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Residual Pine Stocking After Harvest on Private Timberland: A Summary for Six Southern States

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SUMMARY

Residual stocking of pine was assessed on harvested pine-site timberland in six southern States. Recent forest inventories indicated that 36 percent of the privately owned timberland had been harvested. Across all forest types, pine regeneration success ranged from 41 to 66 percent depending on the level of residual pine stocking considered to be adequate. Regeneration for forest industry ranged from 53 to 78 percent. The range for nonindustrial private owners was from 31 to 57 percent. The overall rate of replacement for harvested pine stands was 93 percent for forest industry and 65 percent for nonindustrial private owners. Evidence here suggests that pine regeneration success has been improving in the 1980's.

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INTRODUCTION

Current resource statistics indicate that the periodic net growth of softwoods in the South has decreased from levels of the recent past (Knight 1987). Resource projections suggest a continuation of this trend over the next decade (USDA FS 1988). Though many forces are at work, the most commonly cited reason for the decrease is a lack of pine regeneration following harvest of pine stands on nonindustrial private land. Other factors include pine mortality, an increase in cull trees, and loss of timberland to other land uses. Conversion of mature natural pine stands to young plantations with far less merchantable growth has also been a factor.

Future inventory and growth of pine depend heavily on the current status of pine regeneration. The USDA Forest Service-Forest Inventory and Analysis Project (FIA) has been monitoring the status of pine regeneration after harvest as part of its ongoing forest inventory process (Birdsey and others 1981; McWilliams and Birdsey 1984; McWilliams and Frey 1986; McWilliams and Skove 1987; McWilliams 1988a, 1988b, 1989). Residual pine stocking provides a relative measure of probable pine regeneration success.

The results compare forest types and ownership groups, which are summarized for privately owned timberland in six south central States in a standardized format. State-level information is included to illustrate the importance of the period covered by the inventory rather than the effectiveness of individual State reforestation programs.

METHODS AND DEFINITIONS

Study Region

The study region encompasses Alabama, Arkansas, Louisiana, Mississippi, east Oklahoma, and east Texas (fig. 1). Data were collected on upland sites

where pine was present or was formerly present—these are termed “pine sites.” Most of the study region was located in the Coastal Plain Province. Physiography of the Coastal Plain ranges from relatively flat along the coast to hilly farther north. Parts of the Ozark Plateau and Ouachita Highlands in Arkansas and the mountain provinces and Piedmont in Alabama were included. Some low-lying sites where pines have become established following draining were also covered. The region has undergone increased planting over the past decade, most notably on forest industry land.

Pine forests predominate, but mixed pine-hardwood and hardwood forest types are very common on upland pine sites. Pine forests are dominated by the loblolly-shortleaf forest type, but also include the longleaf and slash pine types. Mixed stands are made up primarily of oak species in combination with pines, but sweetgum and hickory are also very common. Diverse oak-hickory forests comprise nearly all the hardwood timberland on upland pine sites.

Private owners include forest industry and nonindustrial private landowners. Forest industry timberland is defined as timberland owned by enterprises that operate timber products facilities such as pulp or paper mills, sawmills, wood chip mills, or chemical extraction plants. Timberland under long-term lease to forest industry from nonindustrial private owners was also included in that classification.

The nonindustrial private owner group is comprised of individuals, farmers, and corporations. Most of the nonindustrial private owners are individuals. They include such diverse interests as large trust funds managing expansive forest tracts for timber production to families interested in enhancing the scenic quality of their property. Farmers include crop growers and ranchers. The corporate classification covers any corporation not directly involved in the production of timber products, such as timberland management entities, utility companies, banks, or incorporated hunting clubs.

