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Coastal Virginia's Timber Resource—Trends, Present Conditions, and Opportunities for Improvement

by
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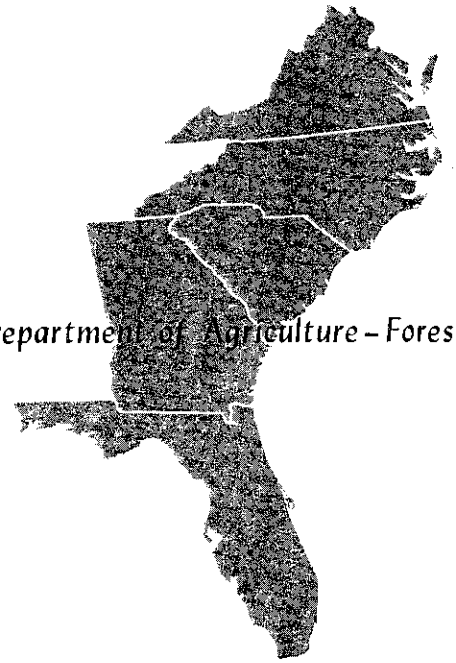

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INTRODUCTION

PURPOSE AND SCOPE

The present condition and future of the timber resource in the Coastal Plain of Virginia have caused increasing concern among resource planners, land managers, and citizens. Problems identified in past forest surveys contributed to this concern. This report focuses on some of the timber resource problems of the Coastal Plain by presenting forest resource trends, remedial actions taken to solve the problems identified, additional mensurational analyses of the data from the latest survey, and opportunities for improving present stand conditions. The findings of the latest survey of the Coastal Plain are included in "Forest Statistics for the Coastal Plain of Virginia, 1976" (Cost 1976). That report contains 26 detailed statistical tables and can be obtained from the Southeastern Forest Experiment Station, P. O. Box 2570, Asheville, North Carolina 28802.

IMPORTANCE OF THE FOREST RESOURCE

The forest resources of the Coastal Plain of Virginia are of vast importance to the people and economy of the entire State. Nearly 51,000 people are employed in timber-based manufacturing industries throughout Virginia (Virginia Department of Labor and Industry 1977). This statistic does not include employees in forest management and related fields, or government employees whose jobs are closely tied to the forest resource. A large number of people employed by forest industries work in the Coastal Plain, and more of Virginia's Forest Product Tax comes from that region than any other. For instance, more than 60 percent of the tax for softwood lumber originated in Coastal Plain counties in recent years. For hardwood lumber, over one-third of the tax was collected from mills located in Coastal Plain counties. As well as being a source of income, Coastal Plain forests also provide recreational opportunities for landowners and many others.

Forest industries in the Coastal Plain rely on regional woodlands, and those of adjacent areas, for their raw materials. An ample supply of pine timber is particularly important in producing lumber, plywood, and pulp. Southern pine's long fibers are necessary to the paper industry. These factors, coupled with the resource problems identified in previous surveys, have led to increasing concern among forestry leaders in Virginia.

TIMBER RESOURCE TRENDS

COMMERCIAL FOREST ACREAGE DECLINING

In 1940, when the first forest survey was conducted in the Coastal Plain of Virginia, the area of commercial forest land was increasing. This trend began many decades before 1940 (Cruikshank 1943). Commercial forests occupied 3.9 million acres in 1940 and increased by 148,000 acres during the following 16 years (table 1). The third survey in 1966 revealed a slight increase in commercial forest acreage, but this increase was due to reclassification of lands formerly considered as unproductive forest land; total forest land de-

clined during this period. A downward trend in forest land was confirmed by the fourth survey in 1976; commercial forest acreage declined by 2 percent between 1966 and 1976.

Table 1.--Land use areas, by land use class and survey completion date

Land-use class	Survey completion date			
	1940	1956	1966	1976
	Thousand acres			
Forest land:				
Commercial forest	3,919.2	4,067.1	4,079.3	4,003.5
Noncommercial forest[1/]	24.6	48.9	20.1	71.8
Total	3,943.8	4,116.0	4,099.4	4,075.3
Agricultural land:				
Cropland[2/]	1,766.5	1,444.2	1,305.3	1,190.9
Pasture	150.5	153.6	155.9	147.7
Total	1,917.0	1,597.8	1,461.2	1,338.6
Other nonforest[3/]	502.1	574.9	711.2	831.0
Water	506.2	580.4	597.3	624.2
Total area	6,869.1	6,869.1	6.869.1	6,869.1

1/ Includes unproductive forest land and productive-reserved forest land.
2/ Includes idle farmland.
3/ Includes urban areas, marsh, and other farmsteads.

The changes in forest area can be interpreted by studying the land use trends for Coastal Virginia. Between 1940 and 1956, total agricultural land declined by 319,000 acres, resulting in large increases in forest land, other nonforest land, and areas classified as water. The rate of decline in agricultural lands slackened between 1956 and 1966, and this trend continued through 1976. This decline resulted in fewer acres reverting to forest land. During this same period, other nonforest lands, primarily urban areas, continued to increase at rapid rates. The result was a reduction in forest land in the third and fourth surveys. This trend is likely to continue in the near future if present patterns in land use continue.

NONFARM OWNERSHIPS INCREASING

The changes in land use in Coastal Virginia during the past 20 years are reflected in changed ownership patterns (table 2). Commercial forests held by miscellaneous private owners have increased by over 1 million acres; farmer-owned forest land declined by over 1 million acres during the same period.

Table 2.--Area of commercial forest land, by ownership class and survey completion date

Ownership class	Survey completion date[1/]		
	1956	1966	1976
	- - - - Thousand acres - - - -		
Public	116.0	131.3	146.2
Forest industry[2/]	758.6	758.8	768.9
Farmer	2,813.2	1,857.0	1,650.4
Miscellaneous private	379.3	1,332.2	1,438.0
All owners	4,067.1	4,079.3	4,003.5

1/ 1940 data omitted because of differences in sources of data and changes in definitions.
2/ Includes lands under long-term lease.

Marginal farmland and, in some cases, entire farms were abandoned and reverted to forest land. In many instances, farmland owners were reclassified as miscellaneous private owners or sold their land to such individuals.

Forest industries have increased their forest-land holdings by only 1 percent during the past 20 years. Holdings by public agencies have increased by 26 percent.

SOFTWOOD INVENTORY DECLINING

Trends in net volume of growing stock and the sawtimber portion of growing stock differ significantly by species group (tables 3 and 4). Softwood growing stock and sawtimber have continuously declined in volume since 1940, whereas hardwood growing stock and sawtimber have continuously increased in volume over the same period.

In 1940, volume of softwood growing stock totaled 2.6 billion cubic feet. This volume declined slightly between 1940 and 1956, but it fell by 8 percent between 1956 and 1966; and, in the next 10 years, it fell another 2 percent. In general, trends in volume of the sawtimber portion of growing stock follow the trends for all growing stock. However, softwood sawtimber volume declined proportionally more than did that of softwood growing stock between 1940 and 1956. This decline reflects a high production of softwood lumber for that period. Furthermore, the use of smaller diameter trees for pulpwood was lower than in more recent years.

Table 3.--The total and per-acre volume[1/] of growing stock on commercial forest land, by species group and survey completion date

Species group	Total net volume				Net volume per acre			
	Survey completion date				Survey completion date			
	1940	1956	1966	1976	1940	1956	1966	1976
	Million cubic feet				Cubic feet			
Softwood	2,638.2	2,636.7	2,420.6	2,383.1	673	648	593	595
Hardwood	2,467.4	2,860.7	2,953.1	3,196.4	630	703	724	798
Total	5,105.6	5,497.4	5,373.7	5,579.5	1,303	1,351	1,317	1,393

1/ To provide a basis for valid comparisons, adjustments have been made to allow for differences in volume tables and sawtimber specifications used in surveys prior to 1976.

