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Recent Trends in Afforestation and Reforestation of Nonindustrial Private Pine Forests in Alabama

William H. McWilliams

SUMMARY

A shrinking of Alabama's nonindustrial private pine forest prompted an analysis of recent trends in afforestation and regeneration. There has been an 828,100-acre addition to the nonindustrial pine-site timberland base from nonforest land uses. Planting has replaced natural seeding as the major cause of afforestation to pine. The area of nonindustrial pine-site timberland harvested in Alabama increased by 29 percent recently. Across all forest types, 68 percent of the harvest area had at least medium stocking of pine following harvest. There has been a significant improvement in the rate at which sites capable of supporting pine are regenerated with pine. The reforestation rate was estimated at 73 percent, compared with 47 percent 8 years ago.

Cover photo — *Fully stocked loblolly pine stand.*

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INTRODUCTION

Recent inventories of Alabama's forest resources (conducted in 1972, 1982, and 1990) have revealed some disturbing trends in conditions of nonindustrial private pine forests. Over the past 18 years, removals of pine have increased by 72 percent, and pine growth has decreased by 18 percent (McWilliams, in press). The 1990 inventory indicated that removals of pine now exceed growth by 17 percent—a reverse of the situation in 1972 when growth exceeded removals by 80 percent. As a result, pine inventory volume has decreased. This development has caused some analysts to be critical of nonindustrial private owners, particularly in the realm of pine regeneration (USDA FS 1988). The concern over regeneration was sparked by a 15-percent decrease in the area of nonindustrial pine forest between the 1972 and 1982 inventories.

Changes in the area of pine forest are the net effect of several forces, including competition among land uses, forest succession, afforestation, and reforestation. Between 1982 and 1990, the area of pine-type timberland decreased, but only by 2 percent. The slower rate of decrease represents an important landmark in the history of nonindustrial private forestry because it has been associated with a trend toward more intensive management. This publication documents trends in afforestation and reforestation that have taken place over the past two decades.

METHODS

Most of the data used for analyzing afforestation and reforestation were obtained as part of the successive forest inventory process carried out by the USDA Forest Service, Southern Forest Experiment Station, Forest Inventory and Analysis unit (SO-FIA). Supplemental information on forest planting (USDA FS 1956–91) and Conservation Reserve Program (CRP) contract acreage were obtained from USDA Forest Service, Cooperative Forestry[1].

The SO-FIA conducts inventories in Alabama (fig. 1) and other Midsouth States. The SO-FIA uses a two-phase sample of temporary aerial photo points and a systematic grid of permanent ground plots. The area of forested land is determined by photointerpretation of temporary points and field checks of permanent plots. Field measurements are conducted on a portion of the permanent plots located on a 3-mile grid. A wide array of tree-level and plot-level measurements are collected at all measurement plots that were forested either at the time of the previous inventory or at the time of the current inventory. Information for each measurement plot is expanded using factors developed as part of the forest area determination. More detailed coverage of SO-FIA procedures is provided elsewhere (Kelly, in press; McWilliams, in press; USDA FS 1990). An important component of the SO-FIA inventories is the collection of data on harvesting and regeneration that began during the 1982 inventory of Alabama (see McWilliams 1990 for more information). Completion of the 1990 inventory has provided the first opportunity to examine trends in the status of pine regeneration.

A subsample of the SO-FIA plots measured in 1982 and 1990 was used to analyze the status of pine regeneration following commercial harvest. The subsample consisted of plots located on nonindustrial timberland that were commercially harvested since the last inventory. Broad ownership category (farmer, corporate, or miscellaneous individual) was determined from county tax assessors and contact with owners. Plots on timberland leased to forest industry were included. Harvesting was classified by field

[1]Moulton, Robert J. 1991. Unpublished data on Conservation Reserve Program contract acreage. On file with USDA Forest Service, Cooperative Forestry, Washington, DC.

William H. McWilliams is a research forester at the Forestry Sciences Laboratory, U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, Starkville, MS 39759.

