LIBRARY

United States
Department of
Agriculture

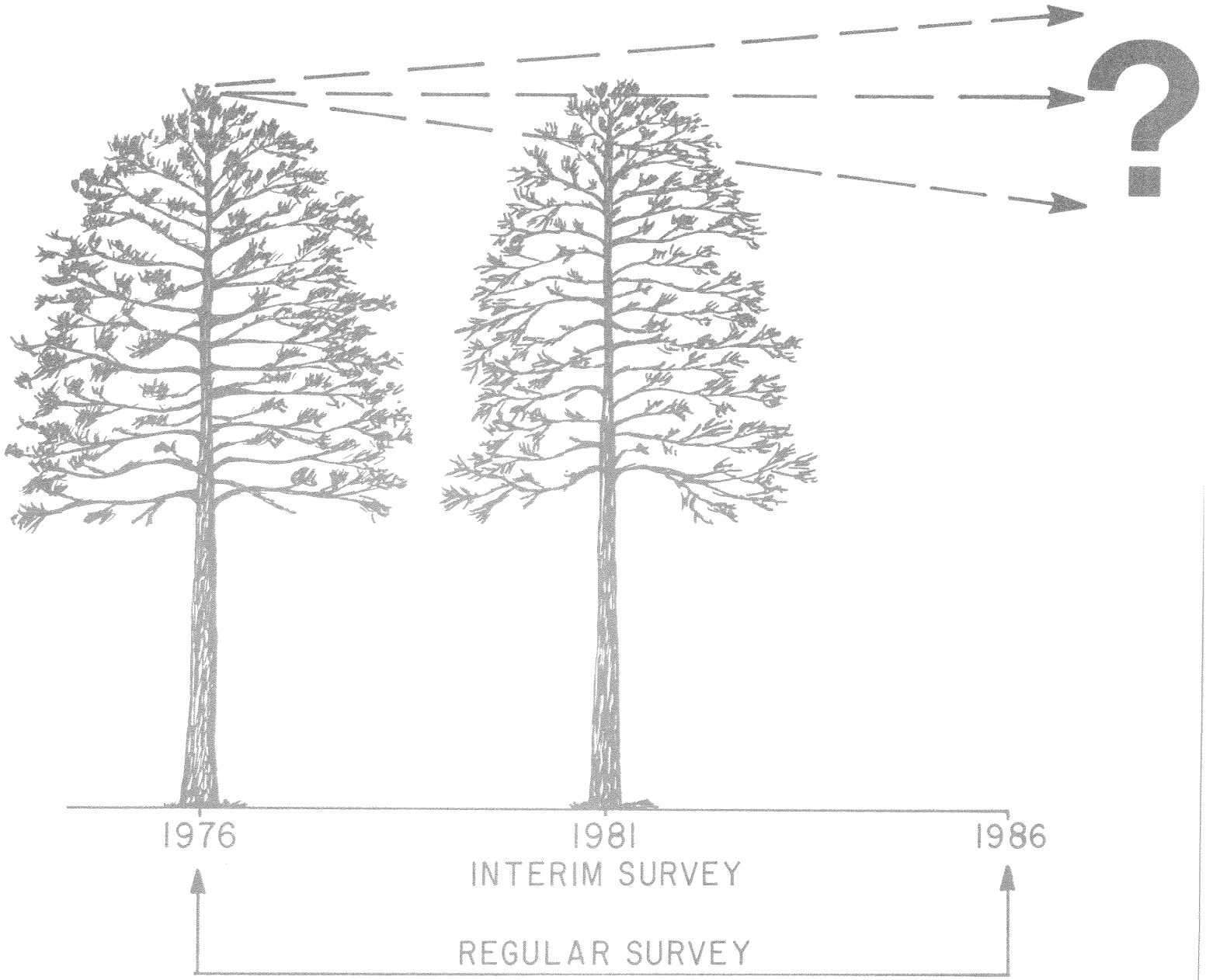
Forest Service

Virginia's Pine Resource: an Interim Assessment, 1981

ROUTING COMMENT
GINGRICH
HARMS
LLOYD
WHITE
WICKER
HOOPER
HOOK

Southeastern Forest
Experiment Station

Resource Bulletin SE-60



August 1981
Southeastern Forest Experiment Station
Asheville, North Carolina

Virginia's Pine Resource: an Interim Assessment, 1981

by
Raymond M. Sheffield, Resource Analyst
and
Gerald C. Craver, Forest Technician

Forest inventories in the Southeast traditionally have been conducted by the Renewable Resources Evaluation (RRE) Work Unit on cycles of approximately 10 years. For certain areas, a 10-year cycle is too long. High resource demand, extensive land-use changes, and widespread natural disturbances can quickly change the forest resource situation. A 5-year inventory cycle is needed in these critical areas according to many forestry leaders. Budget limitations, hiring restrictions, and increased workloads, however, dim the prospects of reducing the cycle of a full-scale inventory to 5 years. Interim surveys in selected areas, therefore, seem more practical for examining specific problems. The RRE Unit at the Southeastern Forest Experiment Station has now twice used an interim survey to provide timely data for a resource of concern in a critical area. The results of an interim survey of the major pine resource regions of Virginia are presented in this report. Some of the results presented differ slightly from preliminary results released shortly after completion of the survey.

THE VIRGINIA SITUATION

The interim survey in Virginia grew out of continuing concern over the pine resource. Over 73 percent of the volume of pine timber is in the Coastal Plain and Southern Piedmont Survey Units of that State. Most previous inventories since 1940 in these two regions have found pine volume declining and annual cut exceeding net growth. The latest inventory in 1976 showed some improvement, especially in the Southern Piedmont where pine stands established on old fields developed to substantially boost inventory volumes (Sheffield 1976). The Coastal Plain annual cut of pine still exceeded net growth, and pine inventory volume was declining in 1976 but at a much slower rate than in the previous inventory (Cost 1976). Another finding of the 1976 inventory was a substantial reduction in the number of 2- and 4-inch pine trees (Boyce and Knight 1979). Forestry leaders have been concerned for some time over these pine resource problems because Virginia has many industries dependent upon pine timber supplies. The problems identified have already led to enactment of landowner assistance legislation by the Virginia General Assembly (Sheffield 1978).