Table 4.--The total and per-acre volume[1/] of sawtimber on commercial forest land, by species group and survey completion date

Species group	Total net volume				Net volume per acre			
	Survey completion date				Survey completion date			
	1940	1956	1966	1976	1940	1956	1966	1976
	Million board feet				Board feet			
Softwood	8,897.3	8,571.6	8,543.2	8,372.1	2,270	2,108	2,094	2,091
Hardwood	7,068.1	8,050.3	8,148.9	8,923.8	1,803	1,979	1,998	2,229
Total	15,965.4	16,621.9	16,692.1	17,295.9	4,073	4,087	4,092	4,320

1/ To provide a basis for valid comparisons, adjustments have been made to allow for differences in volume tables and sawtimber specifications used in surveys prior to 1976.

Trends in volume per acre provide a volume estimate without the influence of a changing commercial forest land base. The trends in softwood volume per acre are basically the same as those for softwood net volume, with one exception—volume of softwood growing stock per acre for 1976 increased slightly from the 1966 level, signifying some improvement in the past 10 years. Net volume of softwood growing stock declined during this period because of fewer commercial forest acres.

In contrast to softwoods, hardwoods have increased in volume in every survey since 1940. Volume of hardwood growing stock increased nearly 30 percent during this period, with the sawtimber portion of growing stock increasing by 26 percent. Per-acre hardwood volumes also registered significant gains with each successive survey.

SOFTWOOD REMOVALS EXCEED NET GROWTH

The relationships between net growth and removals are important in analyzing the timber resource of a particular region over a period of time. Such relationships in the Coastal Plain of Virginia generally correspond to the trends in inventory, with removals exceeding net growth during periods of declining inventory (tables 5 and 6). For softwoods, net annual growth of growing stock in 1940 exceeded removals, but this relationship deteriorated until 1966, when removals exceeded net growth by 34 percent. This growth deficit resulted largely from the high production of softwood pulpwood prior to 1966. In 1976, the fourth survey revealed improvement—growing-stock removals exceeded net growth by 8 percent. Relationships between net growth and removals for softwood sawtimber followed the general trends for growing stock, with one exception—the sawtimber growth deficit worsened in 1976.

With hardwoods, these relationships for both growing stock and the sawtimber portion of growing stock have been favorable throughout the period 1940-76. Hardwood growth surpluses correspond to the increasing hardwood inventory during this period.

Table 5.--Net annual growth and removals of growing stock on commercial forest land, by species group and survey completion date[1/]

Species group	Net annual growth				Annual timber removals			
	Survey completion date				Survey completion date			
	1940	1956	1966	1976	1940	1956	1966	1976
	Million cubic feet							
Softwoods	125.7	107.6	96.3	103.6	112.6	112.6	129.1	111.6
Hardwoods	83.0	98.1	98.3	136.8	32.1	81.2	93.5	95.6
Total	208.7	205.7	194.6	240.4	144.7	193.8	222.6	207.2

1/ In some cases, 1956 and 1966 volumes have been adjusted on the basis of subsequent survey findings.

Table 6.--Net annual growth and removals of sawtimber on commercial forest land, by species group and survey completion date[1/]

Species group	Net annual growth				Annual timber removals			
	Survey completion date				Survey completion date			
	1940	1956	1966	1976	1940	1956	1966	1976
	Million board feet							
Softwoods	512.9	425.3	423.9	415.4	501.3	460.7	428.1	463.6
Hardwoods	235.7	317.6	319.5	466.5	104.6	277.5	321.0	322.4
Total	748.6	742.9	743.4	881.9	605.9	738.2	749.1	786.0

1/ In some cases, 1956 and 1966 volumes have been adjusted on the basis of subsequent survey findings.

VIRGINIA'S RESPONSE TO THE SOFTWOOD GROWTH DEFICIT

After the large deficit in softwood growth was identified in 1966, forest industries and the Virginia Division of Forestry responded by developing plans to remedy the problem. The remedy of each group was different. Forest industry's actions provided a more immediate result, while the State of Virginia enacted legislation intended to provide a long-term solution. This legislation encompassed the entire State and was not limited to the Coastal Plain. However, since most of the softwood growth deficit for the entire State was in the Coastal Plain, the timber situation there greatly influenced the policies adopted.

FOREST INDUSTRY'S RESPONSE

Reduced Harvesting of Softwoods in the Coastal Plain

Forest industry reacted to the growth deficit with an immediate and continuous reduction in harvesting of softwood growing stock from Coastal Plain forests. At the same time, harvesting of hardwood growing stock gradually increased. These changes are exemplified by the pulp and paper industry's procurement of wood after 1966 (figs. 1 and 2). In 1966, pulpmills in Coastal Virginia began to decrease the volume of softwood roundwood removed from the region. The latest pulpwood data available indicate that this trend has continued through 1975. By 1975, receipts of softwood roundwood from the Coastal Plain were down by 67 percent in comparison to the 1965 level, and those of hardwood roundwood from the same region were up by 41 percent.

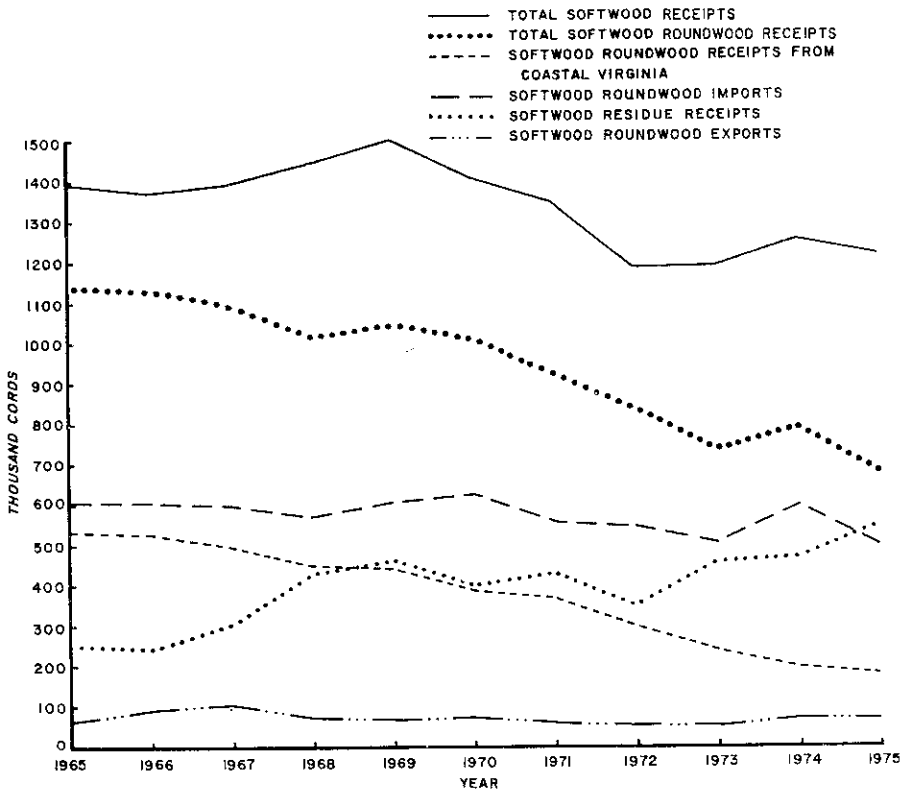

Figure 1.—Softwood receipts by Coastal Virginia pulpmills, by type and source, with roundwood exports to other regions 1965-75.