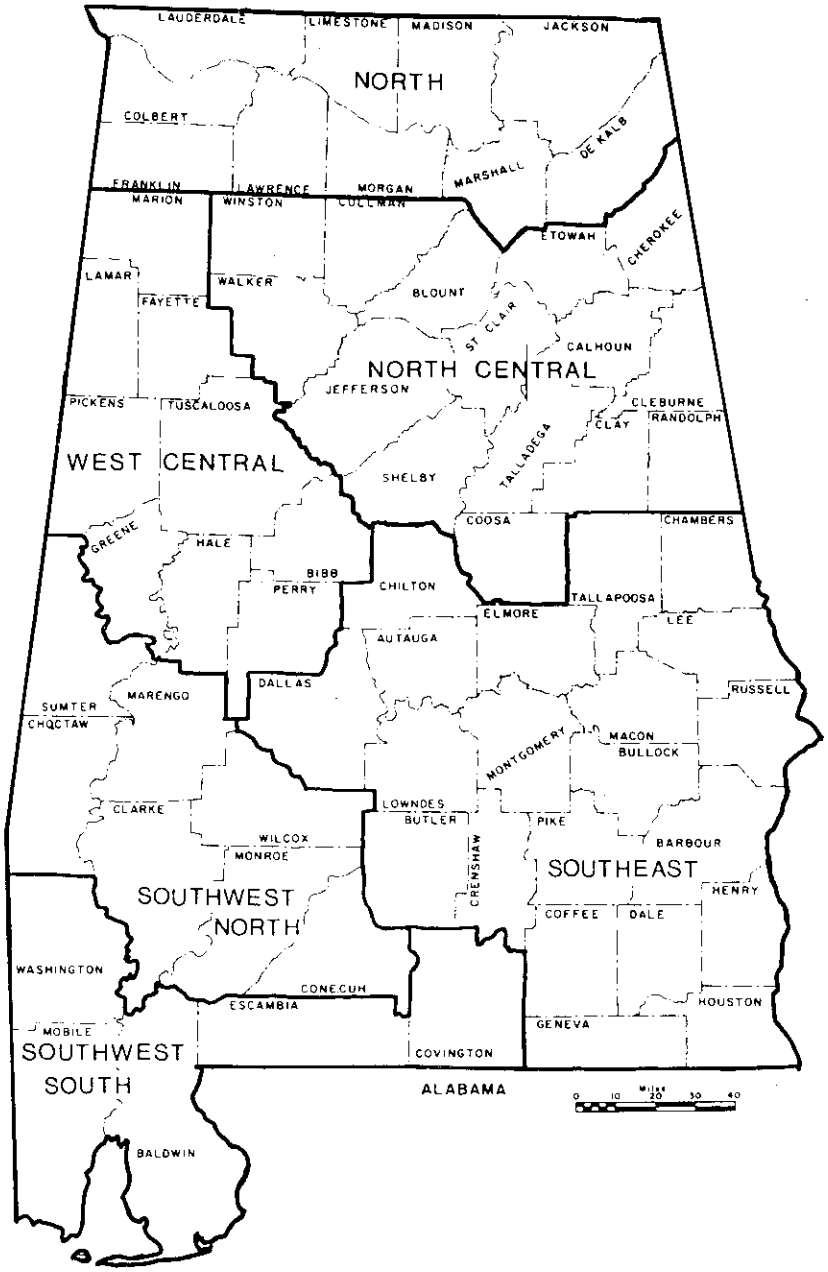

Figure 1. — *Forest inventory regions of Alabama.*

foresters using existing plot conditions and personal judgment to distinguish between commercial harvest and other management activities, such as thinning or stand improvement cutting. Commercial harvesting was grouped into two classes: clearcut and partial cut. Partial cuts include pine selection cuts, diameter limit cuts, highgrading, or any other practice that removes the most marketable trees, leaving a residual stand containing merchantable trees. For convenience, seed tree cuts, shelterwood cuts, and salvage cuts were included in the partial cut category.

Residual pine stocking was assessed by comparing the existing stocking of pine trees with the area occupancy standard used by SO-FIA. The SO-FIA standard represents "normal" or "full" stocking for southern forests and is expressed as number of trees or basal area by diameter class. For example, in a stand composed entirely of seedlings, the minimum for full stocking is 600 stems per acre. For stands with a mixture of tree sizes, the comparison is made by weighting trees according to the inverse relationship between size and number of trees per acre (May 1990).

Residual pine stocking encompasses trees of the newly regenerated stand, either planted or seeded, as well as any trees left from the previous stand. Trees with little or no management potential are excluded. As such, residual pine stocking measures the degree to which the site is occupied by a "manageable" stand of pine. Stocking is grouped into three classes:

Low—less than 30 percent stocked with pine.
Medium—from 30 to 59 percent stocked with pine.
High—at least 60 percent stocked with pine.

The purpose of this grouping is to provide an indication of probable future forest type. Although this is a very useful measure of pine regeneration, it should be noted that there is no absolute measure of success or failure because management objectives vary by owner and forest type.

So that the analysis of pine regeneration could focus on timberland suitable for growing pine, the subsample was limited to well-drained upland sites with a proven ability to support pine—termed "pine-site timberland," which is different from "pine forest types." The SO-FIA classifies forest type based on the relative stocking of dominant and/or codominant pine and hardwood trees. Pine forest types are defined as stands in which 50 percent or more of the stocking consists of pine species. Mixed pine-hardwood stands (synonymous with "oak-pine" used in some reports) are dominated by hardwoods but are at least 25 percent stocked with pine. Pine, mixed pine-hardwood, and hardwood forest types are all common on pine-site timberland. When forest type is discussed in conjunction with harvesting, forest type prior to harvest is used because of rapid changes in vegetative dominance that occur in early stand development.

