

**FOREST MANAGEMENT AND TIMBER PRODUCTION IN THE U.S. SOUTH**

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# Forest Management and Timber Production in the U.S. South

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## Introduction

Most of the land and resources of the southern United States left the public domain more than 150 years ago. Since then, private owners have controlled the allocation of most natural resources within the region. In no other part of the U.S., perhaps the world, has the formation of a significant timber market been left to a generally unregulated private sector. This paper describes the structure of the forest sector in the South with emphasis placed on the unique features that arise from private management of forests.

The question of whether forests regulated by private enterprise can work to the benefit of society in general cuts to the core of a very large share of forest policy issues around the globe. Forest conservation and regulation have traditionally been motivated by the perception that private land owners are uninformed about the value and value dynamics of their resources and that they discount the future too heavily in their decision making. These arguments suggest that private decisions would therefore be short-sighted, resulting in too much cutting in the short-run and increasingly scarce material in the long run. Perhaps the best example of this line of argument is Pinchot's rhetoric regarding timber famine and the consequent need for forest reserves (later National Forests) in the U.S. (Pinchot 1947). Similar cases have been put forth for most other forest policies aimed at private landowners (see Boyd and Hyde 1989).

The U.S. South provides a case for examining the actual performance of private timber markets. The region has passed through a transition from an old-growth harvesting to an essentially agricultural style of forest production. From the early 1950's until the early 1980's forest inventories as well as rates of production have

increased in the region. Since this period of expansion, the region's production shows signs of leveling off. While capacity for expansion exists, recent levels of investment do not portend extensive growth in the immediate future. The response of southern production will play a key role in defining the eventual market response to structural changes in timber production from public lands in the U.S.

The paper is organized as follows. The next section defines the general setting of forest management in the South, including overall land use history and demographics. The third section examines in detail the extent and distribution of timber inventories across quality classes, forest types, and owner types. The subsequent sections then examine the history of timber production from the region, focusing on two questions regarding the functioning of private timber markets. The first looks at evidence regarding how individual private producers have responded to market information in their output and investment decisions. The second examines patterns of forest organization, timber production, and timber prices and their implications for the long run sustainability of timber production in the South. The concluding section summarizes findings but also raises a set of issues that are not addressed in the paper including a suite of issues that define a broader, ecological definition of sustainability.

## General Setting

This paper adopts the boundaries of the U.S. South used in the most recent Forest Service Resource Planning Act (RPA) resource assessments (Figure 1, USDA Forest Service 1994). This region stretches east to west on the Atlantic coast to eastern Texas and Oklahoma, and north to south from Kentucky and Virginia to

the Gulf coast. The thirteen states enveloped by these boundaries contain roughly 24 percent of the land area of the United States, but contain a disproportionate 40 percent of the nation's timberland (Powell et al. 1993, p 23).<sup>1</sup>

Forests are clearly the dominant feature across the entire southern landscape. Figure 2 shows the share of land that is timberland in each southern state (note that Texas and Oklahoma are excluded because forest cover is generally limited to only the eastern third of these states). This share ranges from 48 percent in Kentucky to 69 percent in Alabama, with the most productivity (60-69 percent) concentrated in the coastal plain states from Virginia to Alabama.

A general indication of the productivity of these forests is that 95 percent of all forested land in the region is defined as timberland, the highest share for any region in the U.S. The region's average potential productivity is also the highest in the country. The average potential productivity of forests in the South is about 80 cu ft per acre per year (Figure 3). Productivity in the Pacific Northwest is comparable at 79 cu ft per acre per year, while all other regions in the U.S. have much lower rates.<sup>2</sup> This relatively strong productivity reflects a combination of

edaphic and climatic features that favor the rapid growth of forests in the region. Untended clearings in the South are rapidly colonized by tree cover, usually southern pine, and stands typically grow to financial maturity in 30-50 years. Optimal rotation ages are generally one-half to one-third the length of these defined for timber stands in other parts of the U.S.