Despite some improvement in the pine resource, the situation has been viewed with some apprehension since 1976, and the next survey was not scheduled until 1985 or 1986. An ad hoc committee, made up of representatives from the Virginia Division of Forestry, local forest industries, Virginia Polytechnic Institute and State University, the Virginia Forestry Association, and the Lumber Manufacturers' Association of Virginia, requested a midcycle evaluation of the pine resource in Virginia. An interim survey of the pine resource in the Coastal Plain and Southern Piedmont of Virginia (fig. 1) resulted from this request.

The Virginia Division of Forestry coordinated the survey in cooperation with forest industries. The State Forester appointed a District Forester to coordinate the field operations of the industry survey crews for 3 months. Personnel, equipment, and transportation to conduct the fieldwork were provided by five forest products companies: Champion International, Chesapeake Corporation, Continental Forest Industries, Union Camp Corporation, and WESTVACO.

The 1981 interim survey could not have been accomplished without the generous contributions of these companies. All fieldwork was completed in 3 months. Lumber and other forest products companies contributed money to pay additional expenses such as training and other U.S. Forest Service expenses. Further assistance and support for the survey were provided by the Lumber Manufacturers' Association of Virginia, the Virginia Forestry Association, and Virginia Polytechnic Institute and State University.

Renewable Resources Evaluation provided technical assistance in designing the sample, trained the field crews, and processed the data.

INTERIM SURVEY TECHNIQUES

Procedures for this interim survey were basically the same as those for an interim survey of a seven-county area in South Carolina. The primary objective in both surveys was to determine changes in pine timber volume since the previous regular inventory. Details of the sampling and field procedures are described by Welch and Cathey (1976).

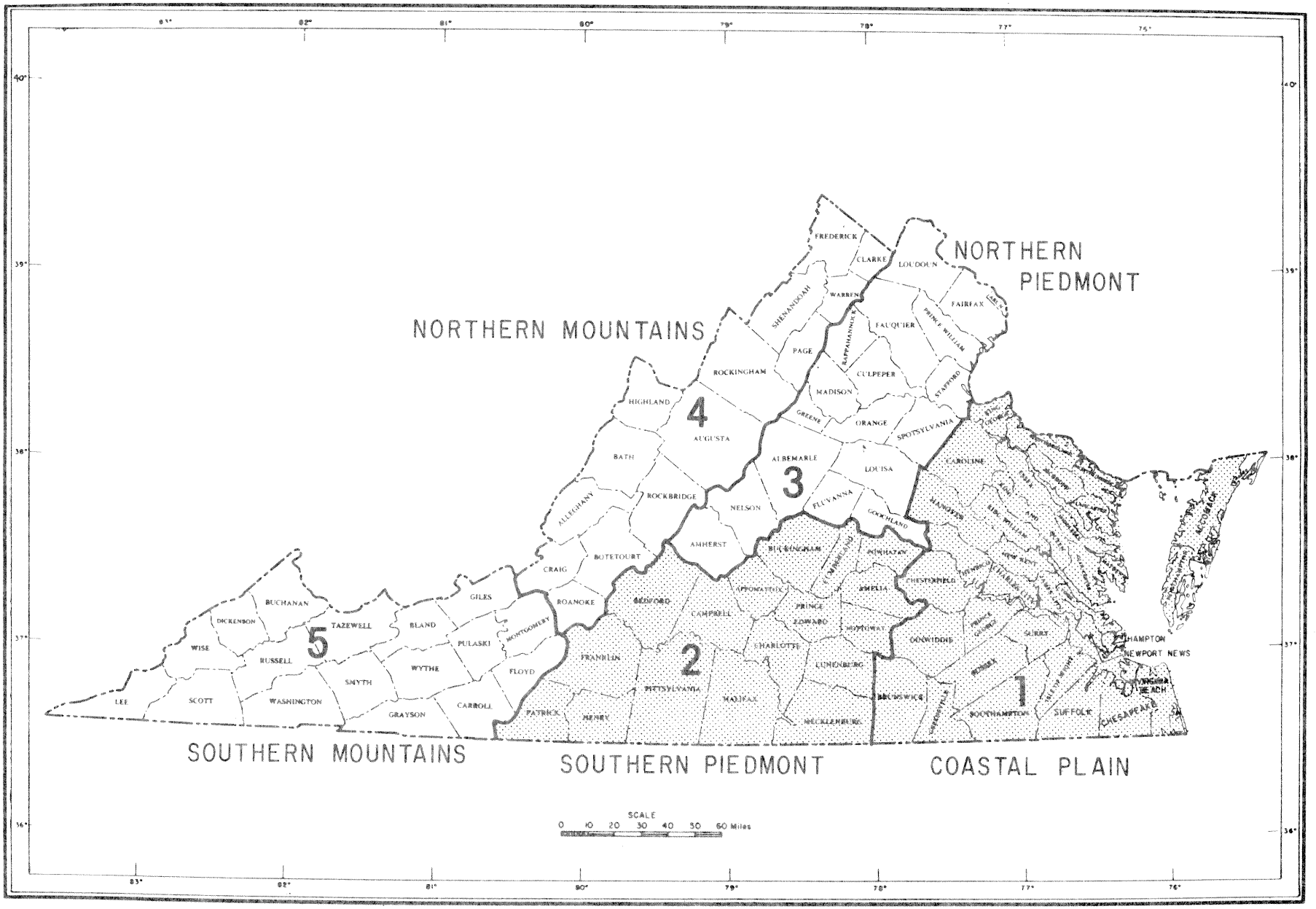


Figure 1.—Interim survey study area in Virginia.

In Virginia, all commercial forest sample locations that had yellow pines present in 1976 were relocated in the 51 counties in the Coastal Plain and Southern Piedmont. There are 2,280 permanent plots in the study area; on 1,592 of these plots at least one yellow pine tree 1.0 inch d.b.h. or larger was recorded in 1976. Field crews visited each of these 1,592 plots during the summer of 1980. At each of these locations, field crews accounted for each pine tree, regardless of tree class, and recorded on a remeasurement record form trees that died or were cut since 1976. Ingrowth pines (trees growing from below 5.0 inches d.b.h. to 5.0 inches or larger) were also recorded. Pines less than 5.0 inches d.b.h. in 1976 and still less than 5.0 inches in the interim survey were not recorded. Growth on surviving trees was computed, using average annual radial growth rates, by species and diameter classes. All hardwood trees recorded on the old sample record were ignored.