RESULTS

Afforestation

Afforestation of agricultural and other nonforest land is an important source of new pine forests. For the most recent inventory period, the total area added to nonindustrial private pine-site timberland in Alabama was 828,100 acres, a 14-percent increase from the previous period (table 1). The increase was due to expansion in the acreage of pine forest types. Of the new pine forest, 9 out of 10 acres were previously agricultural land.

The most notable trend in afforestation has been the shift from natural seeding of abandoned farmland to planting of marginal cropland and other agricultural land. Artificial regeneration has now replaced natural regeneration as the major source of pine stands that are added to the nonindustrial timberland base (fig. 2). The area of new pine stands established artificially nearly tripled between the two inventory periods and now accounts for about three-fourths of the additions to pine forest. The area of pine stands added by natural means decreased by 38 percent.

Information on forest planting and CRP contract acreage puts recent afforestation trends into perspective. Increased forest planting over the past decade is unprecedented in the history of nonindustrial forestry in Alabama (fig. 3, table 2). The previous peak in planting (156,200 acres) was surpassed in 1987 when 179,400 acres were planted. The previous high was accomplished during the Federal Soil Bank Program of the late 1950's and early 1960's. A new record was established in 1988 when 213,200 acres were planted.

Table 1.—*Additions to pine-site timberland from nonforest land uses by forest type and stand origin, nonindustrial private owners, Alabama, 1972-81 and 1982-89*

Forest type	1972–81			1982–89		
	Total	Artificial	Natural	Total	Artificial	Natural
	*Thousand acres**					
Pine	393.9	152.2	241.7	578.2	427.9	150.2
Mixed pine-hardwood	107.4	17.9	89.5	100.2	22.8	77.4
Hardwood	223.8	17.9	205.9	150.2	4.6	145.7
Total	725.1	188.0	537.1	828.5	455.2	373.3

*Rows and columns may not sum to totals because of rounding.

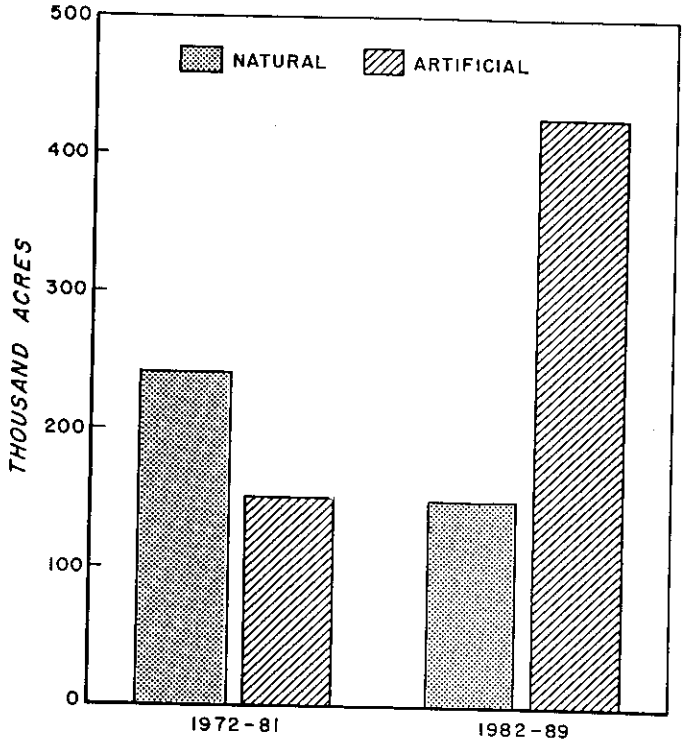

Figure 2. — *Additions to nonindustrial-private pine forest types on pine-site timberland from nonforest land uses by stand origin, Alabama, 1972–81 and 1982–89.*

Table 2.—*Area of forest planting and Conservation Reserve Program contracts, nonindustrial private owners, Alabama, 1955–90*

Year	Area	Year	Area
	Thousand acres		*Thousand acres*
Forest planting*			
1955	19.4	1976	25.8
1956	25.9	1977	32.9
1957	48.9	1978	31.2
1958	85.2	1979	46.0
1959	156.2	1980	59.8
1960	125.7	1981	59.2
1961	71.5	1982	65.8
1962	41.5	1983	75.0
1963	29.3	1984	57.2
1964	26.6	1985	65.2
1965	22.3	1986	101.9
1966	29.1	1987	179.4
1967	40.9	1988	213.2
1968	44.2	1989	142.7
1969	26.4	1990	98.0
1970	27.7		
1971	29.2		
1972	37.8		
1973	40.8		
1974	23.7		
1975	29.0		
Conservation Reserve Program contracts†			
1986	83.1		
1987	97.7		
1988	63.9		
1989	20.0		
1990	13.8		

*Source: USDA FS 1956–91.