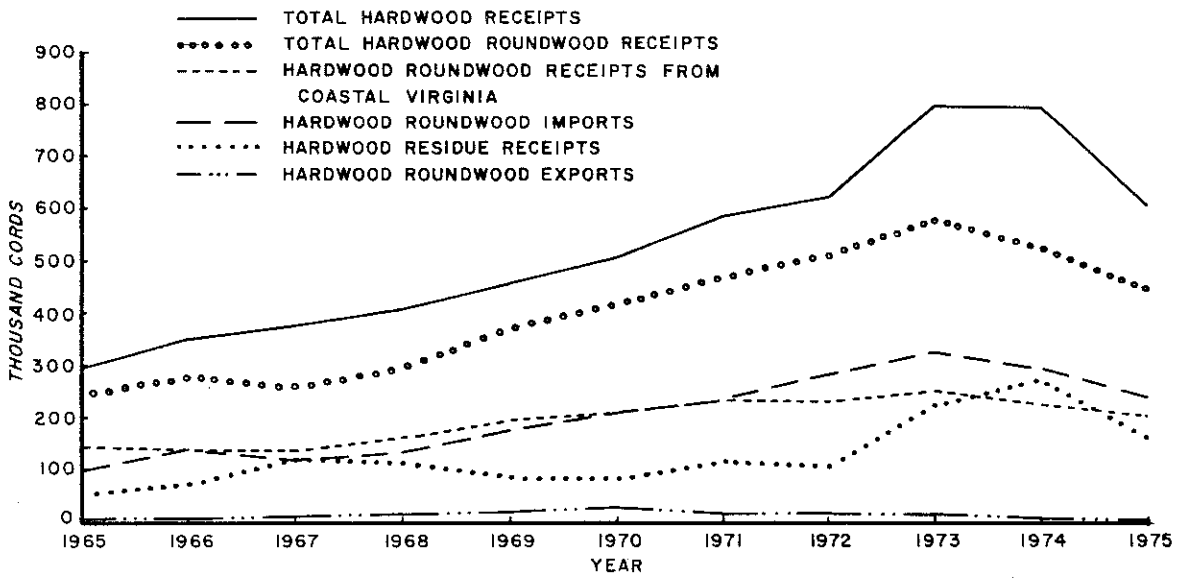

Figure 2.—Hardwood receipts by Coastal Virginia pulpmills, by type and source, with roundwood exports to other regions, 1965-75.

In order to operate their mills at normal capacity, the pulpwood-using industry had to obtain additional raw material. Since softwoods are the predominant species used in the pulping process, other sources of raw material had to be found. The additional raw materials were obtained from three sources: (1) imports of softwood roundwood from outside sources; (2) increased use of hardwoods in the pulping process; and (3) increased use of softwood and hardwood residues.

Importing Softwood Roundwood

Although imports of softwood roundwood increased after 1965, the most striking change was in the percentage of total softwood imported. In 1965, pulpmills in Coastal Virginia relied on imported roundwood from other regions for 53 percent of their softwood roundwood receipts. By 1975, other regions supplied 74 percent of such receipts.

Areas adjacent to the Coastal Plain of Virginia supplied this increased volume (fig. 3). Beginning in 1966, pulpmills in the Coastal Plain gradually reduced the volume of softwoods obtained from Coastal Plain and Piedmont forests in Virginia. At the same time, they began to expand wood procurement in the Coastal Plain and Piedmont of North Carolina, Maryland, Delaware, South Carolina, and Georgia. This trend continued until about 1971, when the volume of softwood pulpwood originating in the Piedmont of Virginia began to increase. Dependence upon North Carolina and other states as sources for such wood declined slightly after 1970. In the period 1973-75, more softwood pulpwood was obtained from the Southern Piedmont of Virginia than from the Coastal Plain. Yet, even though mills increased the amount of imported softwoods, total receipts of softwood roundwood by Coastal Plain mills declined between 1965 and 1975.

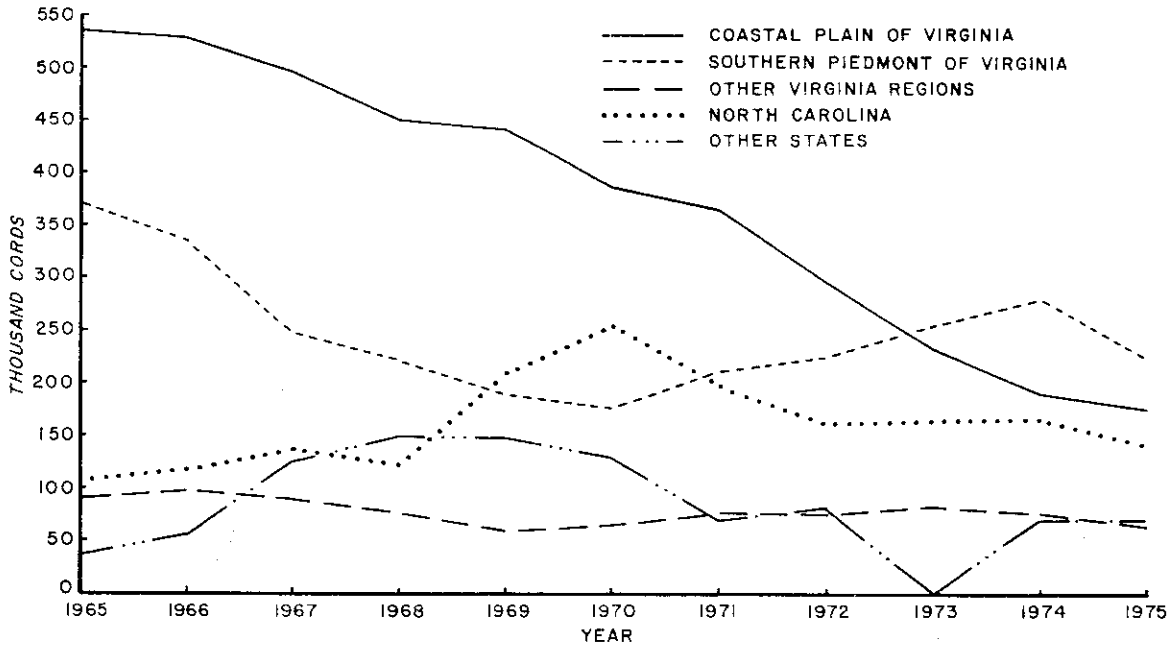

Figure 3.—Softwood roundwood receipts by Coastal Virginia pulpmills, by source, 1965-75.

Increased Use of Hardwoods

By increasing the use of hardwoods, most mills continued to operate at normal capacity. Although limited by the short fibers in hardwoods, pulpmills increased their hardwood roundwood receipts from 244,000 cords in 1965 to 577,000 cords in 1973. This increased hardwood volume came from the same areas where most of the softwood roundwood was obtained (fig. 4).

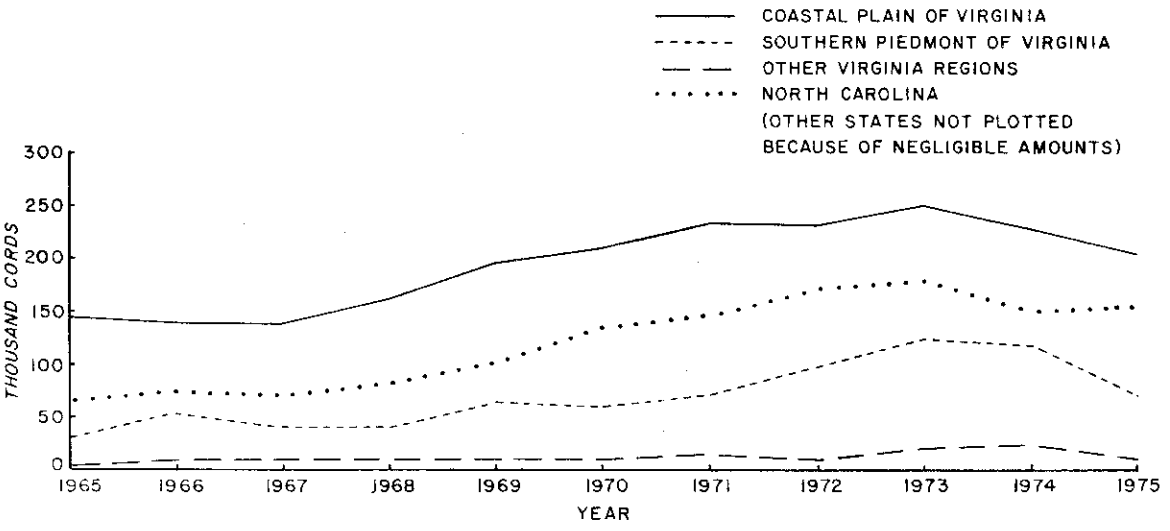

Figure 4.—Hardwood roundwood receipts by Coastal Virginia pulpmills, by source, 1965-75.