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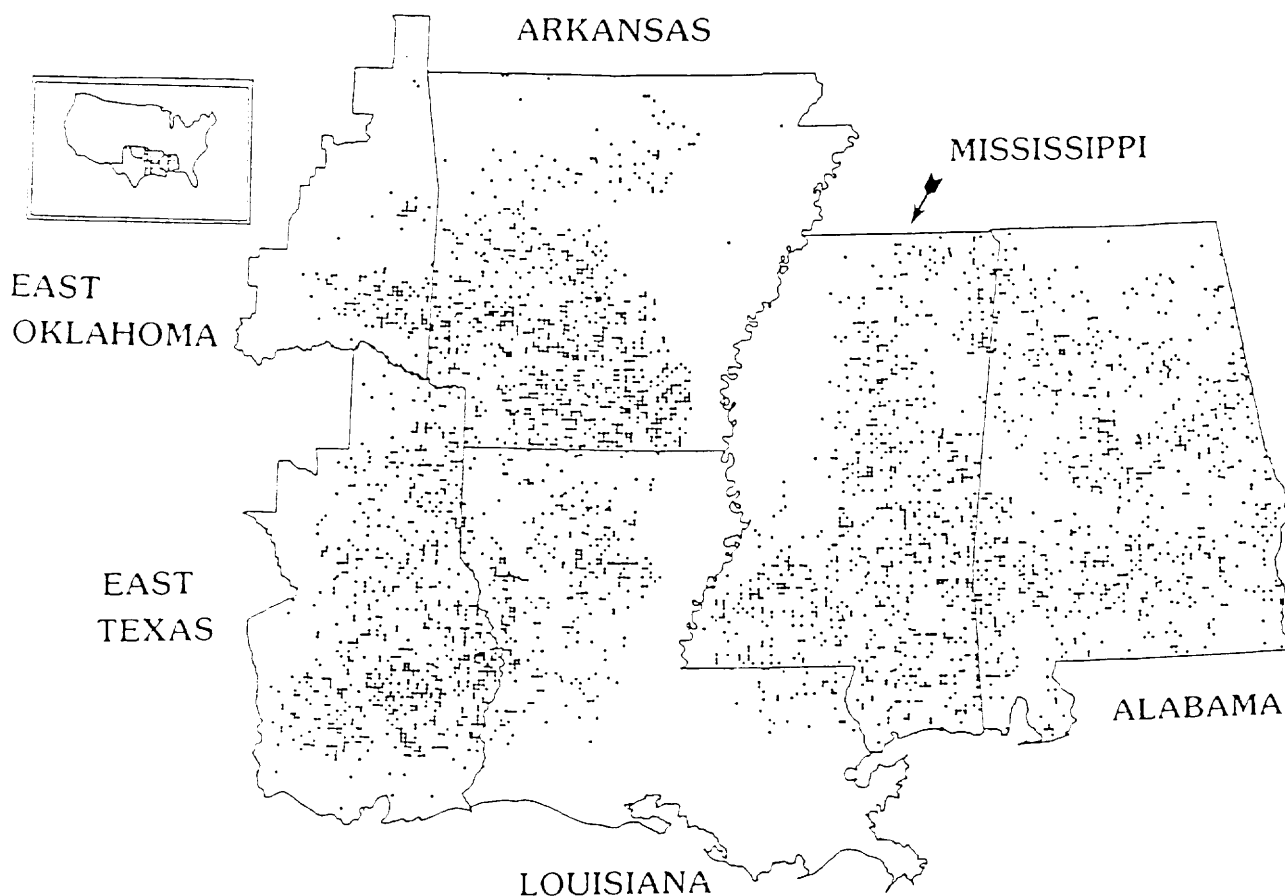


Figure 1.—Study region and distribution of commercially harvested sample plots.

Sample Scheme

Sample data were taken from the most recent FIA inventories for the six States of the study region. The oldest was the Alabama inventory (1982), and the most recent was the Arkansas inventory (1988). The sample included 3,383 sample plots located on a systematic 3-mile grid with each plot consisting of a cluster of 10 satellite points (except in Alabama and Louisiana where 5 points were used). At each point, trees greater than 5.0 inches in d.b.h. were selected for measurement using a 37.5 BAF prism. Saplings were measured on fixed-radius plots centered around the first three points. Well-established pine seedlings were tallied using mil-acre plots at all points.

Timberland area estimates were based on photo-interpretation and ground checks of sample plots, as well as intensification plots interspersed between the sample plots. Sampling error for the total area of commercially harvested timberland was 0.3 percent.

Sampling error (by random sampling formula) increases as area estimates are disaggregated. The relationship between sampling error and the degree of disaggregation is:

Sampling error	Timberland area
<i>Percent</i>	<i>Thousands of acres</i>
0.3	19,613.4
0.5	5,591.2
1.0	1,397.8
2.0	349.4
3.0	155.3
4.0	87.4
5.0	55.9
10.0	14.0
15.0	6.2

Forest type was assigned using the relative stocking of dominant and/or codominant pine and hardwood trees. The definition of pine forests included stands in which 50 percent or more of the stand was composed of southern pine species. Mixed pine-hardwood stands contained a plurality of hardwood species, but pines constituted at least 25 percent. Stands were classified as hardwood if pines contributed less than 25 percent of the overall stocking.

Harvest Classification

The sample plots were selected in stands that had undergone commercial harvest since previous measurement. Harvested stands that shifted to nonforest and use were excluded from the sample. Field crews used existing plot conditions and personal judgment to distinguish between commercial harvest and other activities such as thinnings or stand improvement cuts. Precommercial thinnings, commercial thinnings in poletimber stands, and the removal of a small number of trees for firewood, posts, or other products were not included in the sample. Commercial harvest cuts were grouped into four classes on the basis of cutting intensity and inspection of residual trees:

Complete clearcut—removal of all growing-stock and cull trees.

Merchantable clearcut—removal of growing-stock trees with cull trees left standing.

Partial cut—pine selection cuts, diameter-limit cuts, highgrading, or any other practice that tends to remove the most marketable trees leaving a residual stand of growing-stock and/or cull trees.

Other harvest—seed tree cuts, shelterwood cuts, and salvage cuts.

Clearcuts were distinguished from partial cuts by examination of the residual stand. Stands were only classified as clearcuts if all growing-stock trees were killed. This method of classification follows Smith's 1962 "broad" definition of the clearcut method using FIA criteria to define merchantability.