†Source: Moulton, Robert J. 1991. Unpublished data on Conservation Reserve Program contract acreage. On file with USDA Forest Service, Cooperative Forestry, Washington, DC.

The CRP provided a major impetus for the surge in planting, but was not the only factor. In the years since the CRP began, contract acreage was 38 percent of total forest planting. More important, CRP contract acreage represented two-thirds of the area added to pine-site timberland by artificial means. The most significant factor in the overall increase in planting has been reforestation.

Reforestation

Harvesting.—The current inventory of Alabama indicates that commercial harvest activity was carried out on 4.1 million acres, or 31 percent of the nonindustrial pine-site timberland, during the period since the 1982 inventory. This figure is a 29-percent increase over the previous period (fig. 4, table 3). Demand for pine timber has increased, and nonindustrial private owners are satisfying a higher proportion than in the past. The shift has occurred as the forest industry has begun to reach an equilibrium in the area harvested on its own land. The largest increase in harvested area took place on timberland owned by miscellaneous individuals.

Sixty-three percent of the harvest area was cut using partial cutting, the predominant harvest method of nonindustrial private owners. This contrasts with forest industry, which used clearcuts two-thirds of the time. Partial cutting was very common on timberland owned by farmers and miscellaneous individuals and less common on corporate timberland (fig. 5).

The heavy use of partial cuts by nonindustrial private owners is common across the South and reflects a preference for low-cost silvicultural systems with a strong reliance on natural regeneration. In many cases, stands are essentially clearcut for a particular product, such as sawlogs or all available pine fiber. Nonproduct trees are often left standing, thus avoiding the expense of removal and site preparation that would be incurred under more intensive systems. The residual trees cause stands to be classified as partial cut, but such stands are often treated like clearcut stands. With an adequate seed supply, ample moisture, and freedom from competing vegetation, the