Increased Use of Wood Residues

The increased use of wood residues, a common trend throughout the United States, also played an important role in counteracting the reduced consumption of softwood roundwood. In 1975, receipts for residues, both softwood and hardwood, represented a 134 percent increase over the 1965 level. This trend reflects the improved utilization of raw materials at sawmills and other wood product plants. Most of the residues were obtained from Virginia and North Carolina mills.

As a result of the utilization of wood residues, imported softwood, and local and imported hardwood, receipts of all wood by pulpmills in Coastal Virginia increased substantially between 1965 and 1975.

Exporting Roundwood

The volume of softwood roundwood exported from Coastal Plain forests to other regions could alter the effectiveness of plans for improving the timber resource. Roundwood exports have been small in comparison with imports and, in general, have declined at a rate proportional to the decline in harvesting of softwood growing stock from Coastal Plain forests.

Results of Forest Industry's Actions

Forest industry's actions over the past 10 years helped reduce the large softwood growth deficit found in 1966. As already noted, the deficit of softwood growing-stock growth in 1976 was much less than in 1966.

It would be difficult to determine how changes in the industry's wood procurement have affected each area of wood supply, since interactions involve different regions and states. However, as of the most recent surveys, softwood growth deficits have been identified and softwood inventory volume has declined in Delaware, Maryland, and the Northern Coastal Plain of North Carolina (Ferguson 1967); Ferguson and Mayer 1974; Welch and Knight 1974). Increased softwood procurement in these areas might not be feasible over an extended period.

THE STATE OF VIRGINIA'S RESPONSE

In response to the softwood growth deficit identified in 1966, Virginia forestry leaders began to strengthen an existing law and formulate a new one. The resulting legislation—the amended Virginia Seed Tree Law and the Reforestation of Timberlands Act—works together to form the State of Virginia's reforestation policy.

Virginia's Seed Tree Law

The original Law required landowners harvesting timber to leave four pine seed trees per acre wherever loblolly, shortleaf, pond, or white pine constituted 10 percent of the live trees 6 inches or more in diameter at stump height. Wherever yellow-poplar contributed to stocking of trees 6 inches or larger in diameter, the Law required that two yellow-poplars be left. Seed trees had to be 14 inches or larger in diameter.

After the 1966 survey findings, it became apparent that the Seed Tree Law was not sufficient to provide adequate regeneration on cutover lands. The Law was subsequently revised to increase the requirements for pine seed trees to eight pines 14 inches or larger in diameter per acre. If no pines 14 inches in diameter are present, the Law requires that two of the largest existing trees of the same species be left in place of each 14-inch or larger pine. In 1972, another revision specified that yellow-poplar stocking on acres where the Law would apply be raised to 10 percent—the same as pine stocking. At present, a landowner is not required to leave seed trees if he carries out an alternate reforestation plan approved by the State Forester.

Virginia's Reforestation of Timberlands Act

Shortly after the 1966 Virginia Survey, the State Forester called together forest industry leaders and interested landowners to discuss the softwood growth deficit and develop a solution to the problem. The Pine Reforestation Action Committee was formed and, after several public meetings, the Committee requested the 1969-70 General Assembly to enact remedial legislation. The result was the Reforestation of Timberlands Act.

The purpose of the Reforestation of Timberlands Act is to reforest former pine-growing land that is currently growing only noncommercial and low-quality hardwoods. Financial assistance is provided to private landowners for the reforestation of lands where pine or yellow-poplar constitutes less than 10 percent of the stand. In stands where pine and yellow-poplar comprise as much as 10 percent, the Seed Tree Law applies.

The Division of Forestry is authorized, upon the request of a landowner, to examine the timberland and provide State-owned equipment, seedlings, and other materials necessary for preparing and reforesting the land with pine. The landowner may also use his own equipment and materials, or he can hire contractors to prepare and reforest the land. He may receive incentive payments of up to 50 percent of the total cost of the project, not to exceed a set per-acre value. Another option allows the landowner to receive up to 75 percent of the total cost of the project if he takes a 30-year lien plus an interest-free loan on the reforested land.

This Act was funded by increasing the forest product tax on pine products by approximately 400 percent. This increase was recommended by the pine-using forest industries, a testimony to their concern over the pine timber supply. The State matches the product-tax revenue with monies from the General Fund.

The goal of the Reforestation of Timberlands Act is to overcome the financial barriers to intensive forest management for the private nonindustrial landowners. Only 5 years have passed since this Act became effective, yet already there is evidence that it is accomplishing its designated goal. An increased rate of forest plantings on nonindustrial private ownerships since 1971 indicates that the cost-sharing incentives are helping some landowners overcome the financial barriers (table 7). Most of these landowners are located in the Coastal Plain and Southern Piedmont of Virginia (Horton 1976).

Table 7.--Acres of forest planting,[1/] by ownership class, Virginia

Fiscal year	Ownership class				All owners
	National Forest	Other public	Forest industry	Other private	
	Acres				
1965	1,424	1,312	42,377	28,689	73,802
1966	2,418	1,707	35,039	25,603	64,767
1967	2,748	1,412	43,963	26,797	74,920
1968	2,038	904	36,636	24,590	64,168
1969	2,006	1,286	41,381	25,706	70,379
1970	1,364	1,387	38,493	27,461	68,705
1971	1,804	2,472	35,072	32,539	71,887
1972	2,157	2,833	39,750	53,087	97,827
1973	1,511	3,966	30,419	47,559	83,455
1974	1,530	2,303	27,338	51,618	82,789
1975	1,407	2,449	24,849	59,218	87,923

1/ Includes acres planted by direct seeding.
Source: U.S. Department of Agriculture, Forest Service, Forest and Windbarrier Planting and Seeding in the United States. Issued annually by the Forest Service in Washington, D. C. In 1974, the title of the series was changed to: Forest Planting, Seeding, and Silvical Treatments in the United States.

STAND-AGE DISTRIBUTION OF COASTAL PLAIN FORESTS

The distribution of commercial forest acreage by stand-age class and major forest type provides a new way to evaluate the forest resource. Stand-age distributions reflect past land use trends, forestry practices, and problem areas within the forests. In addition, stand-age data can be used to estimate short-term trends in the timber supply.

During the fourth survey of the Coastal Plain of Virginia in 1976, each sample location was assigned a stand age on the basis of the average age of representative trees in the manageable stand. These data permitted the formation of age profiles by ownership class, forest type, and other area and management classifications. Areas classified as not having a manageable stand were omitted from the age groups since many of these acres had few growing-stock trees. These acres, however, were profiled to provide a comparison with the various age classes.

Age profiles by softwood and hardwood forest types were compiled for all Coastal Plain stands (fig. 5). The softwood types included areas where southern yellow pines or cedars, singly or in combination, comprised 50 percent or more of the stocking. Cypress, although a softwood species, was included with hardwoods according to the conventional separation of forest types. The oak-pine type was also included with hardwoods because, by definition, hardwood species comprise 50 percent or more of the stocking in this type.