Stocking Assessment

Pine stocking was assessed by comparing existing stocking of growing-stock trees with the area occupancy standard used by FIA. The FIA standard is an expression of "normal" or "full" stocking for southern forests. Described in terms of number of trees by 2-inch diameter class, the standard is:

D.b.h.	Number of trees
<i>Inches</i>	<i>Per acre</i>
seedlings	600
2	560
4	460
6	340
8	240
10	155
12	115
14	90
16	72
18	60
20	51
22	42
24	36
26	31
28	27
30	24

Residual pine stocking includes planted trees, naturally seeded trees, and residual trees found following any harvest that occurred after the stand had been harvested. Residual pine stocking was grouped into three classes:

Low—0 to 29 percent stocked with pine,

Medium—30 to 59 percent stocked with pine,

High—greater than 60 percent stocked with pine.

Pine stocking classes are useful for examining pine regeneration, but it should be noted that there is no absolute measure of success or failure because management objectives vary among owners and forest types. In general, pine stocking classes provide an indication of probable future forest type. Appendix tables 1 through 4 contain acreages by past forest type, State, and ownership group.

RESULTS

Commercial Harvest Activity

Ninety percent of the pine-site timberland in the study region is privately owned, with the rest held by public agencies:

Ownership group	Total timberland	Timberland harvested
	----- Percent -----	
Public	10	4
Forest Industry	28	41
Nonindustrial private	62	55

Prior to the most recent inventories, 96 percent of the commercial harvest activity was conducted on private land. Forest industry's share of the harvest area was higher than their share of total timberland. Both public and nonindustrial private owners harvested smaller shares than their shares of total timberland.

Overall, 36 percent of the privately owned timberland showed evidence of commercial harvest (table I). Harvesting tended to be heavier in States where more recent inventories had been completed. The harvest areas ranged from about 25 percent of the pine-site timberland in Alabama and Louisiana to nearly 50 percent in Arkansas and east Texas. Harvesting was greater on industry land, where 49 percent of the timberland base was harvested; 31 percent of the nonindustrial private timberland was harvested.

Forest types were impacted by harvesting in roughly the same proportions as existed before cutting, but with a slight preference for stands containing pine. Prior to harvest, the region's pine sites were 45 percent pine, 26 percent mixed, and 29 percent hardwood. Commercial harvests were 52 percent pine, 26 percent mixed, and 22 percent hardwood (fig. 2). Forest industry showed a preference for cutting stands containing pine.

By far, the most common harvest methods were partial cuts (51 percent of the harvest area) and clearcuts (complete and merchantable) (42 percent) (fig. 3).

In many cases, partially cut stands were essentially clearcut for a particular product—such as pine sawtimber—with nonproduct trees left standing. These residual trees often met FIA's growing-stock criteria. The seemingly high percentage of partially cut timberland may have resulted from some stands being in an intermediate stage of multipass harvest—say with pines cut first and hardwoods cut later. Partial cuts were most prevalent on nonindustrial private timberland, where 71 percent of the partial cuts were found. Clearcuts were more common on industry timberland.

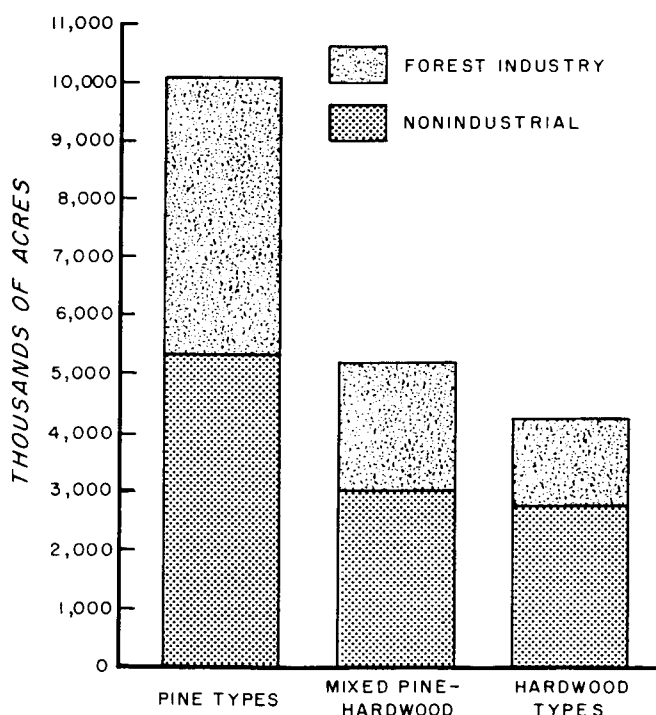


Figure 2.—Area of commercially harvested timberland by past forest type and ownership group.

The two owner groups showed preferences for the type of clearcut used. Seventy-four percent of the industry's clearcuts were classified as complete. Sixty-three percent of the nonindustrial private clearcuts were merchantable clearcuts, with cull and sapling-sized trees left standing. Some of the acreage with residual stems may receive further clearing through site-preparation activity scheduled for after the inspection by FIA field personnel.