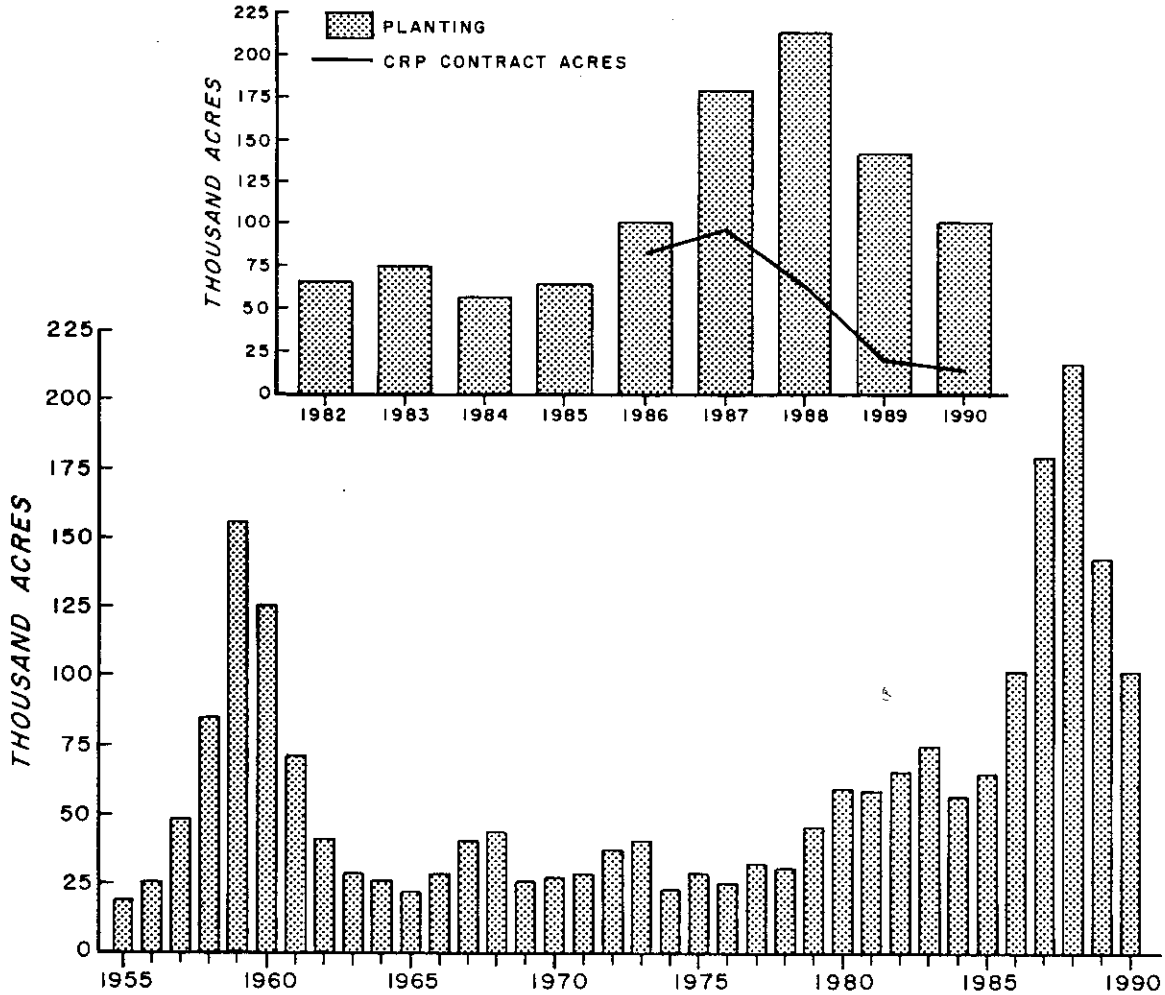

Figure 3. —*Area of forest planting and Conservation Reserve Program contract acres for nonindustrial private owners, Alabama, 1955–90.*

chances for the development of adequate pine stocking are good. If understory and midstory hardwoods are left intact, succession to a hardwood forest type is probable (Langdon 1981). Increased demand for hardwoods in the last 5 years has offered a new opportunity for nonindustrial owners to reduce hardwood stocking in stands with a substantial hardwood component. Also, as planting records demonstrate, planting of pine is emerging as a tool for supplementing natural management on sites where it is economically feasible.

Residual Pine Stocking.—Regeneration success can be assessed by evaluating residual pine stocking in harvested stands. Conclusions regarding the status of pine regeneration depend on which forest types are included and what level of pine stocking is considered to be adequate. The assessment will vary depending on one's viewpoint. For example, is it necessary to regenerate all mixed pine-hardwood and hardwood stands with pine? Or is regeneration of a pine stand as a mixed pine-hardwood stand acceptable? This assessment addresses a range of viewpoints. For simplicity, the entire block of harvested timberland is used in the analysis, and a range of preharvest forest types and pine stocking class combinations is discussed. All the details of residual pine stocking by ownership, preharvest forest type, and method of harvest are contained in tables 4 through 6 for readers interested in answers to more specific resource questions.

For all forest types combined, 30 percent of the harvested pine-site timberland in Alabama had a high stocking of pine following harvest (fig. 6). In the absence of negative forces, such as fusiform rust or drought, most stands with a high stocking of pine will develop into pure pine stands. An additional 26 percent had medium pine stocking, which may be con-

Table 3.—*Area of commercially harvested timberland by ownership, preharvest forest type, and method of harvest, nonindustrial private owners, Alabama, 1972–81 and 1982–89*

Ownership and preharvest forest type	Total past timberland	1972–81 Total	1972–81 Clearcut	1972–81 Partial cut	Total past timberland	1982–89 Total	1982–89 Clearcut	1982–89 Partial cut
	*Thousand acres**							
Farmer								
Pine	2,048.6	476.1	190.5	285.6	1,477.4	419.8	159.0	260.8
Mixed pine-hardwood	1,400.0	277.2	121.9	155.3	1,089.1	287.4	79.6	207.8
Hardwood	1,833.9	258.0	124.8	133.2	2,006.6	540.2	191.1	349.1
Total	5,282.4	1,011.3	437.2	574.1	4,573.1	1,247.4	429.7	817.7
Corporate								
Pine	683.2	232.2	150.2	82.1	681.0	268.1	146.9	121.1
Mixed pine-hardwood	431.1	114.0	57.6	56.5	372.6	118.8	58.1	60.7
Hardwood	324.1	78.7	72.9	5.8	550.5	87.5	50.7	36.8
Total	1,438.4	425.0	280.6	144.4	1,610.5	474.4	255.7	218.7
Individual								
Pine	2,798.7	913.1	398.7	514.4	2,614.9	977.9	335.2	642.7
Mixed pine-hardwood	1,642.0	464.9	199.2	265.6	1,624.6	672.5	231.3	441.1
Hardwood	1,799.5	335.4	222.8	112.6	2,742.6	700.3	252.7	447.6
Total	6,240.2	1,713.4	820.7	892.6	6,982.2	2,350.6	819.2	1,531.4
Nonindustrial private								
Pine	5,530.5	1,621.4	739.4	882.1	4,773.4	1,665.8	641.1	1,024.7
Mixed pine-hardwood	3,473.1	856.1	378.7	477.4	3,086.3	1,078.6	369.1	709.6
Hardwood	3,957.4	672.2	420.5	251.7	5,299.8	1,328.0	494.5	833.5
Total	12,961.1	3,149.7	1,538.5	1,611.2	13,159.4	4,072.3	1,504.6	2,567.7

*Rows and columns may not sum to totals because of rounding. Timberland that was harvested and changed to a nonforest land use is excluded. Timberland under lease to forest industry is included.

