The South's Forestland—On the Hot Seat to Provide More

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Forests of the southern United States range from tropical/subtropical forests on the southern extremities of the region, oak savannah forests on the western fringe, to central hardwood forests and high elevation boreal forests in the north. Upland and bottomland hardwood, southern pine and mixed pine-hardwood forests are found on the more moderate sites between these extremes. The South's forests have been and continue to be molded by a myriad of natural agents and human activities that affect forest values and functions, as well as the relative mix of forest benefits. The pressure on the region's forests to provide more of everything is strong and escalating each year. Major contributors to this pressure include a growing and increasingly non-rural population and increased demand on the region's forests to supply more of the wood products consumed by our nation. Conflict over what our forests should be and how they are managed highlight the need for a sound understanding of the current status of our forests. Here we provide an overview of the current status of southern forests, document changes that have taken place during the latter half of the 20th century and offer some assessment of effects on forest wildlife communities.

Data for this assessment are taken from regional forest inventory data collected by the USDA Forest Service's Forest Inventory and Analysis (FIA) units (USDA Forest Service 1992). Previous assessments of our nation's forest resources provide basic trend information for the South for 1952 and several subsequent years (USDA Forest Service 1958, USDA Forest Service 1982, Powell et al. 1993). The most recent compilation of national statistics was for 1992; these data were updated for the South using results from forest inventories completed since that time. Most of the current forest inventory data used in this assessment are available on the Forest Inventory and Analysis homepage on the Internet: www.srsfia.usfs.msstate.edu. Information on wildlife species and habitat are taken from Wildlife of Southern Forests: Habitat and Management (Dickson in preparation).

Forest Extent and Distribution

Forests cover 214 million acres (86.6 million ha) in the 13 states comprising the southern United States (Figure 1). Forests classified as timberland account for the majority (94 percent). Timberland is considered productive for traditional forest products (i.e., logs for lumber) and not withdrawn from harvesting by statute or formal regulation. Reserved forests are withdrawn from timber harvesting and account for 3 million acres (1.4 million ha) in the South; other forests account for the remaining 9 million acres (3.8 million ha). Other forests were formerly termed unproductive forestland to denote the predominance of trees of small stature that would never achieve sufficient size to produce traditional forest products. However, these forests are often highly productive and valued for many uses, especially as habitat for wildlife species. Other forestland is concentrated in Texas, Oklahoma and Florida. In Texas and Oklahoma, oak savannah forests are predominant. In Florida, hatrack cypress and mangrove forests in the southern half of the state account for most of the other forestland.

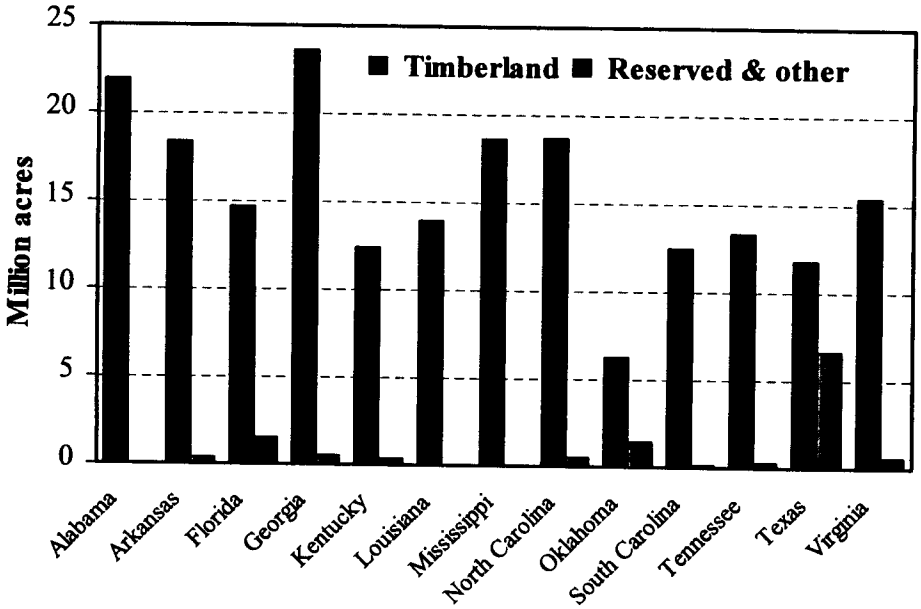


Figure 1. Forest area in the South by state, 1996.