Residual Pine Stocking

Several interrelated factors affect whether or not a stand is well stocked with pine after harvest. Two of

Table I.—Area of commercially harvested timberland by State and past forest type¹

State	Inventory period	Total past timberland	Commercially harvested timberland	Past forest type		
				Pine types	Mixed pine-hardwood	Hardwood types
-----Thousands of acres-----						
Alabama	1972–1981	16,534.7	4,418.4	2,321.2	1,184.3	912.9
Arkansas	1978–1987	8,658.7	4,018.3	2,043.0	1,022.3	953.0
Louisiana	1974–1983	8,028.6	1,897.9	1,112.4	456.9	328.6
Mississippi	1977–1986	10,456.2	4,534.8	2,139.8	1,272.3	1,122.7
East Oklahoma	1976–1985	2,335.3	683.8	346.3	186.7	150.8
East Texas	1975–1985	8,388.2	4,060.2	2,172.0	1,082.7	805.5
All States		54,401.7	19,613.4	10,134.7	5,205.2	4,273.5

¹Includes clearcuts, seed tree and/or shelterwood cuts, partial cuts, and salvage cuts on pine-site timberland. Pine sites are upland sites on which pine is present or was formerly present.

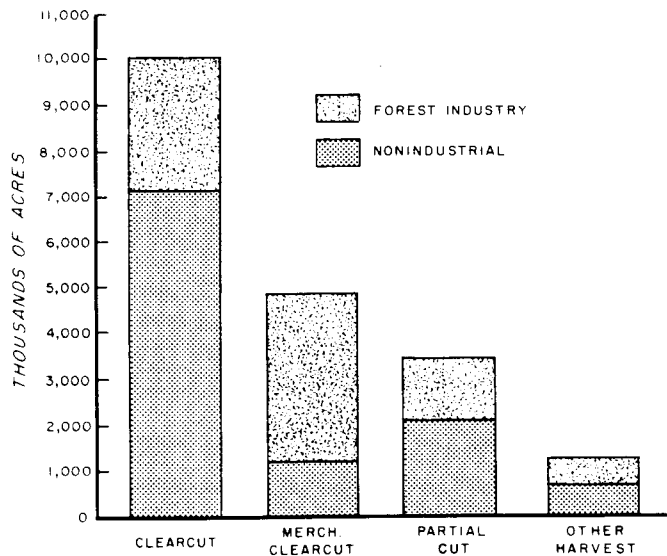


Figure 3.—Area of commercially harvested timberland by method of harvest and ownership class.

the most significant variables collected in the FIA inventories are preharvest (or past) forest type and ownership group. Another is the period of time covered by the inventory.

Forest Type and Ownership.—As would be expected, pine regeneration following harvest was most evident in pine stands. A high stocking of pine should ensure that harvested stands remain as pine-type timberland. For both ownership groups combined, 54 percent of the harvested pine-type timberland had a high stocking of pine (table II). Sixty-two percent of the forest industry stands had high stocking compared to 48 percent of the stands on nonindustrial private land. Harvested stands with medium pine stocking may or may not develop into pure pine

stands, but could represent adequate regeneration under some management scenarios. Overall, 24 percent of the stands had medium pine stocking.

The status of pine regeneration in mixed pine-hardwood stands is also important for assessing the future of the pine resource. Thirty-one percent of the harvested stands had high pine stocking and 32 percent had medium. Most of the stands with medium pine stocking will likely evolve into pine and mixed stands. Some of the medium-stocked stands will revert to hardwood forest types, as will most of the stands with low pine stocking, assuming no follow-up management treatments to boost pine stocking.

Summing together the results for pine and mixed stands—a means for evaluating regeneration of timberland that had supported pine timber—indicates that 46 percent of the harvested acreage had high pine stocking. Forest industry had 57 percent in the high stocking class and nonindustrial private owners had 38 percent. Summing the medium and high classes accounts for 82 and 66 percent of the stands for the two ownerships, respectively. Twenty-seven percent of the harvested pine and mixed stands (4.1 million acres) were in the low stocking class. Sixty-nine percent of this timberland (2.9 million acres) was on nonindustrial private land.

Conversion of hardwood stands growing on pine sites adds to the pine resource base. Thirty-nine percent of the harvested hardwood stands had at least medium pine stocking. Conversion was most intensive on forest industry land.

Inventory Period.—The effects of forces that aren't directly measured by FIA—such as economic cycles—are reflected by the inventory period. State-level inventories provide a “snapshot” of resource conditions that are highly dynamic. For this reason, the results

Table II.—Area of commercially harvested pine and mixed pine-hardwood timberland by past forest type, pine stocking class, and ownership group¹

Past forest type	Pine stocking class	Total private	Ownership group	
			Forest industry ²	Nonindustrial
-----Percent-----				
Pine	High	54	62	48
	Medium	24	23	25
	Low	22	15	27
Mixed pine-hardwood	High	31	47	20
	Medium	32	28	35
	Low	37	25	45
Total	High	46	57	38
	Medium	27	25	28
	Low	27	18	34

¹ Includes clearcuts, seed tree and/or shelterwood cuts, partial cuts, and salvage cuts on pine-site timberland. Pine sites are upland sites on which pine is present or was formerly present.