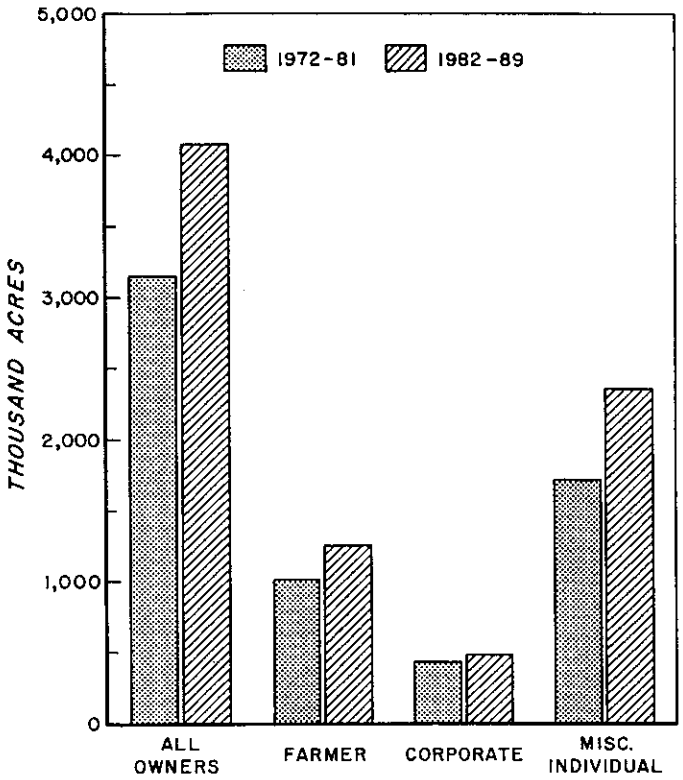

Figure 4. —*Area of commercially harvested nonindustrial-private timberland by ownership and inventory period, Alabama, 1972–81 and 1982–89.*

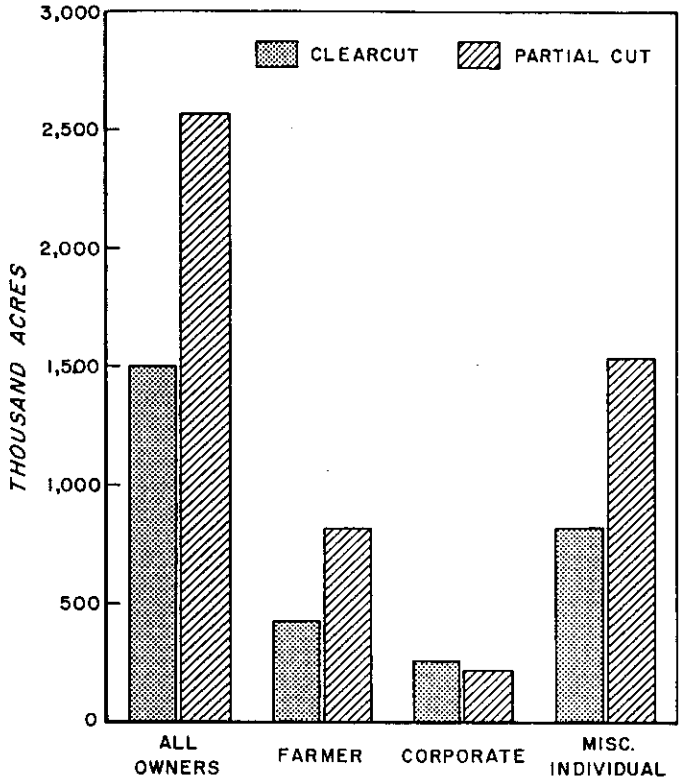

Figure 5. —*Area of commercially harvested nonindustrial-private timberland by ownership and method of harvest, Alabama, 1982–89.*