Area description was kept to a minimum. Crews recorded evidence of significant treatment or disturbance since the 1976 inventory and assigned a treatment opportunity code to describe the treatment needed, if any, to improve existing conditions for timber growth. All other area descriptive items used in this report are based on classifications made in 1976.

LIMITATIONS OF INTERIM DATA

The interim survey was designed to provide updated information on the pine resource at a low cost. Fieldwork in the Virginia interim survey was completed in about 3 months; the last regular inventory of the study area took 14 months for completion. Since procedures were streamlined, the interim survey cannot answer as many questions as a full-scale inventory.

A key question that remains unanswered about the pine resource is the number of 2- and 4-inch pine trees. As a result, little can be said about recent rates of pine regeneration. Pines 2 and 4 inches in diameter could be inventoried in an interim survey, but only by lengthening the data-collection process. Land which did not have a pine tree 1.0 inch d.b.h. or larger in 1976 could easily have such trees after 5 years due to planting, natural regeneration, and growth on existing seedlings. Therefore, all sample locations in commercial forest land would have to be visited regardless of whether a pine was present in the previous inventory. In addition, former nonforest lands now in forest would have to be inventoried.

RESULTS

PINE VOLUME UP 4 PERCENT

In 1976 the inventory of yellow pine in the study area totaled 3,725.9 million cubic feet (table 1). In 1981, it had increased by 4 percent to 3,874.2 million cubic feet. Over the 5-year period, net growth totaled 872.9 million cubic feet, while removals totaled 724.6 million cubic feet.

Table 1.—Change in volume of pine timber, by ownership class, in the Coastal Plain and Southern Piedmont of Virginia, 1976 to 1981

Item	All owners	Ownership class[a]			
		Public	Forest industry[b]	Farmer	Miscellaneous private
	Thousand cubic feet				
Inventory 1976	3,725,883	192,511	763,207	1,649,247	1,120,918
Period change:[c]					
Gross growth	1,049,033	43,177	294,054	396,804	314,998
Mortality	176,180	10,419	19,270	95,220	51,271
Net growth	872,853	32,758	274,784	301,584	263,727
Removals	724,562	31,733	174,917	344,447	173,465
Net change	+148,291	+1,025	+99,867	−42,863	+90,262
Inventory 1981	3,874,174	193,536	863,074	1,606,384	1,211,180

[a]Ownership class as of 1976.
[b]Includes lands under long-term lease.
[c]Does not include ingrowth mortality or ingrowth removals.

Almost all the volume increase occurred on lands owned and leased by forest industry and on miscellaneous private woodlands. Pine volume increased by 13 percent on forest industry and by 8 percent on miscellaneous private land. Pine volume on public lands was essentially unchanged, while that on farmer-owned forest lands decreased by 3 percent over the period. Pine removals exceeded pine net growth by 14 percent on farm woodlots.

The volume of pine sawtimber increased by 3 percent during the interim period and now totals 11.2 billion board feet of sawtimber (table 2). Miscellaneous private woodlands supplied about two-thirds of the increase; sawtimber volume on this class of forest went up by 7 percent. Public and farm forests supplied the remaining portion of the sawtimber increase. Sawtimber volume increased by less than 2 percent on farm forests and almost 5 percent on public forests; it declined by just over 1 percent on lands owned and leased by forest industry.

The distribution of removals, inventory volume, and net growth among ownership classes changed somewhat (table 3). Farm woodlots supplied almost half the 1981 pine harvest, 4 percent more than in 1976. But farmers provided a lower percentage of the total inventory and net growth in 1981 than in 1976, while the opposite situation was found on industry lands. Industry forests supplied 31 percent of the net growth in 1981, up from 26 percent of the total in 1976. The share of net growth coming from farmer-owned forest land declined from 40 percent of the total in 1976 to 35 percent in 1981.

Table 4 shows estimates of average annual growth and removal volumes (period change divided by the remeasurement period) for each class of ownership. These estimates are not completely comparable with the 1976 averages because more sophisticated methods for arriving at annual estimates are used in a regular inventory. The comparisons with 1976 are made here, however, to point out some significant changes.

Net annual growth of pine timber has increased by 2 percent across all ownerships since 1976. On forest industry lands net growth has increased by 24 percent. But on the public and farm forests, pine net growth has decreased by 11 percent since 1976. Pine net growth on miscellaneous private woodlands has been rather stable, increasing by only 1 percent. Average annual pine removals since 1976 are down by nearly 14 percent from the average for the period between 1966 and 1976. This apparent reduction occurred on all ownership classes, but ranged from 5 percent on farmer-owned forest land to 28 percent on public forests. Because the comparison of annual removals in 1976 and 1981 is based on average annual removals over two periods (1966 to 1976 and 1976 to 1981), these averages may not accurately reflect the level of removals for the two stated years. There are indications that pine removals have risen slightly since 1976 (Welch and Bellamy 1980).

About 92 percent of the increase in cubic volume of pine timber was in one species—loblolly pine (table 5). The volume of loblolly pine increased by nearly 9 percent during the period. Virginia pine was the only other species to increase in volume, going up by 2 percent. The volume of shortleaf pine decreased by 9 percent since 1976.

Almost 41 percent of the pine volume increase occurred in the 8-inch diameter class (fig. 2). The 16-inch class accounted for another 27 percent. Pine volume losses were recorded for the 12- and 14-inch diameter classes.

Table 2.—Change in volume of pine sawtimber, by ownership class, in the Coastal Plain and Southern Piedmont of Virginia, 1976 to 1981

Item	All owners	Ownership class[a]			
		Public	Forest industry[b]	Farmer	Miscellaneous private
	Thousand board feet				
Inventory 1976	10,880,475	585,913	2,278,518	4,788,521	3,227,523
Period change:[c]					
Gross growth	3,181,345	159,613	656,149	1,372,842	992,741
Mortality	404,375	29,548	44,422	196,920	133,485
Net growth	2,776,970	130,065	611,727	1,175,922	859,256
Removals	2,473,545	101,933	644,698	1,090,482	636,432
Net change	+303,425	+28,132	−32,971	+85,440	+222,824
Inventory 1981	11,183,900	614,045	2,245,547	4,873,961	3,450,347

[a]Ownership class as of 1976.
[b]Includes lands under long-term lease.
[c]Does not include ingrowth mortality or ingrowth removals.