² Includes land under long-term lease from nonindustrial private owners.

cannot be used to characterize one State as having "better" regeneration success than another.

For example, the Alabama inventory covered the period from 1972 to 1981. This span included two periods of economic turmoil, the second of which, from 1978 to 1981, had an especially adverse effect on forestry. The results for Alabama clearly reflect a negative impact on investment in pine regeneration (McWilliams and Birdsey 1984) (fig. 4). By contrast, Arkansas's inventory spanned the recovery period that took place after the economic slowdown. Inventories show that 82 percent of the harvested pine and mixed stands in Arkansas had at least medium pine stocking, compared to 61 percent for Alabama. However, planting records indicate that reforestation levels have risen sharply for both ownerships since the Alabama inventory was completed. Based on these records, forest planting in Alabama has surpassed all other States of the region. Even though much of the increase is due to the Conservation Reserve Program (CRP) (Cubbage and Gunter 1987), the next inventory in Alabama is expected to show improved pine regeneration success.

DISCUSSION

Any comprehensive statement about pine regeneration is confounded by the diversity of harvest methods, forest types, and management objectives common to southern forestry. Difficult questions arise concerning what timberland is in need of pine regeneration and what constitutes adequate pine stocking.

One extreme viewpoint is that all sites capable of supporting pine should be converted to pure pine forests. Using the high pine stocking class as a measure, results indicate that 41 percent of the harvested pine-site timberland was regenerated (table III). Including stands with medium stocking increases the success rate to 66 percent. This less-stringent criterion may be justifiable in light of some current reports that discuss management of mixed stands as a viable,

low-cost alternative (Phillips and Abercrombie 1987, Cain 1988). Pine regeneration success for forest industry ranged from 53 to 78 percent. The range for nonindustrial private owners was 31 to 57 percent.

Although relative measures of success are preferred because of their flexibility, the overall rate of replacement for pine stands provides additional insight. The replacement rate is computed by dividing the total area with a high stocking of pine by the area of pine stands that was harvested. For both ownerships combined, the rate was 78 percent. The replacement rate was 93 percent for forest industry and 65 percent for nonindustrial private owners.

Assessing trends in pine regeneration success is difficult because there are few studies of past conditions, and comparisons may be inappropriate due to differences in study methods and definitions. Fesco and others (1982) found that 46 percent of the nonindustrial owners that had harvested pine stands also implemented reforestation measures such as planting, seeding, or leaving seed trees. The Fesco study covered the period from 1972 to 1981. Similarly, the results of this study, with an average inventory period from 1975 to 1985, indicated that 48 percent of the harvested pine stands on nonindustrial private land had high pine stocking and an additional 25 percent had medium pine stocking. So, there is strong evidence that the pine regeneration situation is improving.

Planting records provide further evidence to support this finding for both ownerships. Between 1975 and 1985, forest planting increased by 59 percent (fig. 5). Planting increased by 40 percent on forest industry land and by 153 percent on nonindustrial private land. It should be noted that much of the increase in planting on nonindustrial private land in recent years has been conducted as part of the CRP and hasn't contributed directly to reforestation of harvested timberland.

CONCLUSIONS

Current trends in softwood growth and inventory have made pine regeneration a central issue within the southern forestry community. Recent changes in reforestation patterns suggest the importance of monitoring the situation on a continuing basis. Resource analysts and planners need up-to-date information to assess the impact of policies and to predict the future of the pine resource.

Table III.—Area of commercially harvested timberland by pine stocking class and ownership group¹

Pine stocking class	Total private	Ownership group	
		Forest industry ²	Nonindustrial
-----Percent-----			
High	41	53	31
Medium	25	25	26
Low	34	22	43

¹Includes clearcuts, seed tree and/or shelterwood cuts, partial cuts, and salvage cuts on pine-site timberland. Pine sites are up-land sites on which pine is present or was formerly present.

²Includes land under long-term lease from nonindustrial private owners.