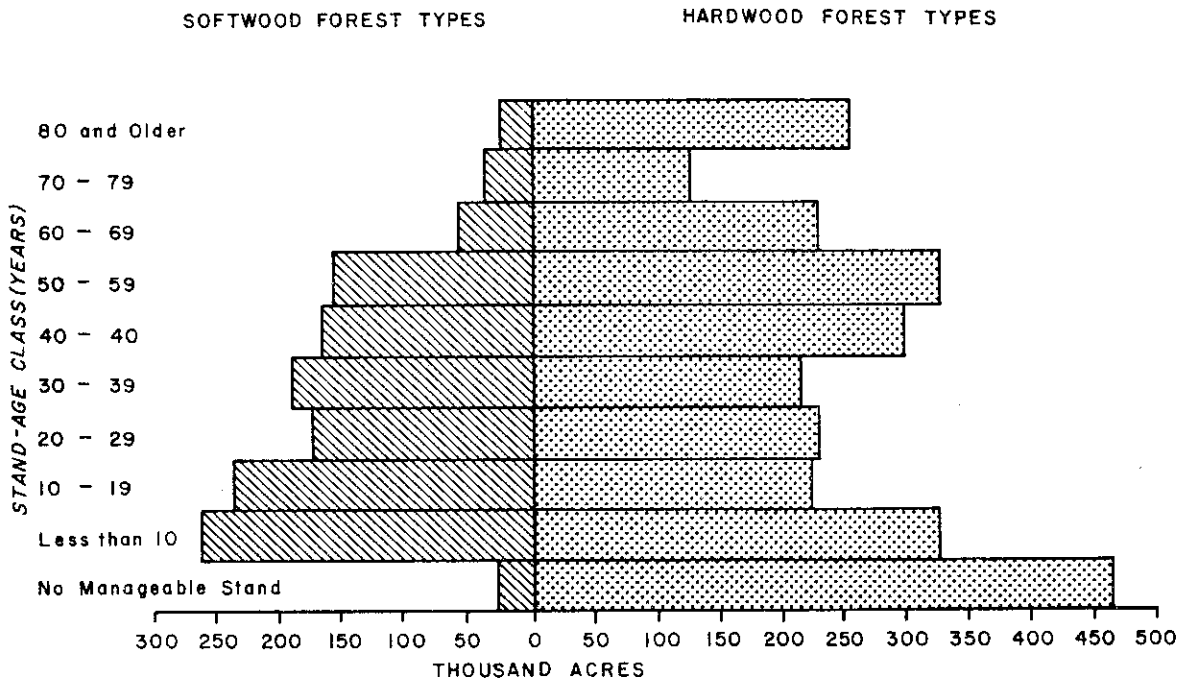

Figure 5.—Area of commercial forest land occupied by softwood and hardwood forest types, by stand-age class, Coastal Plain of Virginia, 1976.

RELATION TO PAST LAND USE, FORESTRY PRACTICES, AND PROBLEM AREAS

Stand-age profiles reflect past land use trends and forestry practices in the area. Knight (1977) showed that a strong relationship existed between the reduction in cropland acreage in past years and the present acreage in each softwood age class in North Carolina. Abandonment of marginal farmland accounted for the reductions in cropland acreage. Many of the abandoned acres seeded in with southern yellow pines, or were planted with pines, and are now the source of much of the softwood timber in North Carolina. Similar trends in reduction of cropland acreage have occurred in Virginia (Boyce and others 1975). Much of Coastal Virginia's softwood timber probably originated on abandoned farmland.

The rate of cropland retirement and subsequent reversion to forest has recently decreased throughout most of the South (Boyce and others 1975). This trend is also occurring in the Coastal Plain of Virginia. A continued rotation between cropland and forest is expected, but at a much lower scale than in past years. Without the reversion of large acreages of abandoned farmland, the harvesting of the older softwood forests will result in reductions in softwood forest types unless adequate pine regeneration after harvest is achieved.

The acreage of softwood types in the two youngest classes—"less than 10 years" and "10 to 19 years"—reflects the pine planting efforts of the past 20 years. Pine plantations accounted for nearly three-fourths of the softwood stands less than 10 years old and for 57 percent of those 10 to 19 years old.

Hardwood stands, unlike softwoods, originate largely as a result of timber harvesting. Knight (1977) showed that a relationship existed between past lumber production in North Carolina and the acreage of hardwood types by stand-age class. The number of acres harvested and the lumber production for a given year were assumed to be related. Generally, even-aged hardwood stands become established on the cutover land. Similar relationships between past levels of lumber production and hardwood acreages, by stand age, probably exist for Coastal Virginia.

A healthy increase in the acreage of the youngest hardwood age class over that of most older hardwood stands is evident. The acreage in this "less than 10" age class exceeds that in the older classes because 86,000 acres of pine plantations were included in the youngest class. These plantations were classified as hardwoods either because of poor survival of pine seedlings, or because they contained more hardwood than pine. Future competition for growing space, water, and available nutrients may transform some of these acres to pine types. However, hardwood encroachment in pine plantations established on harvested stands is likely to be a continuing problem. An examination of forest types on old-field plantations reveals that there is no hardwood problem after pine is planted on abandoned fields, but old-field plantings have declined substantially since the expiration of the Conservation Reserve Soil-Bank Program. Thus, most pine plantations are now established on cutover forest land, and severe hardwood competition usually occurs unless there is intensive site preparation.

The large accumulation of mature and overmature hardwood stands reflects the long hardwood rotations and a shortage of hardwood markets. Adverse conditions limit forestry operations on some acres. Another factor leading to accumulation of mature stands is that some landowners are unwilling to sell their timber.

Hardwoods dominated nearly 463,000 acres classified as having no manageable stand. About 43 percent of these stands have not been disturbed during the past 10 years. Therefore, the conditions in these stands are not likely to improve without intervention from man. Further buildup in this class will occur unless harvested stands are adequately regenerated.

STAND-AGE DISTRIBUTION BY OWNERSHIP

Age profiles for each broad ownership class reveal significant differences in the forest lands of each group of owners (figs. 6 and 7). Owner attitudes, management objectives, and financial status all contribute to these differences.

Forest industry's lands are generally managed on short rotations for pine. This management is reflected in the profiles for softwood and hardwood types. Over 54 percent of forest industry's softwood stands are less than 20 years old; 80 percent of these stands are pine plantations. Forest industry's stands are younger than those of any other ownership class, averaging 27 years for softwood types and 39 years for hardwood types. Yet, substantial acreages of both pine and hardwood remain available for future harvest by industry. Some portion of this acreage is owned by lumber companies who may not manage their lands on short rotations, as do most pulp and paper companies.

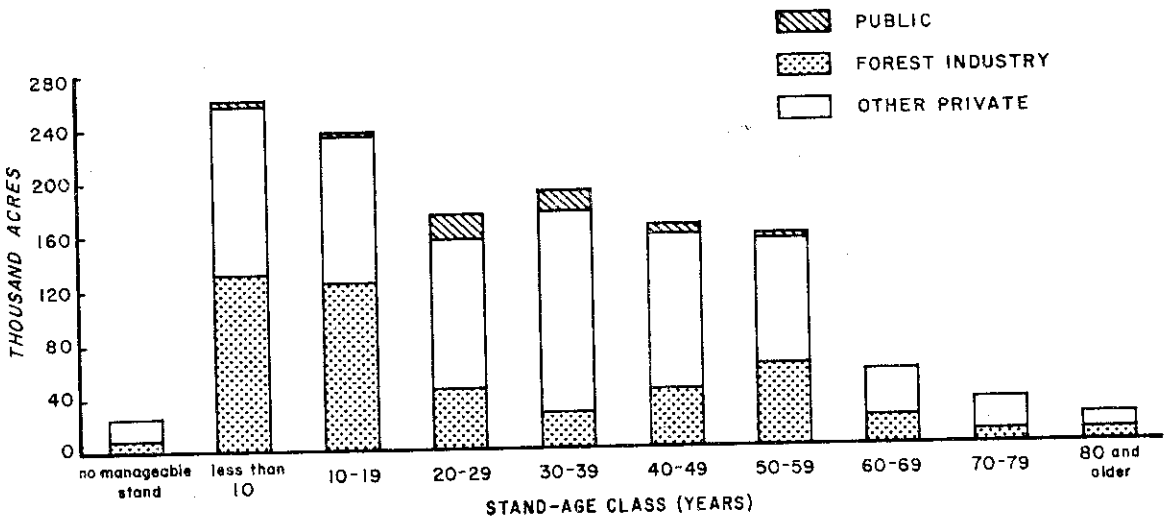

Figure 6.—Total area of commercial forest land occupied by softwood forest types, by stand-age and ownership class, Coastal Plain of Virginia, 1976.