Forest proportion—forest area as a percentage of land area—varies widely between states. In Oklahoma and Texas, less than 20 percent of the land is forested; in contrast, more than 60 percent of Alabama, Georgia, Mississippi, North Carolina, South Carolina and Virginia is forested. Forestland proportion by county also varies substantially (Figure 2). Other than western Oklahoma and Texas, which are not shown in the map, areas with the least forest are found in southern Florida, the entire Mississippi River basin, along the western fringe of the mapped region, and numerous other localities where concentrations of agricultural land or urban land uses predominate. Forests are most dominant in parts of the Appalachian Mountain range, southeastern Georgia and northern Florida, much of Alabama and eastern Mississippi, and an area extending from southeastern Texas and southwestern Louisiana to southwestern Arkansas.

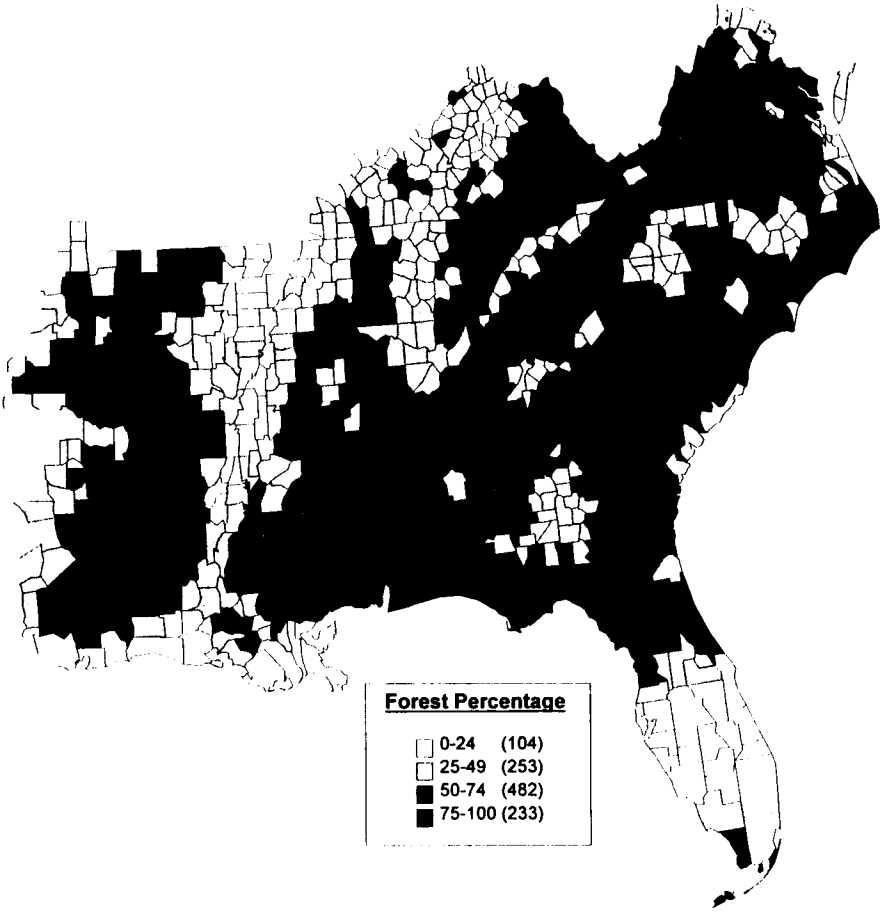


Figure 2. Forest percentage in the South by county, 1996.

Over the latter half of the 20th century, total area occupied by forests in the South has remained relatively stable according to Forest Inventory and Analysis data (Figure 3). Forest area has increased slightly during the 1990s as the movement of agricultural land to forest has more than offset the conversion of forest to other land uses. Forest area in 1996 is less then 5 percent lower than that measured for the region in 1952, with most of that loss occurring in the late 1960s and 1970s. Reductions in area of reserved and other forestland were recorded during the period; however, all of the reduction was in the other forest category, as the acreage of reserved forest increased during the period.

Ownership

At 138 million acres (55.8 million ha), nonindustrial private forest (NIPF) owners control more than two-thirds of the timberland in the South (Table 1). Forest industry has the next largest share with nearly 41 million acres (16.5 million ha), or 20 percent, followed by national forest with 11 million acres (4.6 million ha) and other public agencies with nearly 10 million acres (3.9 million ha). These ownership totals do not include reserved and other forestlands.

Table 1. Area of timberland (in million acres) in the southern United States by ownership class, 1952-1996.