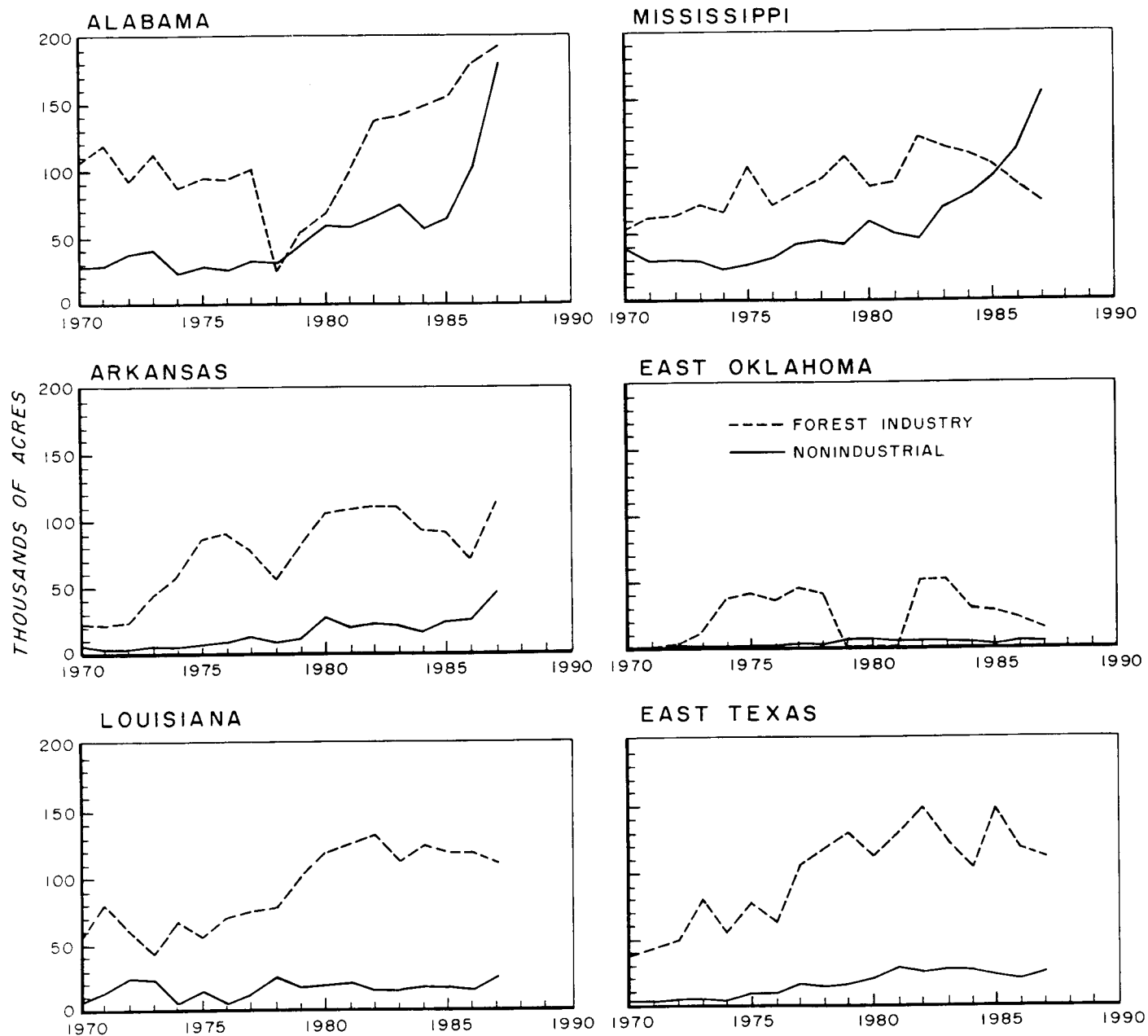


Figure 4.—Area of forest planting by state and ownership group, 1970–1987 (USDA FS 1971–1988).

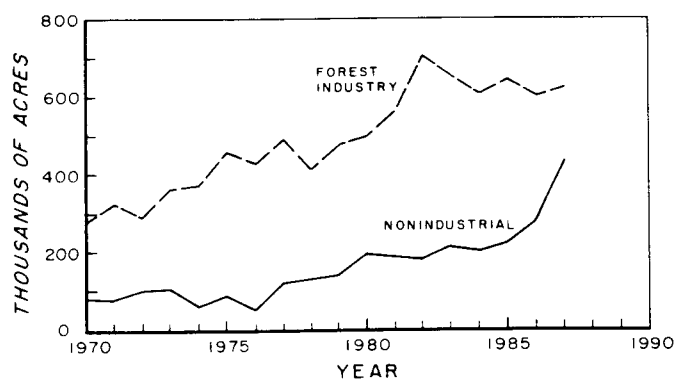


Figure 5.—Area of forest planting in the study region by ownership group, 1970–1987 (USDA FS 1971–1988).

LITERATURE CITED

- Birdsey, Richard A.; van Hees, Willem W.S.; Beltz, Roy C. 1981. Pine regeneration in southwest Arkansas. Res. Pap. SO-165. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 10 p.
- Cain, Michael D. 1988. A low-cost technique for increasing pine volume in mixed pine-hardwood stands. Res. Pap. SO-246. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 9 p.
- Cubbage, Frederick W.; Gunter, John E. 1987. Conservation reserves. *Journal of Forestry*. 85(4):21-27.
- Fesco, R.S.; Kaiser, H.F.; Royer, J.P.; Weidenhamer, M. 1982. Management practices and reforestation decisions for harvested southern pinelands. Staff Report AGES5821230. Washington, D.C.: U.S. Department of Agriculture, Statistical Reporting Service. 74 p.
- Knight, Herbert A. 1987. The pine decline. *Journal of Forestry*. 85(1):25-28.
- McWilliams, William H. 1988a. Status of privately owned harvested timberland in East Oklahoma: 1976-1986. Res. Note SO-340. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 6 p.
- McWilliams, William H. 1988b. Status of privately owned harvested timberland in Mississippi: 1977-1987. Res. Note SO-346. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 6 p.
- McWilliams, William H. 1989. Status of privately owned harvested timberland in Arkansas: 1978-1988. Res. Note SO-353. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 6 p.
- McWilliams, William H.; Birdsey, Richard A. 1984. Alabama survey points to lack of pine regeneration on harvested lands. *Forest Farmer*. 43(10):18.
- McWilliams, William H.; Frey, Paul D. 1986. Status of privately owned harvested timberland in Louisiana: 1974-1984. Res. Note SO-329. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 6 p.
- McWilliams, William H.; Skove, David J. 1987. Status of privately owned harvested timberland in East Texas: 1975-1986. Res. Note SO-338. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 6 p.
- Phillips, Douglas R.; Abercrombie, James A., Jr. 1987. Pine-hardwood mixtures-a new concept in regeneration on harvested lands. *Southern Journal of Applied Forestry*. 11(4):192-197.
- Smith, David Martyn. 1962. The practice of silviculture. Ed. 7. New York: John Wiley & Sons. 578 p.
- USDA, Forest Service. 1971-1988. U.S. forest planting reports. Washington, DC: U.S. Government Printing Office.
- USDA, Forest Service. 1988. The South's fourth forest: alternatives for the future. FRR-24. Springfield, VA: National Technical Information Service. 512 p.