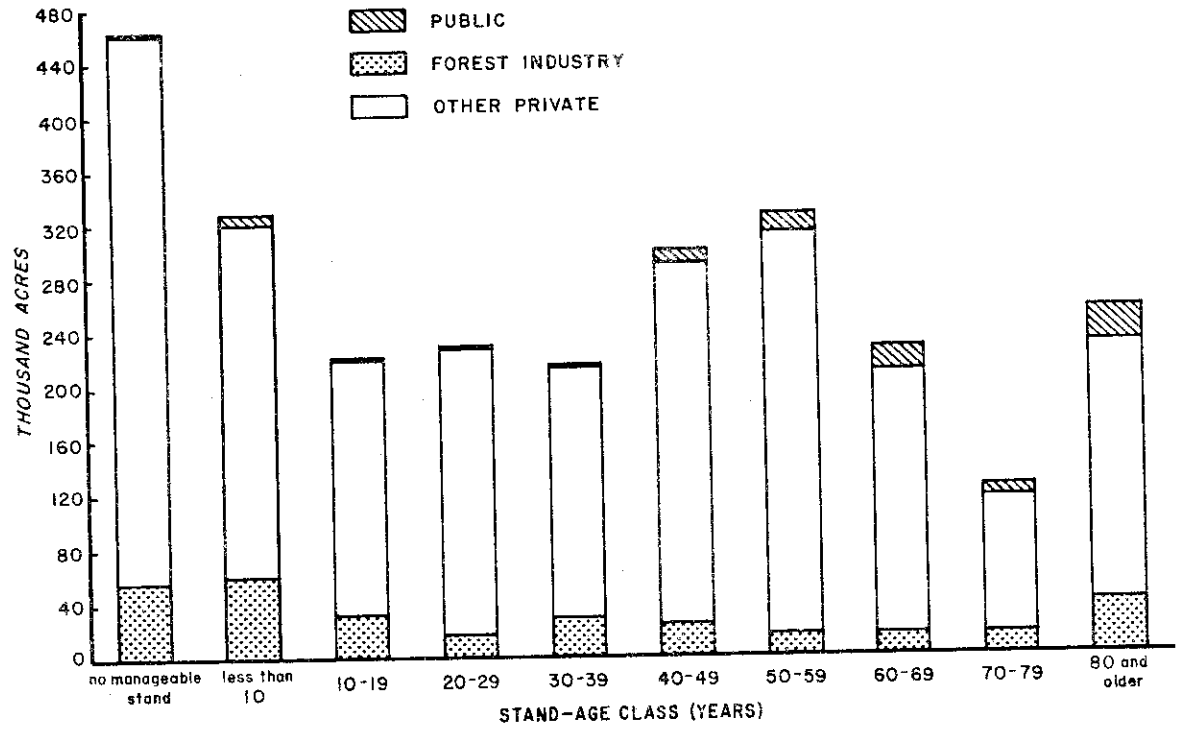

Figure 7.—Total area of commercial forest land occupied by hardwood forest types, by stand-age and ownership class, Coastal Plain of Virginia, 1976.

Publicly owned forests are used for many purposes other than timber production. Age profiles for public forests reflect this multiple use. Older, predominantly hardwood forests accumulate when timber production is not the primary goal. For instance, public hardwood forests average 60 years in age, whereas the overall average age for hardwood forests is 43 years.

The other group of private owners includes those whose management practices range from none to the most intense. The problems private, nonindustrial landowners have faced in practicing intensive management are exemplified by the acreage of their forest land without a manageable stand. Nearly 87 percent of all stands so classified are located on private, nonindustrial woodlands. Failure to achieve adequate regeneration after harvest led to this poor stocking.

Whatever the reason for the lack of regeneration after harvesting—be it lack of concern, knowledge, or financial resources—improved management of private woodlands is a must in Virginia and throughout the Southeast. In Virginia, the Reforestation of Timberlands Act was designed to achieve this goal, and evidence that improvement is underway has been shown. The age profile for softwoods held by nonindustrial, private owners provides additional evidence to substantiate this improvement. The greater acreage in the "less than 10" age class, in comparison with that of the next two older classes, is particularly significant because of the reduced rate of reversion of idle farmland to forest during the past 10 years. With continued concern and landowner participation, the Reforestation of Timberlands Act can accomplish its long-term goals.

PREDICTING SHORT-TERM TIMBER SUPPLIES

Stand-age data are valuable in predicting the relative acreage of softwood and hardwood forests available for harvest now and in the near future. The age profile for softwoods indicates an increase in softwood acreage and, consequently, in volume likely to become available for harvest after the next decade. These stands are assumed to be harvestable at age 30. Pine plantations in the two youngest age classes account for most of this projected increase in harvestable softwood acreage.

The profile for hardwoods shows a buildup of acreage in the older age classes. Because adverse sites limit availability on only 5 percent of all Coastal Plain stands, most hardwood stands in this region should be available for harvest now or in the future, assuming that all landowners will eventually be willing to sell their timber. The hardwood inventory, growth surplus, and age profile all attest that hardwoods offer the best opportunity for increasing the volume cut from Coastal Plain forests.

TIMBER MANAGEMENT OPPORTUNITIES

Each sample plot in the Coastal Plain of Virginia was assessed to determine if treatment would be needed in the next 10 years to improve stand conditions. Factors considered included stand volume and stocking, species composition, stand age, mortality, and site quality. The acreages to which these potential treatments were assigned were compiled according to broad management and ownership classes (table 8).

POOR AND ADVERSE SITES

To adequately evaluate the opportunities for intensive timber management, we must first exclude certain areas as being unsuitable. In Coastal Virginia, these unsuitable areas include poor sites (Site Class 5) and those with

Table 8.--Area of idle cropland and commercial forest land, by broad management, ownership, and treatment opportunity classes, Coastal Plain of Virginia, 1976