Ownership patterns also set the South, along with other parts of the eastern U.S., apart from the west. Unlike the western United States, where public lands were carved out of the public domain, public lands in the East were purchased back from private owners. National Forests in the East have only a short history, dating to the Weeks Law of 1911, with a large share being acquired during the Great Depression (see generally, Steen 1976, p 122-131.) As a result, only a small share of the South is in public ownership; and a full 90 percent of timberland in the South is controlled by private landowners (Figure 4). Of this private share, 22 percent is held by firms that produce wood products ("forest industry") and the remainder is held by a wide variety of individuals and other corporations. This latter group of owners, generally labeled the nonindustrial or other private ownership group, represents a wide range of objectives and forest management.

The allocation of land and the condition and management of forests in the South is therefore determined by the decisions of this wide variety of private landowners. Forest industries predictably manage their land intensively for timber production. In contrast, other private lands are managed for a broad range of uses and products. As a result, the extent of timberland reflects overall land use decisions and the relative strength of agricultural markets as well as the demand for urban and other developed uses of land. In the early 80's a little more than half (55 percent) of the region was classified as timberland, 31 percent of land was used to produce crops or pasture, and 13.9 percent was in some other use (USDA FS 1988, p 257).

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<sup>1</sup>Timberland is forest land that is producing or is capable of producing crops of industrial wood (at least 20 cubic feet per acre per year).

<sup>2</sup>Average productivity is calculated as the area-weighted average of productivity class midpoints as displayed in Powell et al. (1993), and is intended only as a general indicator of production potential. The reader should keep in mind that all regions in the U.S. are heterogeneous in terms of the distribution of productive lands. In addition, note that, while the South and the Pacific Northwest are comparable in terms of average potential productivity, this average applies to roughly five times as much land in the South.

While the share of agricultural land in the South has declined substantially since the beginning of the century, much of the region's timberland could revert to crop production in response to strong markets for agricultural products (Alig 1986). In addition, increasing demands for residential, commercial and other non-rural uses of land are anticipated as the South continues to experience the highest rate of population growth in the U.S. (Alig 1986).

### **The Southern Forest Inventory**

Timber production, investment, land use changes, and forest succession and growth constantly change the composition of forests. The South, while sometimes considered mainly a softwood-producing region, has a wide range of forest conditions, reflecting differences among areas as diverse as the Southern Appalachian Mountains, the Mississippi Delta, and the Atlantic and Gulf Coastal Plains. While a full examination of these diverse forests is beyond the scope of this paper it is important to recognize the diversity as well as the extent of the region's forests. Some of this diversity is reflected in inventory and production statistics presented here.

The distribution of forest conditions can be viewed at a coarse level by examining the areas of hardwood- and softwood-producing forests. In the South, roughly even shares of forests are in hardwood- and softwood-dominated forest types<sup>3</sup>, and this distribution has remained relatively stable over the last 40 years (Figure 5a). However stability in these aggregate categories masks some important changes both between forest types and between forest

ownerships. For softwood forests, natural pine area has steadily declined while the area of pine plantations has steadily increased. The area of upland hardwoods has also increased while the total area of bottomland hardwoods and mixed pine-hardwoods has remained relatively stable over this period. Overall, forest area declined in the South from the 1960's into the early 1980's. However, forest area grew slightly between 1987 and 1992.

Forests have also shifted between ownership categories. The share of forest land controlled by forest industry expanded by 27 percent between 1952 and 1992 from 17 percent of timberland in 1952 to 23 percent in 1992 (Figure 5b). These forests are managed much more intensively than those on other private lands. In 1992, forest industry lands were 34.7 percent pine plantation while only 6.9 percent of other private lands were in pine plantations. Put another way, the forest industry manages 60 percent of the regions's plantations on only 23 percent of its timberland.

While the total area of timberland has remained relatively stable over the last 40 years, the volume of timber contained on these lands has grown considerably. Total inventories of southern forests have expanded by about 69 percent since the 1950's, from 148 billion cubic feet (bcf) in 1952 to 251 billion cubic feet (bcf) in 1992 (Figures 6a and 6b, Powell et al. 1993). Hardwood and softwood growing stocks have, however, expanded at different rates over this period. Hardwood growing stock volume has increased steadily from about 88 bcf to 148 bcf between 1952 and 1992. In contrast, softwood inventories expanded strongly between 1952 and 1977 but have generally leveled off since 1977.