Ownership class	1952	1962	1977	1987	1992	1996
National forest	10.8	11.1	11.5	11.8	11.6	11.5
Other public	6.6	6.7	6.9	8.2	8.9	9.7
Forest industry	31.8	33.6	36.9	38.0	39.0	40.8
Nonindustrial private	155.3	157.3	144.3	139.4	139.8	137.9
All owners	204.5	208.7	199.6	197.3	199.3	199.9

The NIPF owner group includes an extremely diverse mix of owners with widely varying backgrounds and land-management objectives (Birch 1996). Farmers and ranchers, all other private individuals, and corporations other than forest industries are included. This diversity results in an infinitely variable forest, a positive outcome for wildlife as well as forestry. However, dealing with ownership diversity presents challenges in the development of landowner assistance and other natural resource programs. The NIPF owner group accounts for more than half of the timberland in every southern state except Florida, where they have 49 percent. States with the highest proportion of NIPF control include Kentucky (90 percent), Tennessee (80 percent), Virginia (77 percent) and North Carolina (76 percent). Since 1952, NIPF timberland acreage in the South has declined 11 percent, from 155 to 138 million acres (62.7-55.8 million ha). Most of this drop occurred by 1977, with slight reductions occurring in the latest decades.

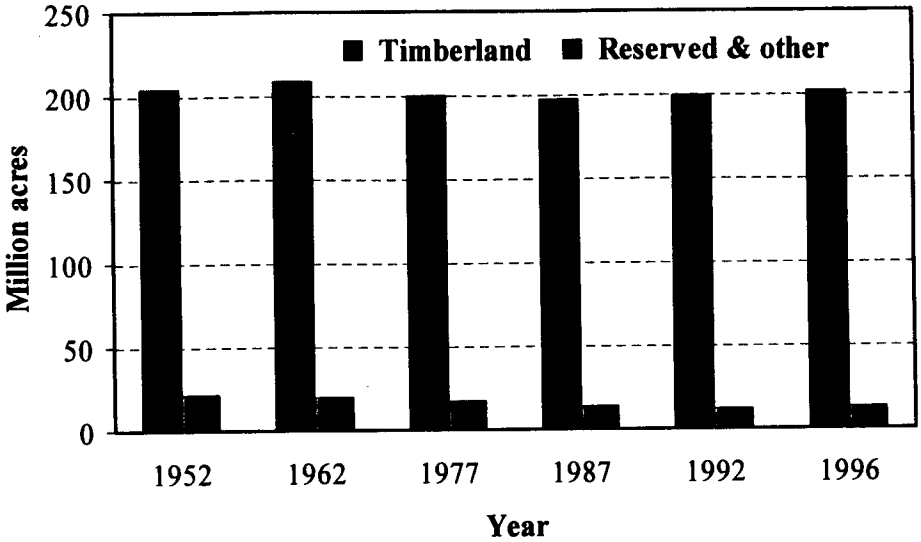


Figure 3. Forest area in the South, 1952-1996.

Forest industry ownership is generally highest in the deeper South. In Louisiana, Texas (eastern), Florida, Georgia, Alabama and Arkansas, forest industry controls 25 percent or more of the timberland. Since 1952, acreage in forest industry holdings has increased by 28 percent; increases have been recorded throughout the period. While it is too soon to discern any long-term trend, evidence from some very recent inventories in the South shows forest industry ownership on the decline. This trend is apparent in Florida, Georgia (inventory underway), South Carolina, North Carolina and Virginia.

Public ownership (national forest and other public combined) of timberland is highest in Florida (19 percent) and Arkansas (17 percent). The trend for public ownership has also been upward, increasing by 21 percent since 1952. Most of the increase has been for other public agencies with only modest change in national forest ownership of timberland.

Forest Composition

The South is often perceived and characterized by visitors as well as inhabitants as a land of southern pines. However, this perception is not substantiated by inventory data. There are more hardwood trees than softwoods for almost all tree sizes for each state (Table 2). A ratio of 1.0 and higher in the table indicates more softwood trees than hardwood trees for any state and tree size.

Florida and Georgia are the only states where softwood trees outnumber hardwoods and that is only for pole size trees; Texas and South Carolina have ratios for some tree sizes that are very close to 1.0.

Table 2. Ratio of softwood to hardwood stems, by state and diameter class.

	D.b.h. class (in inches)			
State	1.0 to 4.9	5.0 to 10.9	11.0 to 16.9	17.0+
Alabama	0.25	0.78	0.73	0.47
Arkansas	0.24	0.60	0.58	0.35
Florida	0.61	1.72[a]	1.14[a]	0.53
Georgia	0.31	1.01[a]	0.88	0.49
Kentucky	0.10	0.14	0.08	0.03
Louisiana	0.32	0.79	0.86	0.59
Mississippi	0.26	0.72	0.61	0.39
North Carolina	0.19	0.73	0.54	0.31
Oklahoma	0.22	0.61	0.39	0.16
South Carolina	0.37	0.99	0.83	0.55
Tennessee	0.14	0.27	0.17	0.07
Texas	0.33	0.87	0.96	0.77
Virginia	0.18	0.51	0.26	0.12
South	0.26	0.71	0.56	0.34

[a]Softwoods are more abundant than hardwoods.