Broad management and ownership classes 1/	Total area	Broad treatment opportunity classes							
		Salvage	Harvest	Commercial thinning	Other stand improvement	Stand conversion 2/	Regeneration	Good condition	Poor management potential 3/
	Acres								
Idle cropland:									
Public	--	--	--	--	--	--	--	--	--
Forest industry	--	--	--	--	--	--	--	--	--
Other private	50,133	--	--	--	--	--	50,133	--	--
Total	50,133	--	--	--	--	--	50,133	--	--
Nonstocked forest:									
Public	1,166	--	--	--	--	--	--	--	1,166
Forest industry	21,135	--	--	--	--	--	6,041	--	15,094
Other private	30,356	--	--	--	--	--	11,840	--	18,516
Total	52,657	--	--	--	--	--	17,881	--	34,776
Pine plantations:									
Public	3,832	--	--	--	--	--	--	3,832	--
Forest industry	213,130	--	--	34,342	17,485	--	--	158,895	2,408
Other private	129,996	--	--	25,330	5,831	--	--	95,407	3,428
Total	346,958	--	--	59,672	23,316	--	--	258,134	5,836
Natural pine stands:									
Public	49,524	--	--	25,416	2,162	--	--	21,946	--
Forest industry	250,050	22,893	19,427	25,578	28,466	5,382	--	139,210	9,094
Other private	653,182	12,727	51,274	114,318	50,155	8,657	8,689	371,142	36,220
Total	952,756	35,620	70,701	165,312	80,783	14,039	8,689	532,298	45,314
Oak-pine stands:									
Public	18,945	--	6,300	3,832	1,827	--	--	6,986	--
Forest industry	115,411	--	6,350	--	19,648	7,331	9,700	72,382	--
Other private	577,649	5,887	42,399	3,050	61,958	35,687	20,427	354,322	53,919
Total	712,005	5,887	55,049	6,882	83,433	43,018	30,127	433,690	53,919
Upland hardwood stands:									
Public	62,046	--	20,983	--	--	1,680	2,713	36,670	--
Forest industry	130,174	--	26,587	--	2,981	14,688	24,356	49,026	12,536
Other private	1,344,618	2,762	139,298	5,528	121,185	150,700	206,501	561,452	157,192
Total	1,536,838	2,762	186,868	5,528	124,166	167,068	233,570	647,148	169,728
Bottomland hardwood stands:									
Public	10,724	--	1,669	--	--	--	210	8,080	765
Forest industry	38,995	--	10,278	--	2,034	2,975	2,305	12,367	9,036
Other private	352,606	--	42,685	--	15,565	5,585	39,819	117,373	131,579
Total	402,325	--	54,632	--	17,599	8,560	42,334	137,820	141,380
All classes:									
Public	146,237	--	28,952	29,248	3,989	1,680	2,923	77,514	1,931
Forest industry	768,895	22,893	62,642	59,920	70,614	30,376	42,402	431,880	48,168
Other private	3,138,540	21,376	275,656	148,226	254,694	200,629	337,409	1,499,696	400,854
Total	4,053,672	44,269	367,250	237,394	329,297	232,685	382,734	2,009,090	450,953

1/ Forest industry includes lands under long-term lease.
2/ Areas occupied with species unsuitable to the site from the standpoint of timber production.
3/ Areas where the timber management potential is severely limited because of poor or adverse sites.

year-round water problems. Altogether, such areas total over 450,000 acres. The following analysis assumes that funds for timber management should not be expended on these acres because of low yields on the poor sites and poor operability on the adverse sites.

STANDS IN GOOD CONDITION

Another type of site that should be excluded from potential treatment is the 2 million acres (56 percent of the commercial forest land) already supporting stands in relatively good condition. By ownership class, the proportion ranges from 54 percent of all publicly owned commercial forests to 60 percent of all lands controlled by forest industry. These acres are in good enough condition that intensive management to increase timber yields during the next decade would not be beneficial. The remaining acreage exclusive of that on poor or adverse sites, however, could be improved by intensive management during the next 10 years.

STANDS THAT WOULD BENEFIT FROM TREATMENT

Conditions on the remaining 1.6 million acres range from heavily damaged stands in need of salvage to poorly stocked stands requiring artificial regeneration. Recommended treatments for the various types of stands in these categories and the acreages involved are summarized below.

Stand Liquidation

Stand liquidation and subsequent regeneration are needed on approximately 412,000 acres. Some of these stands need to be harvested because they have reached or passed maturity; others need to be salvaged because of serious damage from insects, diseases, and weather. In the stands assigned these two treatments, mortality was more than double the overall average, indicating that further volume losses will occur unless action is taken.

Intermediate Treatments

Stands on 237,000 acres could be commercially thinned. These areas support dense stands of merchantable but immature timber. Such stands consist primarily of pine types, both planted and natural. An additional 329,000 acres were assigned treatments such as precommercial thinning, cleaning, release, or other intermediate cutting. Precommercial thinning was assigned primarily to stands where growth losses are likely because of a dense stocking of seedlings or saplings. Cleaning, release, or other intermediate cutting was assigned to stands with sufficient stocking for management but which are receiving serious competition from rough or rotten trees and other inhibiting vegetation. Altogether, intermediate treatment would enhance growth on an estimated 567,000 acres.

Stand Conversion

Stand conversion could potentially benefit 233,000 acres of commercial forest land. Such conversion is needed when the present species composition is incompatible with the site from the standpoint of timber production. Most such stands consist of low-quality hardwoods growing on sites suitable for pine.

Artificial Regeneration

The most promising opportunity to improve stand conditions and increase future timber supplies in Coastal Virginia is artificial regeneration of existing, poorly stocked, commercial forest land. An estimated 383,000 acres are so poorly stocked that they do not support manageable stands. These acres are characterized by low volumes per acre and a higher-than-average stocking because of the presence of rough and rotten trees and other inhibiting vegetation. However, artificial regeneration of these stands is not financially attractive except immediately after harvest, when the landowner is likely to have sufficient funds available. Conditions in these areas probably will not improve without intervention from man. By ownership class, the percentage of commercial forests suitable for intensive management but needing regeneration ranges from 2 percent of all public forest land to 12 percent of all private, nonindustrial forests.

Landowners should also be encouraged to plant pines on over 50,000 acres of idle cropland. In old-field plantations, the costs of site preparation and planting are low and competition from hardwoods is not severe.

OPPORTUNITIES FOR MORE IMMEDIATE IMPROVEMENT

Although the stand treatments discussed are valid methods of improving the timber resource, the benefits derived are not immediate. Additional opportunities exist for more immediate improvement.

One possibility is to increase the utilization of mill and logging residues. Since most larger mills already utilize their residues, further increases in such use may be limited. However, an opportunity exists for more complete utilization of logging residues such as rough and rotten trees and treetops, thereby allowing more wood to be consumed without increasing removals of growing stock. Total-tree chipping is another way to increase the utilization of previously unmerchantable wood.

Finally, increased use of hardwoods to the extent allowed by present technology would decrease the demand for softwoods. In many instances, such an increase may be limited by the poor quality of existing hardwoods, but advances in technology will undoubtedly allow greater hardwood utilization in the future.

CONCLUSIONS

In-depth analysis of the timber supply in the Coastal Plain of Virginia reveals a declining forest land base and softwood inventory and unfavorable relationships between growth and removals of softwoods. These trends, however, do not imply a lack of progress in recent years. On the contrary, the data show that there has been improvement. Yet, if Coastal Virginia is to provide the increasing amounts of wood that will be required in the future, additional progress will be necessary.

Furthermore, while timber requirements are rising, nontimber uses and benefits of the forest are becoming increasingly important. Today's forest management practices are being evaluated for their effects on recreational uses, wildlife habitat, and water quality. Forest managers must be aware of the many nontimber resources of the forests. The ultimate challenge in forest management is to meet both the timber requirements and the needs of other forest users in future years.

APPENDIX

DEFINITIONS OF TERMS

Basal area.—The area in square feet of the cross section at breast height of a single tree or of all the trees in a stand, usually expressed as square feet or basal area per acre.

Commercial forest land.—Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization.

Cropland.—Land under cultivation within the past 24 months, including orchards and land in soil-improving crops, but excluding land cultivated in developing improved pasture. Also includes idle farmland.

Farm.—Either a place operated as a unit of 10 or more acres from which the sale of agricultural products totaled $50 or more annually, or a place operated as a unit of less than 10 acres from which the sale of agricultural products for the year amounted to at least $250.

Farm operator.—A person who operates a farm, either doing the work himself or directly supervising the work.

Farmer-owned lands.—Lands owned by farm operators.

Forest industry lands.—Lands owned by companies or individuals operating wood-using plants.

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Forest type.—A classification of forest land based upon the species forming a plurality of live-tree stocking.

White-red-jack pine.—Forests in which eastern white pine, red pine, or jack pine, singly or in combination, comprise a plurality of the stocking. (Common associates include hemlock, aspen, birch, and maple.)

Spruce-fir.—Forests in which spruce or true firs, singly or in combination, comprise a plurality of the stocking. (Common associates include white cedar, tamarack, maple, birch, and hemlock.)

Longleaf-slash pine.—Forests in which longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. (Common associates include oak, hickory, and gum.)