Expansion in output between 1977 and 1986 suggests that management over this period has resulted in a better organization of timber capital, but the leveling of inventory clearly raises questions about the potential to expand production within the region.

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<sup>3</sup>Hardwood-producing forests are those in upland and bottomland forest type classes. Softwood-producing forests are defined here as those areas in pine plantation, natural pine, and mixed pine-hardwood forest type categories.

The distribution of growing stock also differs between land owner groups (Figure 7). On forest industry land, softwoods comprise about 58 percent of growing stock, while they comprise about 37 percent of the inventory on other private lands. This again reflects the emphasis on softwood timber production on industry lands, but should also indicate that industrial forestry includes a significant component of hardwood production as well.

### **Timber Production in the South**

Timber production from the U.S. South has experienced considerable growth over the last forty years. Total output grew from about 5.0 bcf in 1952 to 8.2 bcf in 1992 (Figure 8). Output expansion was most substantial for softwoods, growing 75 percent, from 3.0 bcf in 1952 to 5.3 in 1992. Hardwood output was relatively stable over most of this period, but grew approximately 71 percent between 1976 and 1986.

Softwood output has grown at a rate higher than the U.S. as a whole. As a result, the South produced an ever-increasing share of total softwood output during this period, moving from about 40% in 1952 to about 50% in 1992 (Figure 8). Conversely the South's share of hardwood output contracted over the same period, from 58% of total U.S. hardwood production in 1952 to 42% in 1992.

In contrast to total output growth, product mix has remained relatively constant over this period (Figure 9). Sawlogs and pulpwood are the dominant products, representing about 80 percent of total output for both softwoods and hardwoods. Each product represents about 40 percent of output for both species groups. The remaining 20 percent is used in veneer logs, fuelwood, or for other miscellaneous industrial products.

### **Timber Markets in the South**

Timber markets are formed in the South by the interaction of private landowners supplying timber and a variety of firms demanding timber. These firms produce a range of final products including lumber, plywood, composite board, and paper products. The demand for timber is therefore derived from and influenced by the markets for these final goods. In general, these final goods markets are well integrated across the U.S. so that shifts in the production of other regions can have a direct impact on timber markets in the South (e.g. Robinson 1974). For example, recent declines in timber production from the Pacific Northwest have likely had an important impact on southern timber production over the last three years.

Markets for different final goods are also interconnected. For example, shifts in the demand of one final good (say pulpwood) may have an indirect effect on markets for another (say pine sawtimber). These connections between markets arise from the basic substitutability of various timber products (e.g. Newman 1987) as well as economies of scope arising from the multiple products that are generated by timber harvests.

While private markets for timber products exist, concern has often been raised about the ability of private landowners to efficiently allocate resources to long-term timber production (See, in general, Hyde 1980). These concerns date to the latter part of the nineteenth century, when timber production amounted to mining a non-renewable old-growth resource, and have been carried forward to the modern agricultural form of timber production. These concerns boil down to a couple of arguments for market failure: 1) a lack of access to essential price information, and 2) a failure of private landowners to anticipate or respond to market signals of scarcity. However, we can find little empirical support for these basic concerns.

Active markets exist for both timber standing on the stump and for delivered logs. Private landowners sell their timber on the open

market either through timber sale auction or through a long-term contract with a wood products firm. Many timber sellers are infrequent participants in these markets, raising concerns over informational efficiency. That is, it could be difficult or impractical for private landowners to gather current price information and thereby understand the fair market value of their timber. Besides the obvious problems with fairness, this raises a potential cause of under investment in future timber production.

One source of price information for private timber owners is consulting foresters and state service foresters who provide various technical forestry services to landowners. They provide an important link between landowners and timber markets and the science of forest management and production. Private consulting foresters may not always be the best source of unbiased information, however, given their incentives to sell timber and collect commissions (e.g. Boyd and Hyde 1989).