Appendix Tables

Table 1.—Area of commercially harvested pine-type timberland by State, ownership group, and pine stocking class¹

class

State	Ownership group	Total past timberland	Commercially harvested timberland	Pine stocking class		
				High	Medium	Low
----- Thousands of acres -----						
Alabama	Forest industry ²	1,998.0	834.6	450.9	193.6	190.1
	Nonindustrial	5,425.2	1,486.6	460.5	441.4	584.7
	Total	7,423.2	2,321.2	911.4	635.0	774.8
Arkansas	Forest industry	1,828.3	1,201.0	764.2	293.7	143.1
	Nonindustrial	1,592.5	842.0	493.0	203.0	146.0
	Total	3,420.8	2,043.0	1,257.2	496.7	289.1
Louisiana	Forest industry	2,058.7	616.4	362.8	141.0	112.6
	Nonindustrial	2,504.5	496.0	277.8	112.3	105.9
	Total	4,563.2	1,112.4	640.6	253.3	218.5
Mississippi	Forest industry	1,239.4	669.8	422.4	177.9	69.5
	Nonindustrial	2,943.5	1,470.0	730.7	356.7	382.6
	Total	4,182.9	2,139.8	1,153.1	534.6	452.1
East Oklahoma	Forest industry	441.1	260.0	179.1	58.4	22.5
	Nonindustrial	283.7	86.3	62.2	12.0	12.1
	Total	724.8	346.3	241.3	70.5	34.6
East Texas	Forest industry	1,813.1	1,209.8	771.3	257.2	181.3
	Nonindustrial	2,177.9	962.2	543.1	188.7	230.4
	Total	3,991.0	2,172.0	1,314.4	445.9	411.7
All States	Forest industry	9,378.6	4,791.6	2,950.7	1,121.8	719.1
	Nonindustrial	14,927.3	5,343.1	2,567.3	1,314.1	1,461.7
	Total	24,305.9	10,134.7	5,518.0	2,435.9	2,180.8

¹Includes clearcuts, seed tree and/or shelterwood cuts, partial cuts, and salvage cuts on pine-site timberland. Pine sites are upland sites on which pine is present or was formerly present.

²Includes land under long-term lease from nonindustrial private owners.

Table 2.—Area of commercially harvested mixed pine-hardwood timberland by State, ownership group, and pine stocking class¹

State	Ownership group	Total past timberland	Commercially harvested timberland	Pine stocking class		
				High	Medium	Low
----- Thousands of acres -----						
Alabama	Forest industry ²	1,029.8	398.8	166.6	93.6	138.6
	Nonindustrial	3,378.3	785.5	87.8	243.1	454.6
	Total	4,408.1	1,184.3	254.4	336.7	593.2
Arkansas	Forest industry	932.4	483.1	198.1	200.6	84.4
	Nonindustrial	1,370.6	539.2	151.9	211.6	175.7
	Total	2,303.0	1,022.3	350.0	412.2	260.1
Louisiana	Forest industry	638.3	272.2	115.2	77.3	79.7
	Nonindustrial	1,259.3	184.7	46.0	62.7	76.0
	Total	1,897.6	456.9	161.2	140.0	155.7
Mississippi	Forest industry	612.6	319.7	131.6	91.8	96.3
	Nonindustrial	2,166.9	952.6	219.0	310.9	422.7
	Total	2,779.5	1,272.3	350.6	402.7	519.0
East Oklahoma	Forest industry	281.0	132.7	51.8	46.5	34.4
	Nonindustrial	344.5	54.0	23.7	30.3
	Total	625.5	186.7	51.8	70.2	64.7
East Texas	Forest industry	890.9	517.8	324.4	87.0	106.4
	Nonindustrial	1,491.8	564.9	120.7	209.2	235.0
	Total	2,382.7	1,082.7	445.1	296.2	341.4
All States	Forest industry	4,385.0	2,124.3	987.7	596.8	539.8
	Nonindustrial	10,011.4	3,080.9	625.4	1,061.2	1,394.3
	Total	14,396.4	5,205.2	1,613.1	1,658.0	1,934.1

¹Includes clearcuts, seed tree and/or shelterwood cuts, partial cuts, and salvage cuts on pine-site timberland. Pine sites are upland sites on which pine is present or was formerly present.

