls).

LITERATURE CITED


Alig, Ralph J., Thomas J. Mills, and Robert L. Shackelford. 1980. Most Soil bank plantings in the South have been retained; some need follow-up treatments. Southern Journal of Applied Forestry. 4:60-64.