The ideal solution to information problems in markets is to compile and make public valid and timely price data. To accomplish this in the South, the USDA helped establish Timber Mart South, which has reported stumpage and delivered prices for various timber products, on a regular basis since 1977. Since 1981, Timber Mart South has been a privately funded enterprise. With Timber Mart South, and in some cases with price reporting by states, there is a generally accepted and available source of price data in the South, indicating that private landowners, even small concerns, have access to fair market values for their timber.

If we assume that private landowners have reasonably good access to timber prices, the next question is whether or not they respond to these price signals. Some have argued that private timber--at least from the other private ownership--is less than reliable, depending more on individual circumstance than on market condition. If this were the case, timber supply would fail to respond to increasing scarcity,

leading to substantial market inefficiency. This is the core of the argument for the public regulation of timber harvesting.

The weight of empirical evidence, however, rejects the notion that private landowners do not respond to market signals. One source of evidence is empirical work on aggregate timber supply functions. In particular, we can examine the own-price elasticity of timber supply, which measures the proportional response of timber production to an increase in timber price. That is, the elasticity provides a direct estimate of timber producers' response to market signals.

Newman's (1988) model of timber supply and demand yields positive, though inelastic, supply elasticities for aggregate supplies of pulpwood and sawtimber in the South. Adams and Haynes (see, Cabbage and Haynes 1988, pg. 29) estimate supply elasticities for industry and other private owners, separately. They find comparable inelastic supply elasticities for the both owner groups. Other studies (e.g. Robinson 1974, Daniels and Hyde 1986) find similar results.<sup>4</sup>

One could argue that while supply elasticities are positive, they are still relatively inelastic, suggesting perhaps a less than optimal supply response. However, it is important to recognize that the referenced studies are essentially short to medium run models, within which land and inventories may not fully adjust to changing markets. We should anticipate inelastic response under these conditions. In the only study to actually derive short- and long-run timber supply elasticities, Newman and Wear (1993), show similarly inelastic short-run elasticities. Consistent with the economic model of supply, however, the long-run supply elasticities are much more elastic, ranging up to 3.4. This implies that, when given time to adjust

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<sup>4</sup>See Cabbage and Haynes (1988) for a general discussion of supply elasticities and private timber markets.



their production plans, private landowners can and do respond to market signals in the production of timber. Furthermore, these elasticities are quite comparable to supply elasticities for other agricultural products (Cubbage and Haynes 1988).

The Newman and Wear study also provides evidence that the investment decisions of private landowners respond to both price and cost information. Their results indicate, therefore, that private landowners have invested in forests in anticipation of future returns. In fact, their results indicate that forest management on other private lands, while different from forest industry's management, is also consistent with rational economic production.<sup>5</sup> Elasticity evidence, therefore suggests that private producers, including those in the "other private" category, can and do respond to market signals in the production of timber. They therefore provide a strong rebuttal to the argument for a fundamental market failure in the formation of timber supply. Price elasticities alone do not, however, reveal how markets will respond to future conditions. Elasticities are calculated with all other factors, including competing demands for land, shifts the product mix demanded for forests, or even climate changes, held constant. The question of how timber markets will actually develop and influence forested landscape of the South therefore remains.

### **Is Timber Production Sustainable?**

Sustainability is a contentious topic in natural resource management. Differences arise not only over how to effect sustainable systems but also over how to define them. Forestry, throughout its history, has been organized around a concept of sustained yield that is utilitarian in

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<sup>5</sup>More precisely, they fail to reject profit maximization as the model of forest management, on other private lands.

the sense of sustainable agriculture, and places emphasis on the sustained production of forest products. More recent discussions focus on expanded models of sustainability that address landscapes and systemic ecological conditions that result from the cumulative impacts of peoples' use of land and resources. This definition is sufficiently broad to support extended debate within and among the several disciplines it encompasses. The objectives of this section, however, are only to examine (1) whether various indicators suggest that physical timber production from the South is indeed sustainable well into the future and (2) whether timber material from the South is becoming more or less scarce in an economic sense. The first question focuses on forest conditions within the region. The second question addresses regional conditions but also addresses the relative position of the South in terms of national wood products markets. We therefore adopt a working definition of sustainability that is perhaps closest to the forester's definition of sustained yield. The result is something that can be measured and a measure that provides a first-approximation to a broader definition of sustainability.