Loblolly-shortleaf pine.—Forests in which loblolly pine, shortleaf pine, or other southern yellow pines, except longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. (Common associates include oak, hickory, and gum.)

Oak-pine.—Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking, but in which pines comprise 25 to 50 percent of the stocking. (Common associates include gum, hickory, and yellow-poplar.)

Oak-hickory.—Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking, except where pines comprise 25 to 50 percent, in which case the stand would be classified oak-pine. (Common associates include yellow-poplar, elm, maple, and black walnut.)

Oak-gum-cypress.—Bottomland forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, comprise a plurality of the stocking, except where pines comprise 25 to 50 percent, in which case the stand would be classified oak-pine. (Common associates include cottonwood, willow, ash, elm, hackberry, and maple.)

Elm-ash-cottonwood.—Forests in which elm, ash, or cottonwoods, singly or in combination, comprise a plurality of the stocking. (Common associates include willow, sycamore, beech, and maple.)

Maple-beech-birch.—Forests in which maple, beech, or yellow birch, singly or in combination, comprise a plurality of the stocking. (Common associates include hemlock, elm, basswood, and white pine.)

Gross growth.— Annual increase in net volume of trees in the absence of cutting and mortality.

Growing-stock trees.—Live trees of commercial species qualifying as desirable or acceptable trees.

Growing-stock volume.—Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs. (Net volume in primary forks is included.)

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous.

Soft hardwoods.—Soft-textured hardwoods, such as boxelder, red and silver maple, hackberry, loblolly-bay, sweetgum, yellow-poplar, magnolia, sweetbay, water tupelo, blackgum, sycamore, cottonwood, black cherry, willow, basswood, and elm.

Hard hardwoods.—Hard-textured hardwoods, such as Florida and sugar maple, birch, hickory, dogwood, persimmon (forest grown), beech, ash, honeylocust, holly, black walnut, mulberry, all commercial oaks, and black locust.

Idle farmland.—Includes former croplands, orchards, improved pastures, and farm sites not tended within the past 2 years, and presently less than 16.7 percent stocked with trees.

Improved pasture.—Land currently improved for grazing by cultivation, seeding, irrigation, or clearing of trees or brush.

Inhibiting vegetation.—Cover sufficiently dense to prevent the establishment of tree seedlings.

Logging residues.—The unused portions of trees cut or killed by logging.

Manageable stand.—Commercial forest land generally 60 percent or better stocked with growing-stock trees of any size or species composition as long as they are suited, in the aggregate, to a single primary treatment opportunity.

Miscellaneous Federal lands.—Federal lands other than National Forests, lands administered by the Bureau of Land Management, and Indian lands.

Miscellaneous private lands—corporate.—Lands owned by private corporations other than forest industry.

Miscellaneous private lands—individual.—Privately owned lands other than forest industry, farmer-owned, or corporate lands.

Mortality.—Number of sound-wood volume of live trees dying from natural causes during a specified period.

National Forest land.—Federal lands which have been legally designated as National Forests or purchase units, and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Net annual growth.—The increase in volume for a specific year.

Net volume.—Gross volume of wood less deductions for rot, sweep, or other defect affecting use for timber products.

Noncommercial forest land.—(a) Unproductive forest land incapable of yielding crops of industrial wood because of adverse site conditions, and (b) productive-reserved forest land.

Nonforest land.—Land that has never supported forests and land formerly forested where timber production is precluded by development for other uses.

Nonstocked land.—Commercial forest land less than 16.7 percent stocked with growing-stock trees.

Other Federal lands.—Federal lands other than National Forests, including lands administered by the Bureau of Land Management, Bureau of Indian Affairs, and other Federal agencies.

Other public lands.—Publicly owned lands other than National Forests.

Other removals.—The net volume of growing-stock trees removed from the inventory by cultural operations, such as timber stand improvement, land clearing, and other changes in land use that result in the removal of the trees from the commercial forest.

Plant byproducts.—Wood products such as pulp chips, obtained incidental to production of other manufactured products.

Plant residues.—Wood materials from manufacturing plants not utilized for some product.

Poletimber trees.—Growing-stock trees of commercial species at least 5.0 inches in d.b.h. but smaller than sawtimber size.

Productive-reserved forest land.—Forest land sufficiently productive to qualify as commercial forest land, but withdrawn from timber utilization through statute or administrative designation.

Quality class.—A classification of sawtimber volumes by log or tree grades.

Rotten trees.—Live trees of commercial species that do not contain at least one 12-foot saw log, or two noncontiguous saw logs, each 8 feet or longer, now or prospectively, primarily because of rot or missing sections, and with less than one-third of the gross tree volume in sound material.

Rough trees.—(a) Live trees of commercial species that do not contain at least one 12-foot saw log, or two noncontiguous saw logs, each 8 feet or longer, now or prospectively, primarily because of roughness, poor form, splits, and cracks, and with less than one-third of the gross tree volume in sound material, and (b) all live trees of noncommercial species.

Saw log.—A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight, and with a minimum diameter inside bark for softwoods of 6 inches (8 inches for hardwoods).

Saw-log portion.—That part of the bole of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the bole of sawtimber trees above which a saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber trees.—Live trees of commercial species containing at least a 12-foot saw log, or two contiguous saw logs, each 8 feet or longer, and with at least one third of the gross board-foot volume between the 1-foot stump and minimum saw-log top being sound. Softwoods must be at least 9.0 inches and hardwoods at least 11.0 inches in diameter at breast height.

Sawtimber volume.—Net volume of the saw-log portion of live sawtimber in board-foot International $\frac{1}{4}$-inch rule.

Seedlings.—Live trees less than 1.0 inch in diameter at breast height that are expected to survive and develop.

Site class.—A classification of forest land in terms of inherent capacity to grow crops of industrial wood based on fully stocked natural stands.

Class 1.—Sites capable of producing 165 or more cubic feet per acre annually.

Class 2.—Sites capable of producing 120 to 165 cubic feet per acre annually.

Class 3.—Sites capable of producing 85 to 120 cubic feet per acre annually.

Class 4.—Sites capable of producing 50 to 85 cubic feet per acre annually.

Class 5.—Sites incapable of producing 50 cubic feet per acre annually, but excluding unproductive sites.

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Pines.—Yellow pine species which include loblolly, longleaf, slash, pond, shortleaf, pitch, Virginia, and Table-Mountain pine.

Other softwoods.—Cypress, eastern redcedar, white cedar, eastern white pine, eastern hemlock, spruce and fir.

Stocking.—The degree of occupancy of land by trees, measured by basal area or the number of trees in a stand and spacing in the stand, compared to a minimum standard, depending on tree size, to fully utilize the growth potential of the land.

Fully stocked.—100 percent or more stocking

Medium stocked.—60 to 100 percent stocking

Poorly stocked.—Less than 60 percent stocking

Survivor growth.—The increase in volume of growing-stock trees that survive cutting and mortality for a specified year.

Timber products.—Roundwood products and plant byproducts.

Timber removals.—The net volume of growing-stock trees removed from the inventory by harvesting; cultural operations, such as stand improvement; land clearing, or changes in land use.

Unproductive forest land.—Forest land incapable of producing 20 cubic feet per acre of industrial wood under natural conditions, because of adverse site conditions.

Upper-stem portion.—That part of the main stem or fork of sawtimber trees above the saw-log top to a minimum top diameter 4.0 inches outside bark or to the point where the main stem or fork breaks into limbs.

Urban and other areas.—Areas within the legal boundaries of cities and towns, suburban areas developed for residential, industrial, or recreational purposes; school yards; cemeteries; roads; railroads; airports; beaches; powerlines and other rights-of-way; or other nonforest land not included in any other specified land use class.

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Keywords: Forest trends, commercial forest land, forest ownership, timber volume and growth, timber removals, stand age, timber management opportunities.

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