Data on forest cover types assigned to stands throughout the South also indicate a preponderance of hardwood—52 percent of the timberland is classed as a hardwood type (Table 3). Upland hardwood forests occupy 75 million acres (30.3 million ha), or about 37 percent of the timberland. These stands are comprised of species such as oaks (*Quercus* spp.), hickories (*Carya* spp.), yellow-poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), American beech (*Fagus grandifolia*) and red maple (*Acer rubrum*). Upland hardwood stands make up more than 50 percent of the timberland in Kentucky, Tennessee, Virginia and Oklahoma. Bottomland hardwood forests account for 15 percent of the timberland, or 30 million acres (12.3 million ha). The most common bottomland hardwood forest type is oak-gum-cypress; these forests are often comprised of numerous oak species, tupelo and blackgum (*Nyssa* spp.), red maple and cypress (*Taxodium* spp.). Bottomland hardwood forests are concentrated in Louisiana, Florida, Mississippi and South Carolina.

Southwide, one-third of all timberland is classified as a pine forest type (50 percent or more of the tree stocking is pine). While the proportion of timberland in pine cover types varies widely across the region, Florida is the

Table 3. Percentage of timberland in southern states by forest management class.

State	Pine plantation	Natural pine	Oak-pine	Upland hardwood	Bottomland hardwood
Alabama	18	18	19	33	10
Arkansas	12	17	16	38	16
Florida	33	19	9	14	25
Georgia	23	26	12	25	15
Kentucky	1	5	7	82	5
Louisiana	18	21	12	15	34
Mississippi	16	15	17	32	20
North Carolina	11	22	14	38	14
Oklahoma	10	13	14	53	10
South Carolina	21	23	15	20	20
Tennessee	3	8	12	72	5
Texas	15	21	21	27	15
Virginia	10	12	13	62	4
South	15	18	14	37	15

only southern state where pine types make up more than 50 percent of the timberland. If oak-pine stands (pine stocking between 25 and 50 percent) are included, the percentage of timberland with significant pine stocking exceeds one-half of all timberland in six states—Alabama, Florida, Georgia, Louisiana, South Carolina and Texas. Loblolly pine (*Pinus taeda*), shortleaf pine (*P. echinata*), slash pine (*P. elliottii*) and longleaf pine (*P. palustris*) are the primary pine species in the region.

At 31 million acres (12.5 million ha), pine plantations make up 15 percent of timberland in the South, just short of the natural pine total. An additional 3.8 million acres (1.5 million ha) were planted, but hardwoods dominate the stocking; these stands are included in the oak-pine or hardwood types. Loblolly pine is the species most widely planted throughout the region, whereas slash pine is often planted in the southernmost portion. Planting of longleaf pine is increasingly common as efforts to reestablish the species on former longleaf sites are escalating. Pine plantations make up more than one-fourth of the timberland in many areas including the southern coastal area of South Carolina, southeastern Georgia, northern Florida, southern Alabama and Mississippi, southwestern Louisiana, and southeastern Texas (Figure 4).

An examination of changes in stand cover type categories since 1952 reveals major shifts within the pine resource (Figure 5). Area in natural pine stands has dropped to less than half the 72 million acres (29 million ha) that existed in 1952. Concurrently, pine plantation area has increased from 2 to 31