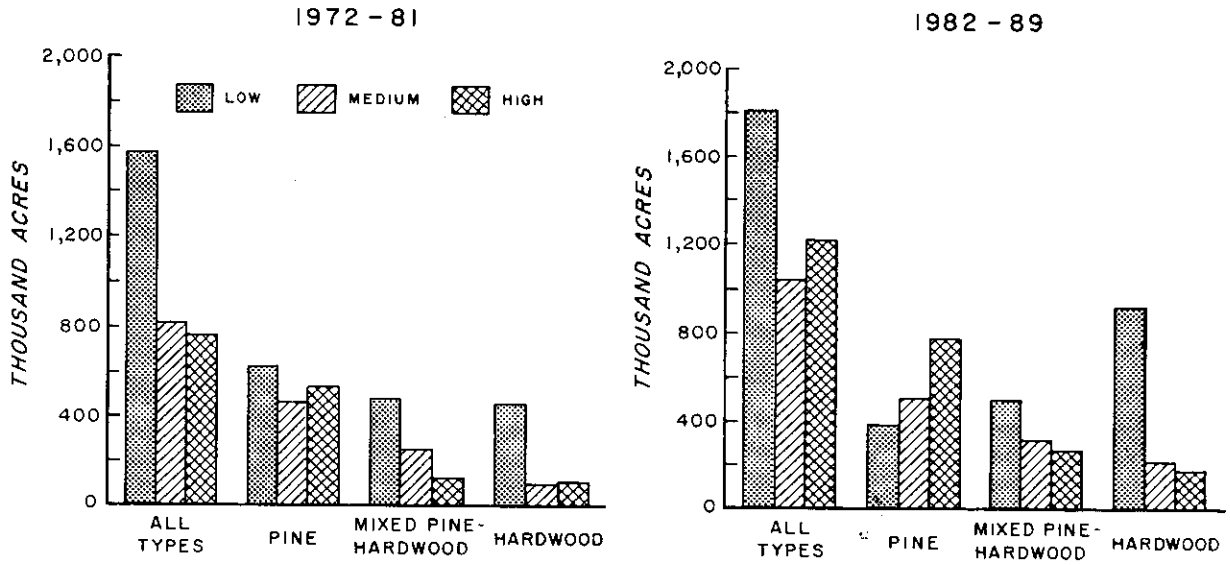

Figure 6. — *Area of commercially harvested nonindustrial-private timberland by preharvest forest type and pine stocking class, Alabama, 1972–81 and 1982–89.*

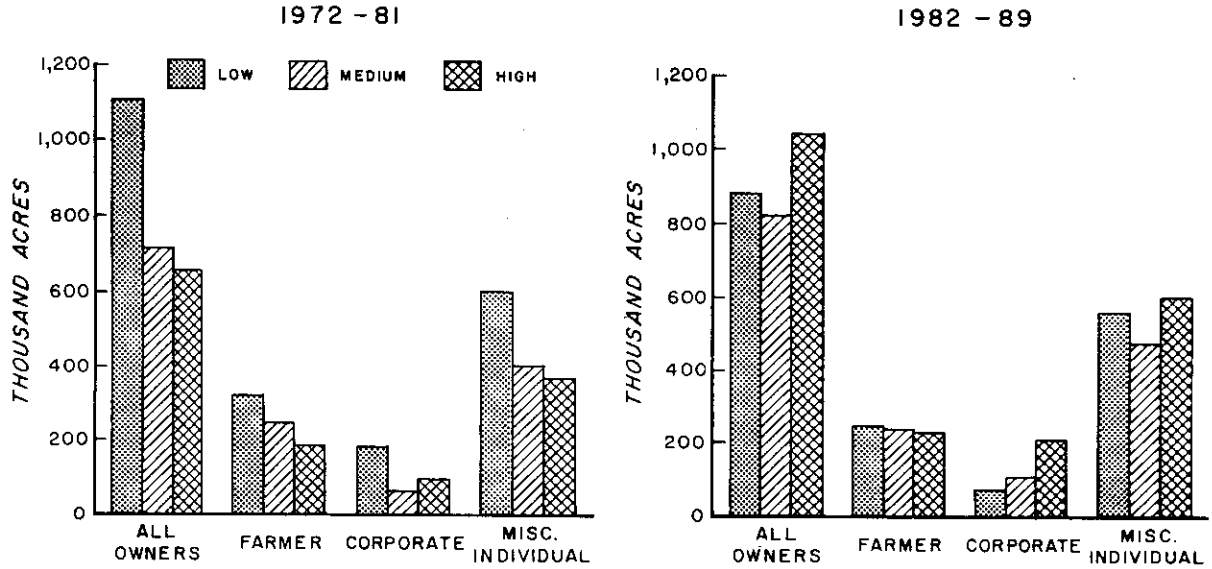

Figure 7. — *Area of commercially harvested nonindustrial-private pine and mixed pine-hardwood timberland by ownership and pine stocking class, Alabama, 1972–81 and 1982–89.*

Table 4.—*Area of commercially harvested pine-site timberland by ownership, preharvest forest type, and pine stocking class, nonindustrial private owners, Alabama, 1972–81 and 1982–89*