Perhaps the simplest way to portray the outcomes of complex dynamics in forest production is to compare the rate of timber growth with the rate of removals. Figure 6a, shows how softwood timber inventories, after completing an expansionary phase, have leveled off over the last fifteen years. A long-run steady state in forest production would suggest a constant level of inventory where timber growth just offsets timber removals. If removals exceed growth (i.e. the growth removal ratio is less than one) then inventory will decline. Conversely a growth:removal ratio greater than one indicates expanding inventories. Most recent growth and removal data for the South as a whole show expanding hardwood inventories ( $G/R=1.53$ , Table 1), and slightly contracting softwood

inventories ( $G/R=.95$ ).<sup>6</sup> Seven of twelve states exhibit contracting softwood inventories while only one state, South Carolina, shows contracting hardwood inventory.<sup>7</sup>

The magnitude of the softwood  $G/R$  for the South as a whole (.95) does not suggest significant erosion in timber inventories in the South (at this rate of decline it would take more than 350 years to liquidate the softwood inventory). It is even possible that a  $G/R$  less than one could be associated with an expanding forest economy that is shifting away from sawtimber and towards pulpwood production. However, this kind of shift is not supported by market information and historical changes in the timber product mix. While we do not have data for the last three years, during which markets have experienced important changes, these results raise questions about the likelihood of a large expansion in Southern softwood products.

The spatial distribution of growth:removal data provides additional insights. Figure 10 maps where in the South softwood removals exceed growth. These areas generally correspond with the most active softwood markets, especially in the Atlantic Coastal plain. The most significant erosion of softwood inventories in the South, however, arise in the upper Piedmont of Georgia and Alabama ( $G/R$ 's range from .66 to .76) reflecting the influence of significant urban development on timber inventories. Again, this emphasizes the importance of factors exogenous to timber markets in influencing the future timber productivity of the region.

Physical timber inventories provide one approximation of how forest production has

changed over time. However, inventory measures do not necessarily capture shifts in the quality and age distribution of forests. To account for differences of quality requires a value denominator that estimates for the contribution of inventory to eventual production. Wear (1993) provides measures of the capital input to softwood production in the South that accounts for these differences and defines net as well as gross investment in timber production in the South.

Forest capital indices in Figure 12 show different patterns of investment on industry and other private lands. For the forest industry, investment both in land and intensive management expanded the resources dedicated to timber production from the 1950's, into the early 1980's. In contrast, the other private ownership experienced disinvestment until the 1970's reflecting the movement of timberland to other uses and shifts from pine to hardwood forest types.

In total, resources dedicated to softwood production have remained essentially constant over the last decade (middle line in Figure 12). Strongly positive net investment on industry lands have just offset disinvestment on other private lands over the historical period. Over the last few years, investment, while substantial, has played a replacement rather than expansionary role in the forest sector of the South.

Another indicator of how a natural resource sector is developing is the relative scarcity of the resource. Increasing scarcity is signaled by rising real timber prices while decreasing scarcity is signaled by falling real timber prices. Because of the interplay of regional and global markets, these trends mark the relative availability of timber in the context of a much larger final goods market. Price trends should however, be interpreted carefully especially since raw material markets are subject to strong cyclic patterns.

Figure 11 shows price data for delivered timber products in the Southern Coastal plain of Georgia, an area with one of the highest rates of

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<sup>6</sup>The source for these data is Cabbage et al. (In press).

<sup>7</sup>South Carolina's data were confounded by the damage and salvage harvests resulting from Hurricane Hugo.

timber production in the U.S. As expected, softwood sawtimber prices have trended upward over the last three years. However, real prices in 1993 and 1994 are just approaching previous peak values obtained in the late 1970's. In contrast, pine and hardwood pulpwood prices have remained essentially level or declined over this entire period. At first glance, then, there appears to be no compelling evidence of increasing economic scarcity of timber material from the South.