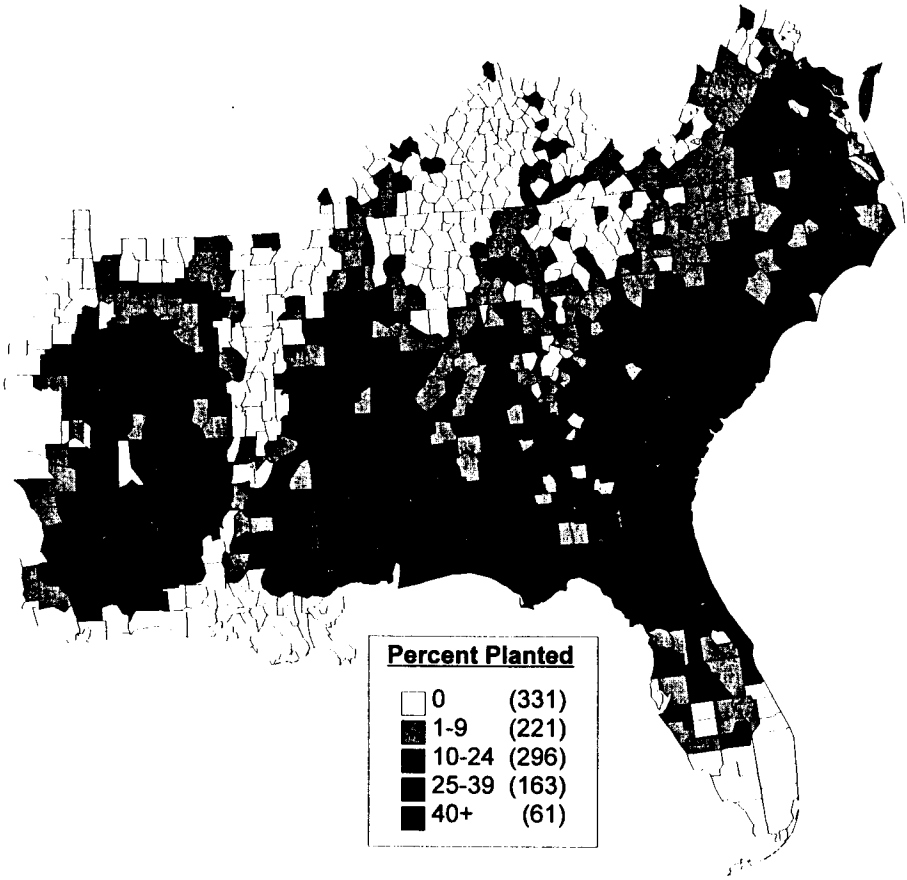


Figure 4. Percentage of timberland originating from tree planting in the South by county, 1996.

million acres (0.8-12.5 million ha). Upland hardwood stands have risen slowly during the period; bottomland hardwood area dropped until around 1970 and has been relatively stable since that time. Oak-pine stands have made up a fairly constant area of around 30 million acres (12.1 million ha) for most of the period.

The balance between pine and hardwood cover types has been relatively constant in the South during the past four to five decades. Increases in pine plantation area have come primarily at the expense of natural pine. While hardwood stands have been and continue to be converted to pine plantations, this activity is apparently not happening at a rate greater than pine stands are moving to hardwood types after disturbance or cutting.

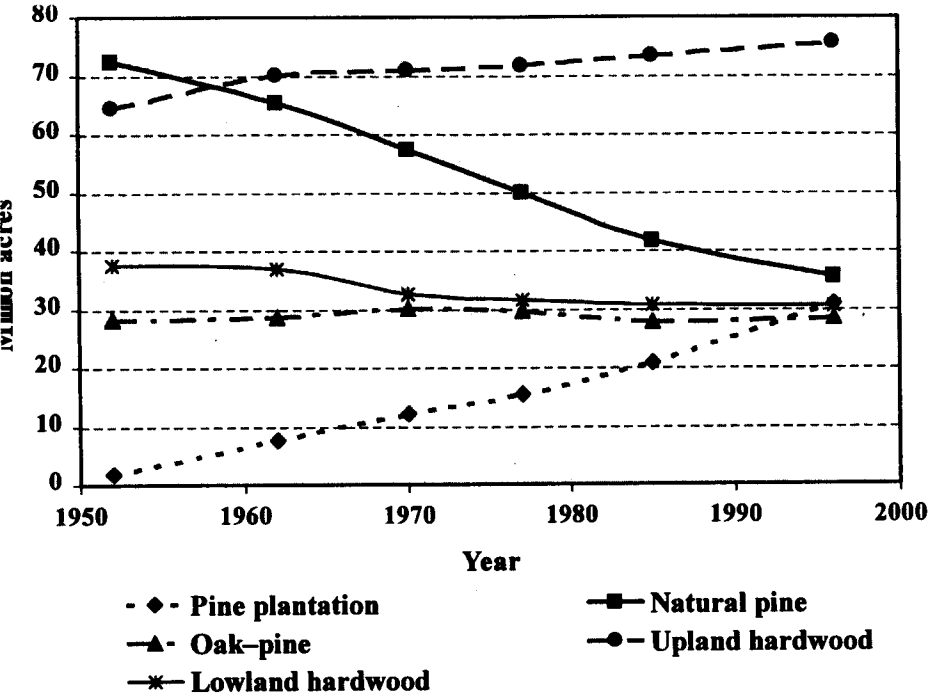


Figure 5. Timberland area in the South by forest management class, 1952-1996.

Stand Size and Age Structure

The mix of tree sizes in a region combined with successional stage and forest types can have a significant bearing on wildlife habitat suitability. Stand size class is one variable available for use in evaluating the mix of stands dominated by trees that range in size from seedlings to sawtimber. Sapling-seedling stands primarily have trees less than 5.0 inches in diameter at breast height (d.b.h.); poletimber stands have trees between 5 and 9 inches d.b.h. for softwoods and between 5 and 11 inches for hardwoods; sawtimber stands have trees primarily larger than the poletimber upper limit listed above.