Table 3.—Distribution of commercial forest land and inventory volume, net growth, and removals of yellow pine, by ownership class and year of inventory, Coastal Plain and Southern Piedmont of Virginia

Item	Public	Forest industry[a]	Farmer	Miscellaneous private
	Percentage of total			
Commercial forest acreage:				
1976	4	17	46	33
Inventory, all yellow pine:				
1976	5	21	44	30
1981	5	22	42	31
Net growth, all yellow pine:				
1976	4	26	40	30
1981	4	31	35	30
Removals, all yellow pine:				
1976	5	24	44	27
1981	4	24	48	24

[a]Includes lands under long-term lease.

Table 4.—Net annual growth and annual timber removals of yellow pine by ownership class and year of inventory, Coastal Plain and Southern Piedmont of Virginia

Ownership class[a]	Net annual growth[b]		Annual removals[b]	
	1976	1981	1976	1981
	Thousand cubic feet			
Public	7,549	6,685	8,939	6,476
Forest industry[c]	45,135	56,078	41,690	35,698
Farmer	69,101	61,548	74,359	70,295
Miscellaneous private	53,103	53,822	46,096	35,401
All owners	174,888	178,133	171,084	147,870

[a]Ownership class as of 1976.

[b]1976 figures are an average for the period between 1966 and 1976; 1981 figures are an average for the period between 1976 and 1981.

[c]Includes lands under long-term lease.

Table 5.—Change in volume of pine timber on commercial forest land, by species, Coastal Plain and Southern Piedmont of Virginia, 1976 to 1981

Species	Inventory in 1976	Net change between 1976 and 1981	Inventory in 1981
	Thousand cubic feet		
Loblolly pine	2,171,315	186,106	2,357,421
Virginia pine	960,378	16,029	976,407
Shortleaf pine	556,694	−49,787	506,907
Pond pine	16,657	−1,163	15,494
Pitch pine	20,839	−2,894	17,945
All species	3,725,883	148,291	3,874,174

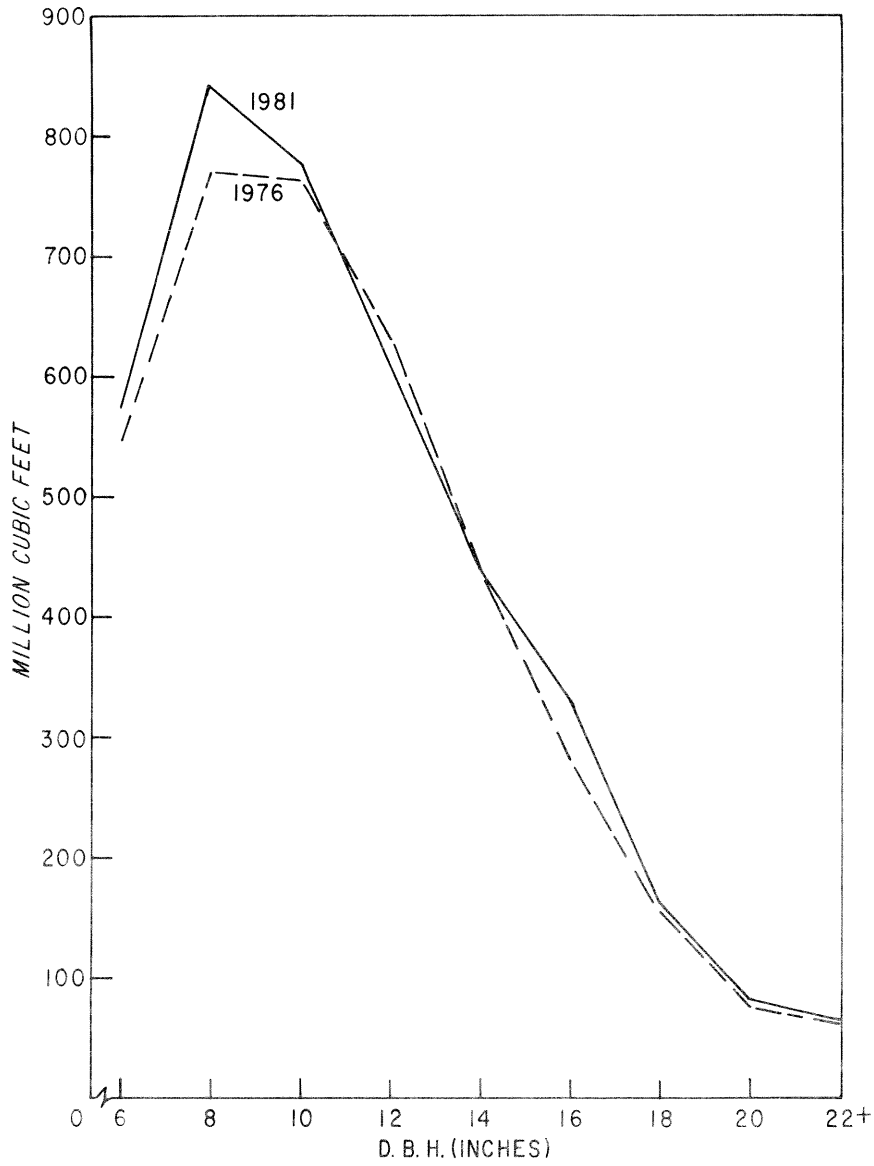


Figure 2.—Volume of yellow pine timber, by diameter class, Coastal Plain and Southern Piedmont of Virginia, 1976 and 1981.

5.1 MILLION FEWER 6-INCH PINES

Table 6 shows the net change in the number of pine trees by diameter and ownership class. For the most part, these net changes in number of trees are consistent with the changes in volume. A 5.1-million tree decline in the 6-inch class seems inconsistent with the volume increase shown in figure 2. However, an in-depth look at the 6-inch class revealed that the loss in number of trees occurred in the lower portion (5.0 to 5.9 inches) of that class, while the upper portion of the class (6.0 to 6.9 inches) actually gained trees, resulting in the small net increase in volume.