²Includes land under long-term lease from nonindustrial private owners.

Table 3.—Area of commercially harvested hardwood-type timberland by State, ownership group, and pine stocking class¹

Pine stocking class						
State	Ownership group	Total past timberland	Commercially harvested timberland	Pine stocking class		
				High	Medium	Low
----- Thousands of acres -----						
Alabama	Forest industry ²	819.4	259.3	109.0	29.0	121.3
	Nonindustrial	3,884.1	653.6	86.1	91.7	475.8
	Total	4,703.5	912.9	195.1	120.7	597.1
Arkansas	Forest industry	666.3	330.5	98.5	68.3	163.7
	Nonindustrial	2,268.5	622.5	48.8	129.4	444.3
	Total	2,934.8	953.0	147.3	197.7	608.0
Louisiana	Forest industry	548.4	170.7	77.4	46.1	47.2
	Nonindustrial	1,019.4	157.9	24.1	44.5	89.3
	Total	1,567.8	328.6	101.5	90.6	136.5
Mississippi	Forest industry	501.4	272.1	81.3	78.7	112.1
	Nonindustrial	2,992.4	850.6	108.6	123.7	618.3
	Total	3,493.8	1,122.7	189.9	202.4	730.4
East Oklahoma	Forest industry	203.4	86.4	17.3	35.0	34.1
	Nonindustrial	781.6	64.4	6.6	57.8
	Total	985.0	150.8	17.3	41.6	91.9
East Texas	Forest industry	540.9	355.2	128.4	89.6	137.2
	Nonindustrial	1,473.6	450.3	16.9	111.2	322.2
	Total	2,014.5	805.5	145.3	200.8	459.4
All States	Forest industry	3,279.8	1,474.2	511.9	346.7	615.6
	Nonindustrial	12,419.6	2,799.3	284.5	507.1	2,007.7
	Total	15,699.4	4,273.5	796.4	853.8	2,623.3

¹Includes clearcuts, seed tree and/or shelterwood cuts, partial cuts, and salvage cuts on pine-site timberland. Pine sites are upland sites on which pine is present or was formerly present.

²Includes land under long-term lease from nonindustrial private owners.

Table 4.—Area of commercially harvested timberland by State, ownership group, and pine stocking class¹

State	Ownership group	Total past timberland	Commercially harvested timberland	Pine stocking class		
				High	Medium	Low
----- Thousands of acres -----						
Alabama	Forest industry ²	3,847.2	1,492.7	726.5	316.2	450.0
	Nonindustrial	12,687.6	2,925.7	634.4	776.2	1,515.1
	Total	16,534.8	4,418.4	1,360.9	1,092.4	1,965.1
Arkansas	Forest industry	3,427.0	2,014.6	1,060.8	562.6	391.2
	Nonindustrial	5,231.6	2,003.7	693.7	544.0	766.0
	Total	8,658.6	4,018.3	1,754.5	1,106.6	1,157.2
Louisiana	Forest industry	3,248.5	1,059.3	555.4	264.4	239.5
	Nonindustrial	4,783.2	838.6	347.9	219.5	271.2
	Total	8,031.7	1,897.9	903.3	483.9	510.7
Mississippi	Forest industry	2,353.4	1,261.6	635.3	348.4	277.9
	Nonindustrial	8,102.8	3,273.2	1,058.3	791.3	1,423.6
	Total	10,456.2	4,534.8	1,693.6	1,139.7	1,701.5
East Oklahoma	Forest industry	925.5	479.1	248.2	139.9	91.0
	Nonindustrial	1,409.8	204.7	62.2	42.3	100.2
	Total	2,335.3	683.8	310.4	182.2	191.2
East Texas	Forest industry	3,244.9	2,082.8	1,224.1	433.8	424.9
	Nonindustrial	5,143.3	1,977.4	680.7	509.1	787.6
	Total	8,388.2	4,060.2	1,904.8	942.9	1,212.5
All States	Forest industry	17,043.4	8,390.1	4,450.3	2,065.3	1,874.5
	Nonindustrial	37,358.3	11,223.3	3,477.2	2,882.4	4,863.7
	Total	54,401.7	19,613.4	7,927.5	4,947.7	6,738.2

¹Includes clearcuts, seed tree and/or shelterwood cuts, partial cuts, and salvage cuts on pine-site timberland. Pine sites are upland sites on which pine is present or was formerly present.

²Includes land under long-term lease from nonindustrial private owners.

McWilliams, William, H. 1989. Residual pine stocking after harvest on private timberland: A summary for six southern States. Res. Pap. SO-252. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 12 p.

Commercial harvest activity and residual stocking of pine is examined for privately owned pine-site timberland in Alabama, Arkansas, Louisiana, Mississippi, east Oklahoma, and east Texas. Pine regeneration success is evaluated by preharvest forest type and ownership group.

Keywords: Clearcut, forest industry, future timber supply, nonindustrial private forest landowner, partial cut, pine regeneration.