Current stand size distributions for the South show that the sawtimber stand size class is the most abundant for both pine and hardwood forests (Figure 6). Bottomland hardwood forests have the highest percentage of sawtimber stands; sawtimber stands outnumber poletimber and sapling-seedling stands by 3 to 1. Stand size distributions are more balanced for pine/pine-hardwood and upland hardwood forests but sawtimber stands still prevail. Sapling-seedling stands are most prevalent in pine/pine-hardwood forests. Stand size distributions often reflect levels of harvest activity in each of the different forest types.

Much higher levels of harvesting occur in pine stands than in hardwood; harvests that remove a major part of the stand usually returns an area back to a sapling-seedling stand size. Inventory data from 1952 to 1996 show that sawtimber stands have increased in prevalence during the period. Poletimber stands were the dominant stand size category in the South in 1952.

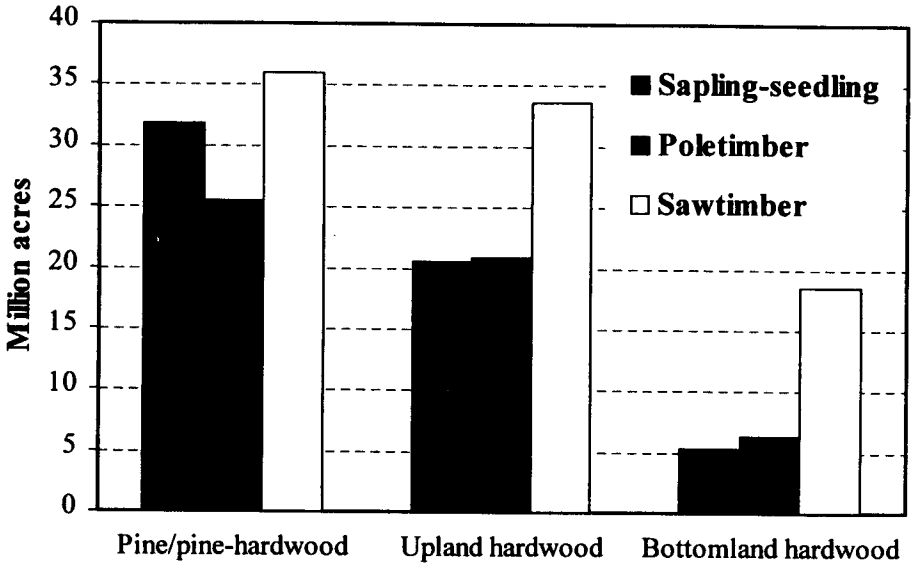


Figure 6. Timberland area in the South by forest-type group and stand-size class, 1996.

Changes in the number of trees existing on timberland between 1977 and 1996 by d.b.h. class also show a pronounced shift toward higher proportions of large diameter trees (Table 4). During the past two decades, numbers of both softwood and hardwood species have increased for the largest diameter classes and declined for the smaller diameter classes. Number of softwood stems have increased in the 16-inch and larger diameter classes, with increases of 30 percent or more for the 22-inch and larger classes. Number of hardwood stems have increased in the 12-inch and larger classes, with increases of 30 percent or more for the 20-inch and larger classes.

Stand age data provide us with a more detailed look at the successional stages for forest stands than is possible using stand size class data. As compatible data on stand age were not available across the region and for consecutive inventory periods, this assessment was conducted for Florida, North Carolina, South Carolina and Virginia where data for three inventories permitted the assessment of age structure changes across three decades from the 1970s to the

1990s (Figure 7). Mixed age stands were not recognized for this analysis; in these stands, age class was assigned based upon the average age of dominant and co-dominant trees in the stand.

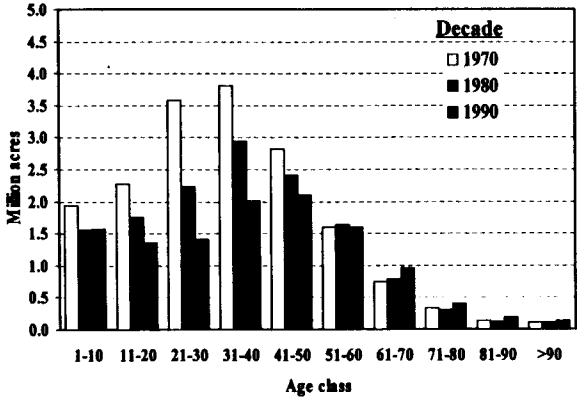
Table 4. Number of trees (in billions) on timberland in the South by diameter class and species group, 1996, and percentage change, 1977-1996.