The net change in number of trees for all owners masks rather large differences between the ownership classes. For instance, the number of 6-inch pine trees on lands owned and leased by forest industry increased by 13.2 million trees, or by 23 percent, and the number in the 8-inch class increased by 11.9 million trees, or by 56 percent. Forest industry was the only ownership class to show an increase in the number of 6-inch pine trees; two-thirds of the increase in 8-inch pines was on industry lands. On farmer-owned forest lands, the number of 6-inch pines declined by 12.2 million trees, a 15-percent reduction. The reduction in number of 6-inch pines totaled 3.4 million trees, or 6 percent, on miscellaneous private land, and 2.8 million trees, or 32 percent, on public forests. Substantial reductions in number of trees were also recorded in the 8-, 10-, and 12-inch diameter classes on farm forests.

Table 6.—Net change in number of pine trees on commercial forest land, by diameter and ownership class, Coastal Plain and Southern Piedmont of Virginia, 1976 to 1981

Ownership class[a]	All classes	Diameter class								
		6	8	10	12	14	16	18	20	22+
	Thousand trees									
Public	−2,222	−2,780	332	294	−122	−52	104	2	2	−2
Forest industry[b]	24,933	13,249	11,944	636	−734	−493	340	−94	76	9
Farmer	−15,891	−12,154	−1,603	−1,569	−1,507	442	279	191	25	5
Miscellaneous private	5,138	−3,401	5,705	1,488	955	113	326	−23	−38	13
All owners	11,958	−5,086	16,378	849	−1,408	10	1,049	76	65	25

[a]Ownership class as of 1976.
[b]Includes lands under long-term lease.

The decline in the number of 6-inch pines forebodes likely reductions in volumes in the larger diameter classes in future years as fewer trees are available to feed upward through the stand table. Fewer small trees and timber harvesting have already led to volume losses in the 6 through the 12-inch diameter classes on farmer-owned land. Boyce and Knight (1979) predicted a reduction in the number and volume of 6-inch pines from observed declines in the number of 2- and 4-inch pines between 1966 and 1976. In the interim-study area, the number of 2-inch pines dropped by 191 million trees, or by 25 percent, between 1966 and 1976, while the number of 4-inch pines fell by 9.3 million trees, or 2 percent, during the same period. These reduced numbers of 2- and 4-inch pines caused the reduction in number of 6-inch pines found in the interim survey. A volume loss for the 6-inch class will likely occur as the accumulation of trees in the upper end of that class moves into the 8-inch class.

Stand age profiles for pine forest types, by ownership class, provide further support for the observed changes in the 6-inch diameter class (fig. 3). Both the stand age and forest-type classifications are based on the 1976 data. The profile for forest industry lands shows that their pine stands were concentrated in the 0- to 9- and 10- to 19-year age classes. This accumulation of stands in the two youngest age classes accounts for the large increases in the number of 6- and 8-inch pine trees between 1976 and 1981. The development of these young pine stands, a large proportion of which are plantations, apparently fed large numbers of pine trees past the 5-inch threshold for ingrowth. Before 1976 fewer pine stands were feeding trees into the 6-inch class, as evidenced by the relatively small acreage in the 20- to 29-year age class.

The 1976 pine age profile for farms shows why numbers of 6-inch pines declined between 1976 and 1981. In 1976 the largest acreage of pine stands was in the 30- to 39-year age class, with somewhat less acreage in the 20- to 29-year class, and still less in the 10- to 19-year class. This depressed acreage of pine types in the 10- to 19-year age class compared to that in the next two older classes accounts for the large net loss of pine trees in the 6-inch diameter class on farmer-owned land. If we assume that the 0- to 9-year-old pine stands will be moving pine trees over the 5-inch threshold in the next 5 to 10 years, then some improvement may well be forthcoming. The acreage is 62 percent higher in this class than in the 10- to 19-year class. About 42 percent of the pine acreage in the 0- to 9-year class is in plantations.

The age profile for the miscellaneous private owners provides no clear explanation of the 6-percent reduction in number of 6-inch pines since 1976. The age structure is much more stable on this ownership in the earlier age classes. Pine plantations made up 57 percent of the acreage in the 0- to 9-year age class in 1976.