These three indicators of sustainability, inventory dynamics, timberland investment, and price trends, all seem to suggest a well-organized timber producing sector in the southern United States. That is, the sector appears to have grown in an orderly manner between the 1950's and 1980's and leveled off in the late 1980's and early 1990's. Unfortunately, data are not yet compiled that would provide insights into the sector's response to recent structure changes in national timber markets. However, investment history does not indicate that landowners anticipate significant expansion in the timber growing sector.

### **Role of Government in Private Forest Management**

While private landowners manage most of the South's forests, federal and state governments have also played a role in promoting forest management. Government assistance to private landowners dates to the Clarke-McNary Act of 1924 which enabled state-federal cooperation in several areas of forest protection and management (see Cabbage et al. 1993). Since then, expenditures by the federal government in the South have supported a broad fire protection program as well as assistance in the form of cost sharing for forest regeneration and timber stand improvement and technical advice for landowners.

These assistance programs have generally been motivated by concern regarding future

timber supply (Forestry Incentives Program) or overall resource conservation (Conservation Reserve Program). They are aimed exclusively at the "other private" category of landowners, particularly those who manage small holdings. These landowners are encouraged to maintain the productivity of their land and forests through educational programs and limited financial assistance.

Fire protection represents perhaps a more significant contribution to the South's forest sector. These programs reduce the risk of catastrophic forest loss--some would say by a substantial margin--thereby improving the odds of realizing a return on forestry investments. This reduction in uncertainty has likely played a significant role in the expansion of forest production since the 1940's.

Government's direct roles in southern timber production has been (1) to reduce risk for forest investors (lend stability to the investment environment) and (2) to extend information and assistance to small landowners. They raise an important question. What is the extent of government participation in forest management and timber production in the South?

One way to define the extent of the government's participation in timber production is to compare program expenditures with total investments in forestry. Table 2 shows direct expenditures for fire and landowner assistance programs for selected years. In 1983, for example, these programs totaled \$123 million. Investment in softwood production alone (Wear 1993) was \$3.6 billion in 1983, including investments in regeneration and forest growth. Comparable investment estimates are unavailable for the half of southern forests that are in hardwood forest types. However, using softwood investment alone, these government expenditures represent only 3% of total forest investment in 1983. During the growth phase of southern forestry, the program share was higher (9% in 1960 and 1970), but still a relatively small

share of the total assets dedicated to timber production.

It is likely that cooperative forestry and forestry assistance programs have had an important influence on the development of forestry in the South. Their effects have been on establishing investment infrastructure (by reducing fire risk) and keeping important marginal, sometimes highly erodible, lands out of agricultural production. The latter's direct effect on timber supply has been rejected (Boyd and Hyde 1989). In any case, the government's direct contribution to timber production has been very small in terms of total investment. Timber production decisions are clearly dominated by the market within the South.

### **Concluding Remarks**

This paper has described the evolution of the South's forest sector from several perspectives. Findings are summarized below:

- ✓ The South contains 24 percent of the U.S. land area, and 40 percent of U.S. timberland.
- ✓ Southern forests are among the most productive in the United States.
- ✓ Timberland ownership is dominated by private landowners. While ownership by forest industry has grown steadily, the majority of land is held by a varied group of nonindustrial private owners.
- ✓ The total area of forestland has declined since the 1950's but has grown slightly in the late 1980's and early 1990's.
- ✓ In contrast to forest area, forest inventories have expanded substantially over this historical period. Softwood inventories, however, have leveled off since the late 1970's.
- ✓ Output of timber products (especially softwood) grew in absolute terms. As with softwood inventories, output leveled off during the most recent period.

- ✓ Econometric analysis of timber supply and of forest management reject the notion of widespread market failure in southern timber markets. Timber owners have and should be expected to respond to market signals in their production plans.
- ✓ An analysis of the most recent growth:removal ratios for the South indicate that production may be operating at or near capacity. The spatial pattern of these ratios also indicates localized urban development pressures on timber lands.
- ✓ Patterns of timber investment indicate that, while gross investment in timber production is substantial (e.g. \$3.6 billion for softwoods alone in 1983), net investment is near zero. That is, investment has played essentially a replacement rather than expansionary role within the region.
- ✓ Price trends for timber products seem to reject the notion of increasing economic scarcity of timber material. However, recent changes in U.S. timber markets have not played out completely.
- ✓ Government has played a role in reducing investment risk and providing assistance to some private landowners. However, government participation is relatively minor compared to the total resources dedicated to production within the region.