	Softwoods		Hardwoods	
Diameter class (in inches)	1996	Percentage change 1977-1996	1996	Percentage change 1977-1996
2	13.272	-23	64.529	-12
4	7.660	-22	16.438	-24
6	4.630	-11	6.638	-16
8	2.794	-4	3.675	-8
10	1.477	-9	2.268	-2
12	0.858	-6	1.419	3
14	0.488	-1	0.923	10
16	0.266	6	0.560	14
18	0.133	14	0.331	23
20	0.066	22	0.189	31
22-28	0.057	31	0.222	30
30+	0.004	33	0.030	33
Total	31.708	-18	97.221	-13

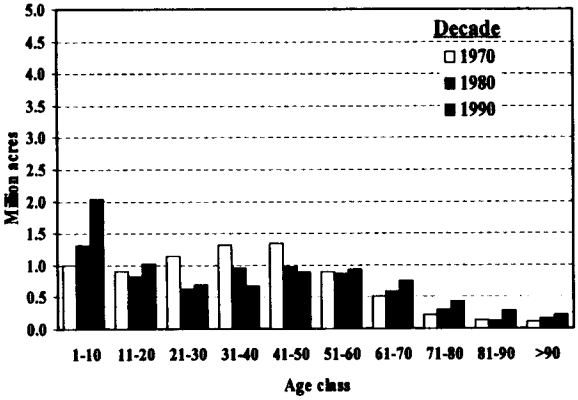
For natural pine stands, the current age structure and change since the 1970s clearly depicts the reduced extent of this type in these four states. A progression of these stands toward older age classes and a more balanced age structure is also clear. Area of natural pine stands greater than 50 years old has increased, even in the face of strong harvesting pressure and a 32-percent reduction in total area in natural pine. Two factors contribute to this buildup in older stands: 1) many of the stands between 21 and 50 years old have clearly progressed through the age classes; and 2) older stands are not being harvested at a rate proportionate to their abundance, suggesting that these stands might be held off the timber supply market due to owner preferences and objectives that are not compatible with harvesting, especially clear-cutting.

Age profiles for oak-pine stands in these four states reveal the same trend toward more older stands; the buildup in stands older than 50 years is more pronounced for oak-pine stands. One obvious difference for oak-pine stands is the strong buildup in the youngest stands. Harvested stands tend to restock with a mixture of pine and hardwood species. Many of these stands naturally change to a pine or hardwood type as the trees grow and compete for space.

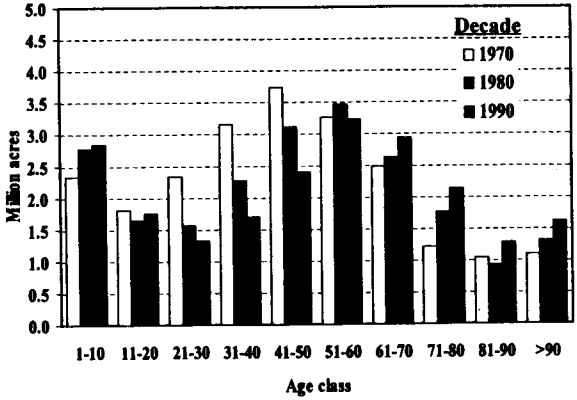
(a) Natural pine

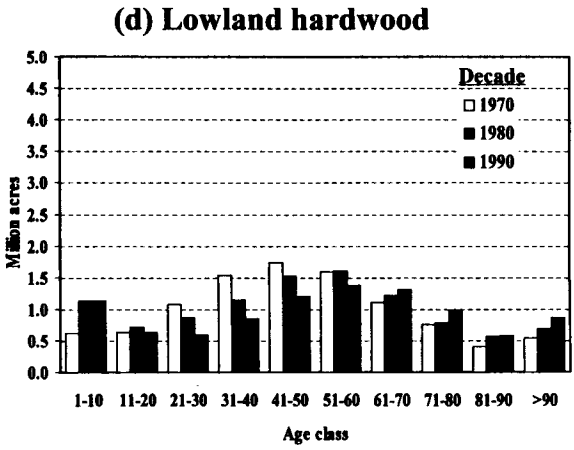


(b) Oak–pine



(c) Upland hardwood





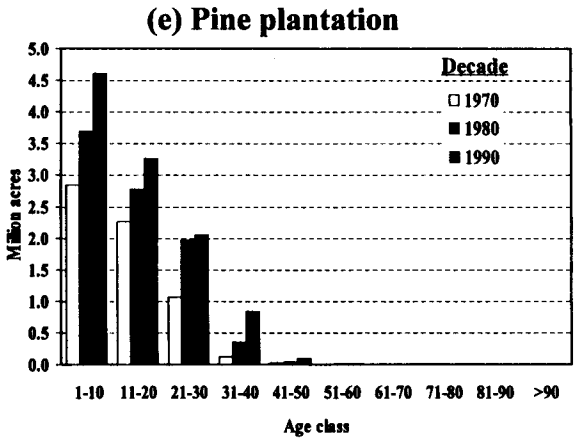


Figure 7. Change in age structure of timberland in Florida, North Carolina, South Carolina and Virginia by decade and forest management and stand-age class.