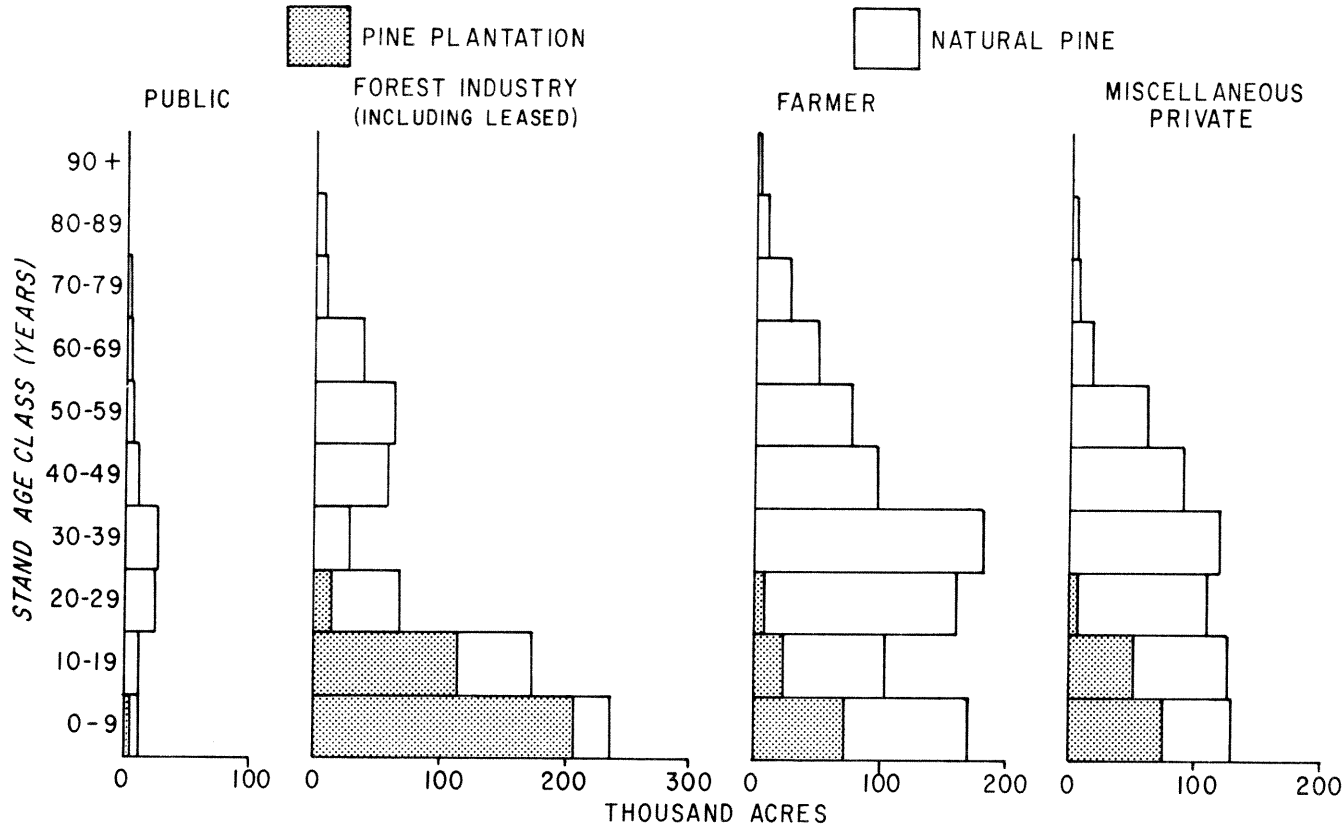


Figure 3.—Area of commercial forest land occupied by pine forest types, by stand age class, ownership class, and stand origin, Coastal Plain and Southern Piedmont of Virginia, 1976.

The profile for public forests is similar to that for farmers in that the acreage in the age classes likely to have contributed to the 6-inch class during the interim period is less than the acreage in the 20- to 29-year age class. However, no improvement in pine regeneration is evident in the 0- to 9-year class.

These age profiles point out the critical need to maintain stable regeneration programs over time. Lapses in pine regeneration, such as that indicated by the 10- to 19-year age class for farmers, will affect timber supplies in the decades that follow.

47 PERCENT OF PLANTING ON FARM WOODLANDS

About 19 percent of the commercial forest land containing pine in 1976 was treated or significantly disturbed since 1976 (table 7). Harvesting was the predominant treatment, occurring on 178 samples. About 53 percent of the harvest operations took place on forest lands owned by farmers in 1976, over 22 percent on forest industry lands, and 22 percent on miscellaneous private woodlands. Artificial regeneration occurred following the harvest operation on one-fourth of all harvested stands. Altogether, planting occurred on 47 sample locations. Almost 47 percent of the planting was on farm woodlands, 36 percent on forest industry lands, and 11 percent on miscellaneous private forest lands.

Natural disturbances caused significant damage on 35 samples. Insects and weather were the predominant damaging agents. Thinning and other intermediate cutting occurred on 25 samples. Since 1976, 41 of the revisited sample locations were cleared for nonforest land uses.

We must emphasize that the current stand history data cannot be directly compared to that from the last regular inventory because only a portion of all samples were remeasured. Therefore, a determination of trends in acreage harvested or planted is not possible.

The stand age classifications made in 1976 were used to evaluate the rates at which stands of varying ages were harvested. The number of sample locations harvested since 1976 in each stand age class of each broad forest type was determined. This number was divided by the number of remeasured sample plots in that age class and forest type to arrive at the rate of harvesting for the 5-year interim survey. Results for 20-year age classes are shown in table 8.

As expected, rates of harvesting were highest in the older age classes, particularly for natural pine stands. About 39 percent of the natural pine stands 60 to 79 years old in 1976 were harvested since then, and 50 percent of the natural pine stands 80 years and older were harvested. Due to their relatively low age, only 3 percent of the pine plantation plots were

Table 7.—Distribution of remeasured sample locations, by recent stand history and ownership class, Coastal Plain and Southern Piedmont of Virginia, 1981

Recent stand history[a]	All owners	Ownership class[b]			
		Public	Forest industry[c]	Farmer	Miscellaneous private
	Number of samples				
No significant treatment or disturbance	1,289	53	246	557	433
Harvesting with artificial regeneration	45	3	16	22	4
Other harvesting	133	2	24	72	35
Thinning or other intermediate cutting	25	2	7	10	6
Other artificial regeneration	2	--	1	--	1
Natural disturbance	35	2	5	19	9
Other miscellaneous treatments[d]	22	1	1	11	9
Diverted to other land use	41	1	--	21	19
Total	1,592	64	300	712	516

[a]Primary treatment or disturbance since 1976.
[b]Ownership class as of 1976.
[c]Includes lands under long-term lease.
[d]Includes prescribed burning, grazing, drainage, site preparation, and other man-caused disturbances.

Table 8.—Percentage of remeasured samples harvested between 1976 and 1981, by stand age class and forest type, Coastal Plain and Southern Piedmont of Virginia

Stand age class (years)	All types	Broad forest types			
		Pine plantations	Natural pine	Oak-pine	Hardwood
	Percentage of plots				
0–19	4	2	3	4	6
20–39	12	11	14	7	11
40–59	13	--	20	15	8
60–79	21	--	39	18	13
80+	18	--	50	14	13
No manageable stand	10	0	0	7	11
All classes	11	3	15	10	10

Stand age and forest type, 1976 classifications.

harvested. The harvesting rates for both oak–pine and hardwood stands were substantially lower than corresponding values for pine stands, particularly at the older age classes. Some trees have been harvested in about 7 percent of the oak–pine stands and in about 11 percent of the hardwood stands classified as not supporting a manageable stand in 1976. Since little volume was removed from these stands (table 9), the harvesting was likely used as some form of stand improvement. About 79 percent of the yellow pine volume removed during the interim period was cut from stands classified as pine types in 1976. Volumes in table 9 are for trees cut during thinning, stand improvement, and land-clearing operations, as well as final harvests.

Table 9.—Volume of yellow pine timber removed from commercial forest land, by stand age class and forest type, Coastal Plain and Southern Piedmont of Virginia, 1976 to 1981

Stand age class (years)	All types	Broad forest types			
		Pine plantations	Natural pine	Oak-pine	Hardwood
	Thousand cubic feet				
0–19	48,845	29,648	12,568	2,961	3,668
20–39	190,760	6,099	152,664	19,327	12,670
40–59	274,602	--	220,995	35,821	17,786
60–79	158,234	--	123,147	16,718	18,369
80+	37,400	--	24,117	6,299	6,984
No manageable stand	14,721	1,073	317	6,317	7,014
All classes	724,562	36,820	533,808	87,443	66,491

Stand age and forest type, 1976 classifications.