Taken together, these findings indicate that the South's forest sector is well-organized and highly productive. The sector has grown in an orderly manner and appears to have reached a stasis over the last few years. An equilibrium is rarely stable though, and shifts in demands for non-forest land uses and demands for wood products will likely lead to change.

This paper has focused exclusively on timber production in the South and the ability of atomistic, diverse landowners to supply a timber market. All indicators discussed here suggest

that the market has worked well in the production of timber. However, it is equally clear--though not necessarily as easy to measure--that many services that are provided by forests but do not trade in markets may become increasingly scarce in the South. For example, concerns over biodiversity, wetland protection, and habitat fragmentation are the subject of much policy debate and motivation for existing and potential future regulation of forest management in the South and other regions. In essence, these might be components of a broader definition of sustainability, that obviously extend the sustained-yield model discussed here. Increasing regulation is likely in pursuit of this broader vision, portending additional and possibly important changes in timber markets. The collection of existing local, state, and federal regulations, however, have not yet had discernable impacts on timber supplies at the market-level examined here.

Table 1. Timber growing stock, growth, and removal data in the South.<sup>1</sup>

<u>State</u>	<u>Survey Year</u>	<u>Softwood</u>			<u>Hardwood</u>		
		<u>Inventory</u>	<u>Growth</u>	<u>Removals</u>	<u>Inventory</u>	<u>Growth</u>	<u>Removals</u>
		-----million cubic feet-----			-----million cubic feet-----		
Alabama	1990	11,110	661	720	11,974	568	370
Arkansas	1988	7,920	388	423	11,068	425	241
Florida	1987	9,330	487	474	5,660	140	66
Georgia	1989	15,600	817	959	15,130	456	342
Louisiana	1991	9,900	527	659	8,920	310	261
Mississippi	1987	9,090	509	520	10,340	436	241
North Carolina	1990	12,530	589	511	20,212	569	427
Oklahoma	1993	1,390	109	55	1,610	66	28
South Carolina	1993	8,030	344	492	8,650	182	236
Tennessee	1989	2,880	100	52	13,800	539	168
Texas	1992	7,870	512	526	5,060	199	159
Virginia	1991	6,650	317	252	19,840	531	346
Total	-	102,280	5,360	5,643	132,264	4,421	2,885

Source: USDA Forest Service, Forest Inventory and Analysis Reports, Southeastern and Southern Forest Experiment Stations.

<sup>1</sup>Table was duplicated from Cubbage et al. (In press).

Table 2. Federal and state expenditures for private forest management in the South as a share of total forest investment (millions of 1982 \$'s).

<u>Assistance Programs</u>	<u>1983</u>	<u>1980</u>	<u>1970</u>	<u>1960</u>
a. Federal and state expenditures for wildfire <sup>1</sup>	87.9	88.9	109.0	78.1
b. Federal expenses for regeneration and timber stand improvement	9.5	15.9	3.3	13.7
c. Federal and state expenditures for forest management assistance	25.4	25.9	11.5	5.3
d. Total assistance	122.8	130.7	123.9	97.0
<u>Direct Softwood Investment</u>				
e. Planting costs	240.8	252.5	111.4	118.1
f. Forest rent <sup>2</sup>	3364.4	3175.0	1124.2	908.3
g. Total direct investment	3605.2	3427.5	1235.6	1026.4
h. Total investment (g + c + a)	3718.5	3542.3	1356.1	1109.8
i. Federal share (d/h) x 100	3.3%	3.7%	9%	9%

<sup>1</sup>Source for assistance programs is USDA Forest Service (1987).

<sup>2</sup>Methods used to calculate forest rent are explained in Wear (1993).

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