Regardless of whether they remain classified as oak-pine, the trends evident here are more older stands and more early successional habitat with a mix of softwood and hardwood species.

Age structure changes for upland and bottomland hardwood forests since the 1970s follow the same pattern described above for mixed pine-hardwood stands. Both hardwood stand types show strong increases in acreage for age classes greater than 60 years old. Increases in the early successional stages are

also evident; these increases probably result from increased timber harvest during the period.

With a strong concentration of stands in the youngest age classes, pine plantations have a strikingly different age structure than do the other stand types. Growth in each age class for each time period is evident. Strong replenishment rates (planting after harvest and establishment on agricultural land) have created an age structure heavily weighted toward young stands. This structure is also maintained by harvesting (liquidation) of planted stands at a much younger age than natural stands—harvesting by age 20 is not uncommon. Planted stands will supply increasing volumes of timber in the next decade—a trend that is already well underway. In regions where pine plantations are concentrated, such as southeastern Georgia and northeastern Florida (see Figure 4), these stands are already supplying half or more of the softwood harvest.

The Changing Forested Landscape—Implications for Wildlife

Currently, southern forests are vastly different than those that existed when European settlers arrived centuries ago (Dickson in preparation). Almost all current forests have been repeatedly altered by humans. Many forested areas have always been in tree cover, but have sustained cycles of harvesting, restocking and growth. The history of yet other southern forests is one of clearing, cultivation, abandonment and reversion back to forest. Only rare pockets of unaltered old-growth stands remain.

It is clear that wildlife species have been impacted by changes in the quantity and quality of forested habitat. Some species such as the ivory-billed woodpecker (*Campephilus p. principalus*) are now extinct as a result of habitat loss and/or exploitation. Other species such as the red-cockaded woodpecker (*Picoides borealis*) have lost much of their preferred habitat and now benefit from widespread recovery efforts as a result of their classification as endangered. However, most species have probably experienced population cycles in unison with the cycles occurring within the forests of the region. White-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*) and beaver (*Castor canadensis*) are species that in recent decades have experienced low populations followed by pronounced rebounds related to forest change and restoration and management activities. A downward trend in populations of many Neotropical migratory bird species is currently underway (Finch and Stangel 1993), due in part to habitat loss, change and fragmentation in the southern United States, as well as in tropical wintering grounds.

Southern forests will continue to go through cycles of change. Combined with the impact of legislation and management programs, broad-scale changes underway in the region's forests will alter the suitability of the southern landscape as habitat for various wildlife communities. On the other hand,

some attributes of southern forests are not changing rapidly and this stability is an important factor to consider. Some of the most prominent changes underway in southern forests, as well as stable attributes are summarized below.

- Forestland remains the predominant land use throughout much of the South.
- The forestland base in the South has been generally stable for several decades, and no severe reductions are anticipated in upcoming decades.
- The diversity in ownership of forestland in the region will continue to promote heterogeneous forest conditions.
- From a regional perspective, the South's forests are extremely diverse, with a mix of tree species and forest cover types.
- The overall mix of pine, hardwood and pine-hardwood stands has not changed greatly in five decades. Specific forest types, such as longleaf pine, have declined in extent, with resultant impacts on wildlife species dependent upon them.
- The pine component of the region's forests is moving steadily toward more planted stands and fewer natural pine stands.
- Both natural pine and hardwood stands are maturing—there are more stands in older age classes and more trees in larger diameter classes. While these stands are far from being old growth, this trend is a positive one for species needing late successional habitat.
- Area of young, early successional stands is also increasing, especially for pine plantations, pine-hardwood and hardwood stands.

Southern forests will continue to be stretched to meet the demands of our society. The region's population will continue to grow and become more interested in how our forests are managed. More people will demand that all forest values are given equal attention. These demographic and social changes combined with continued increases in demand on our forests to supply more wood will result in intensified conflict about forests and their management. These conflicts can be handled through partnerships with all parties, embracing ecosystem management principles and employing a diversity of management scenarios across the landscape.

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