STANDS NEEDING REGENERATION INCREASE

When a sample location showed evidence of significant treatment or disturbance since 1976, field crews assigned a new treatment opportunity code to describe the treatment needed to enhance timber growth. For sample locations not disturbed, the treatment opportunity assigned in 1976 was still assumed to be valid. This procedure resulted in a minimum of change in the number of samples needing various treatments (table 10). The most significant change by treatment opportunity was in the number of samples needing regeneration. In 1976, 128 of the remeasured samples needed regeneration compared to 205 in 1981. This increase occurred on all ownership classes.

Table 10.—Change in the number of samples, by treatment opportunity, ownership class, and year of inventory, Coastal Plain and Southern Piedmont of Virginia

Treatment opportunity	All ownerships		Ownership class[a] and year of inventory									
			Public		Forest industry[b]		Farmer		Misc. private individual		Misc. private corporate	
	1976	1981	1976	1981	1976	1981	1976	1981	1976	1981	1976	1981
	Number of samples											
Immature stand in good condition	897	870	35	36	187	187	379	366	267	254	29	27
Merchantable stand damaged-salvage	21	25	0	1	11	6	9	13	1	5	0	0
Mature stand ready for harvest	121	107	9	7	18	14	60	54	30	27	4	5
Commercial thinning	107	89	8	8	25	25	41	29	28	25	5	2
Precommercial thinning	20	17	0	0	10	9	6	5	4	3	0	0
Cleaning, release, or other stand improvement	112	102	3	2	24	22	47	41	34	33	4	4
Stand conversion	145	136	6	6	13	11	80	75	41	39	5	5
No manageable stand-regeneration	128	205	2	3	12	26	69	108	40	59	5	9
Cleared to nonforest land use between 1976 and 1981	41	41	1	1	0	0	21	21	17	17	2	2
Total number of samples	1,592	1,592	64	64	300	300	712	712	462	462	54	54

[a]Ownership class as of 1976.
[b]Includes lands under long-term lease.

Most of the increase in regeneration opportunity resulted from timber harvesting. For instance, 93 of the 178 harvested sample stands (52 percent) were classified in the interim survey as needing regeneration. Many of these stands may have been in the 1- to 2-year delay period between harvest and planting operations. For a 5-year survey cycle, stands in this delay period make up a higher proportion of all harvested stands than for a 10-year cycle. Even so, there is an opportunity to increase pine regeneration on cutover forest lands. The poorly stocked forest land managed by forest industry will likely be regenerated, but the backlog of such conditions on nonindustrial private land leaves room for continued improvement.

SECTIONAL RESULTS

The interim survey study area is quite large and the forest resource within this area is diverse. These factors make it desirable to look at the results for smaller, more homogeneous areas. Three such areas were identified: (1) 12 Coastal Plain counties south of the James River; (2) 22 Coastal Plain counties north of the James River; and (3) the entire Southern Piedmont (fig. 4). A brief summary of the more important findings for each of these areas follows.

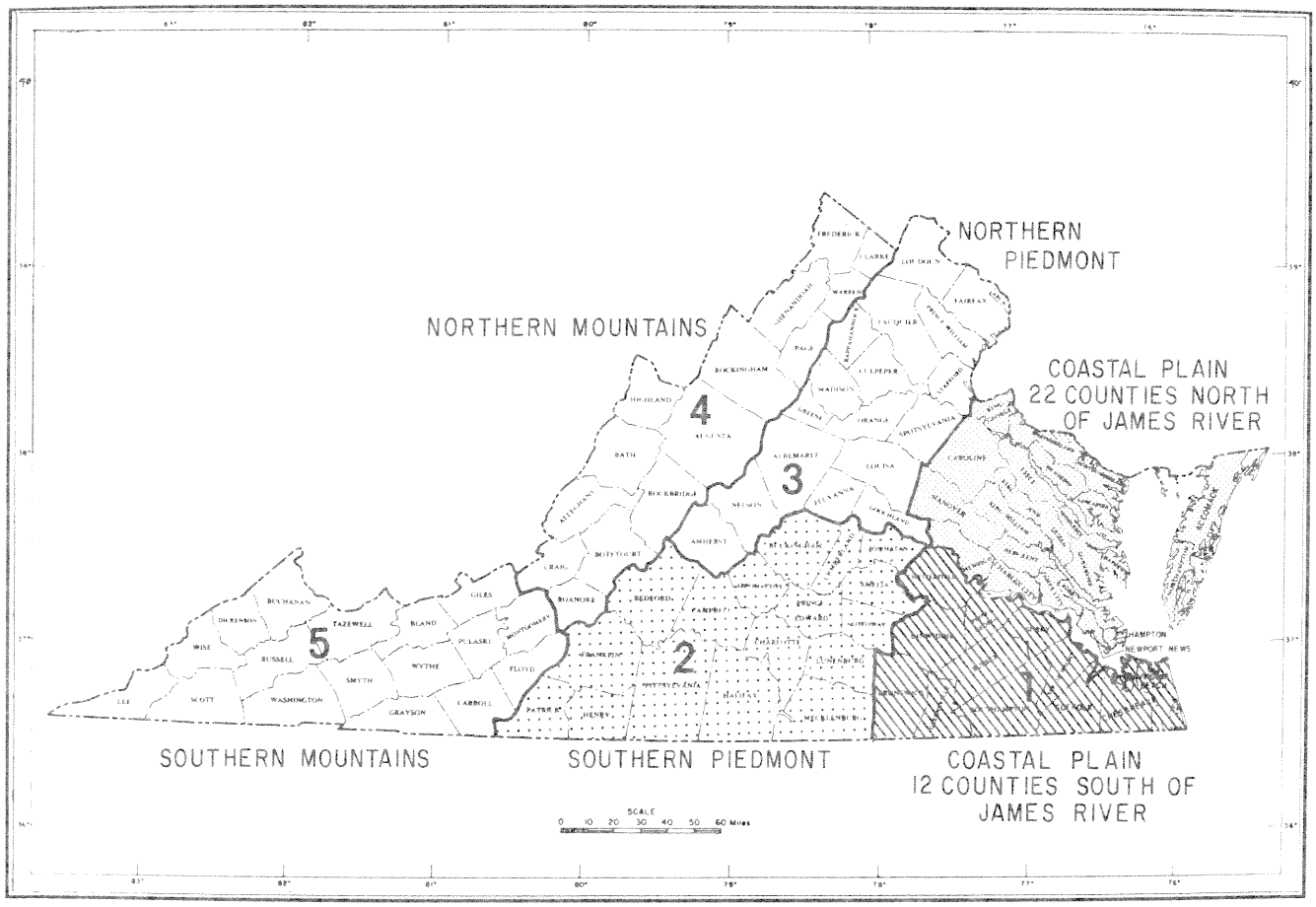


Figure 4.—Interim study area broken into three sections.

12 Coastal Plain Counties South of the James River

Commercial forests occupied 2.1 million acres in this area in 1976. Over 32 percent of the volume of yellow pine timber for the entire study area was located in these 12 counties in 1976. Almost 42 percent of the pine sawtimber was in these counties. Of the 1,592 sample locations remeasured, 509 were here. This area also has the highest concentration of forest industry ownership in the State; about 25 percent of the commercial forest here is owned by forest industry. Nonindustrial private owners control 73 percent of the commercial forest.

In this area, pine volume dropped by nearly 2 percent since 1976. Pine sawtimber volume decreased by 4 percent. Loblolly pine, the dominant species with 93 percent of the volume, changed little in cubic volume since 1976. The loblolly sawtimber inventory declined by over 2 percent. Both the cubic- and board-foot volumes of shortleaf pine dropped by 30 percent since 1976. Pine volume losses were recorded in the 10-, 12-, 14-, and 18-inch diameter classes. One positive finding was a 4.4 million tree increase (10 percent) in the 6-inch diameter class.

22 Coastal Plain Counties North of the James River

Commercial forests covered 1.9 million acres in this area in 1976. About 31 percent of the pine cubic volume in the interim study area was located in these 22 counties, 33 percent of the pine sawtimber volume was located here. Forest industries own only 13 percent of the commercial forests in this area, while nonindustrial private owners control nearly 82 percent. During the interim survey, 476 sample locations were remeasured in these 22 counties.

The volume of all pine timber in this area increased by 6 percent, and pine sawtimber volume increased by 8 percent since 1976. Loblolly pine and Virginia pine make up 99 percent of the inventory and both increased in volume by almost 7 percent since 1976. The 6- and 12-inch diameter classes were the only two diameter classes to show volume losses. This 22-county area accounted for all the net loss in the number of 6-inch pines for the interim study area. The number of 6-inch pines plummeted by 11.9 million trees, or by 20 percent, since 1976. Rather large losses in the number of 2- and 4-inch pines between 1966 and 1976 led to the loss of 6-inch pine trees.

Southern Piedmont

Commercial forests occupied 3.8 million acres in the Southern Piedmont in 1976. This region contained 37 percent of the pine cubic volume for the entire study area. Only 25 percent of the pine sawtimber was in the Southern Piedmont. Forest industry controlled 15 percent of the commercial forests and nonindustrial private owners over 81 percent. In this area, 607 sample locations were remeasured during the interim survey.

Pine cubic and sawtimber inventories increased by 7 percent in the Southern Piedmont since 1976. Loblolly pine accounted for all the gain in cubic volume and now makes up 23 percent of the pine inventory. Volume of Virginia pine, with 47 percent of the inventory, remained about the same. Shortleaf pine, with 29 percent of the inventory, decreased in volume by 5 percent. For the sawtimber portion of the inventory all the major yellow pine species increased in volume. The volume increase in this region occurred in every diameter class except 20 inches, in which an 11 percent decline occurred. The number of 6-inch pines continued to increase but at a slower rate than in 1976.

SUMMARY

Findings of the interim survey are somewhat mixed. For the study area as a whole, volumes are up since 1976, but volumes declined in some localized areas. Net growth is also up slightly. Average annual removals for the 5-year period are down from the average for the period between 1966 and 1976. On the negative side, inadequate pine regeneration in past years has now led to fewer trees in the 6-inch diameter class. This problem occurred on all except industry forests and was especially severe on farm forests. Regionally, much of this loss in number of 6-inch pines occurred in a 22-county area in the Coastal Plain north of the James River.

Since the interim survey is not a complete inventory and does not provide an estimate of the number of 2- and 4-inch pines, we cannot assess the present pine regeneration situation. But the results of the interim survey, taken in light of the pine regeneration problems identified during the 1976 inventory, lead one to conclude that continued and possibly strengthened emphasis must be put on adequate pine regeneration following timber harvests. Virginia's future timber supplies depend on it.

LITERATURE CITED

Boyce, Stephen G., and Herbert A. Knight.
1979. Prospective ingrowth of southern pine beyond 1980. U.S. Dep. Agric. For. Serv., Res. Pap. SE-200, 50 p. Southeast. For. Exp. Stn., Asheville, N.C.

Cost, Noel D.
1976. Forest statistics for the Coastal Plain of Virginia, 1976. U.S. Dep. Agric. For. Serv., Resour. Bull. SE-34, 33 p. Southeast. For. Exp. Stn., Asheville, N.C.

Sheffield, Raymond M.
1976. Forest statistics for the Southern Piedmont of Virginia, 1976. U.S. Dep. Agric. For. Serv., Resour. Bull. SE-35, 33 p. Southeast. For. Exp. Stn., Asheville, N.C.

Sheffield, Raymond M.
1978. Coastal Virginia's timber resource: trends, present conditions, and opportunities for improvement. U.S. Dep. Agric. For. Serv., Resour. Bull. SE-43, 24 p. Southeast. For. Exp. Stn., Asheville, N.C.

Welch, Richard L., and Thomas R. Bellamy.
1980. Changes in output of industrial timber products in Virginia, 1976-1978. U.S. Dep. Agric. For. Serv., Resour. Bull. SE-54, 21 p. Southeast. For. Exp. Stn., Asheville, N.C.

Welch, Richard L., and Robert A. Cathey.
1976. Sampling and analytical techniques for an interim survey in the South Carolina Lowcountry. U.S. Dep. Agric. For. Serv., Res. Pap. SE-154, 8 p. Southeast. For. Exp. Stn., Asheville, N.C.

U.S. Government Printing Office: 1981 - 735-056/4014 Region No. 3-II