Ownership and preharvest forest type	1972–81				1982–89			
		Pine stocking class				Pine stocking class		
	Total	Low	Medium	High	Total	Low	Medium	High
	*Thousand acres**							
Farmer								
Pine	476.1	172.1	159.3	144.6	419.8	101.5	146.2	172.1
Mixed pine-hardwood	277.2	149.4	86.6	41.2	287.4	141.1	90.1	56.2
Hardwood	258.0	203.2	32.6	22.3	540.2	396.4	93.6	50.1
Total	1,011.3	524.7	278.4	208.2	1,247.4	639.0	329.9	278.4
Corporate								
Pine	232.3	115.4	40.9	76.1	268.1	33.6	72.8	161.8
Mixed pine-hardwood	114.0	69.1	22.3	22.6	118.1	39.9	32.7	46.2
Hardwood	78.7	33.6	11.4	33.6	87.5	55.0	16.5	16.0
Total	425.0	218.1	74.6	132.4	474.4	128.4	122.0	224.0
Individual								
Pine	913.1	340.2	262.4	310.6	977.9	249.7	286.3	441.8
Mixed pine-hardwood	464.9	263.8	141.8	59.2	672.5	315.3	193.1	164.1
Hardwood	335.4	224.2	58.8	52.3	700.3	479.8	108.1	112.4
Total	1,713.4	828.3	463.0	422.1	2,350.6	1,044.9	587.5	718.2
Nonindustrial private								
Pine	1,621.4	627.7	462.5	531.2	1,665.8	384.8	505.3	775.7
Mixed pine-hardwood	856.1	482.3	250.7	123.1	1,078.6	496.2	315.9	266.5
Hardwood	672.2	461.2	102.8	108.2	1,328.0	931.2	218.2	178.5
Total	3,149.7	1,571.1	816.0	762.6	4,072.3	1,812.3	1,039.4	1,220.7

*Rows and columns may not sum to totals because of rounding. Timberland that was harvested and changed to a nonforest land use is excluded. Timberland under lease to forest industry is included.

sidered adequate in some cases. Some of the medium-stocked stands will develop into pure pine stands and others will contain a mixture of pine and hardwoods. Without further treatments to boost pine stocking, the timberland with low pine stocking will probably evolve into stands dominated by hardwood.

When all forest types are considered, combining timberland with high and medium stocking of pine makes it possible to appraise the area of harvested timberland that should contain a significant component of pine. The percentage of timberland harvested with at least medium stocking went from 50 to 56 percent between the two inventory periods.

Another approach is to examine pine and mixed pine-hardwood stands because they supported a significant component of pine prior to harvest. The most recent inventory shows that 38 percent of such stands had high pine stocking and 30 percent had medium stocking (fig. 7). This finding compares with 26 and 29 percent, respectively, for these two classes in the previous inventory. The biggest improvements occurred on land owned by corporations and miscellaneous individuals.

As would be expected, regeneration was most successful following harvest of pure pine stands. Forty-seven percent of the harvested pine stands had a high stocking of pine following harvest (fig. 8). At first, this figure may seem low, but it must be remembered that other forest types also provide a source of new pine stands. For example, 30 percent of the hardwood stands harvested in the most recent inventory had at least medium pine stocking. Also, there has been significant improvement, as only 33 percent of the harvested pine stands had high stocking in the previous inventory. On a percentage basis, corporate-owned land showed the most dramatic improvement.

Pine Reforestation Rate.—As just illustrated, comprehensive statements about regeneration are confounded by the number of variables involved and the difficulty of making concise assumptions regarding appropriate management objectives for nonindustrial private owners. Examining a range of pine stocking levels for the various forest types that were harvested is preferred for its flexibility; however, some measure of overall success is needed. The pine reforestation rate provides such a measure, as it captures not only

Table 5.—*Area of clearcut pine-site timberland by ownership, preharvest forest type, and pine stocking class, nonindustrial private owners, Alabama, 1972–81 and 1982–89*

Ownership and preharvest forest type	1972–81				1982–89			
	Total	Pine stocking class			Total	Pine stocking class		
		Low	Medium	High		Low	Medium	High
	*Thousand acres**							
Farmer								
Pine	190.5	109.0	35.1	46.4	159.0	67.8	30.2	60.9
Mixed pine-hardwood	121.9	68.6	24.0	29.3	79.6	35.3	17.4	26.9
Hardwood	124.8	92.3	10.2	22.3	191.1	116.7	35.0	39.4
Total	437.2	269.9	69.3	98.0	429.7	219.8	82.6	127.3
Corporate								
Pine	150.2	80.3	17.2	52.6	146.9	28.1	33.1	85.8
Mixed pine-hardwood	57.6	28.9	6.0	22.6	58.1	17.0	11.6	29.5
Hardwood	72.9	27.8	11.4	33.6	50.7	28.2	11.3	11.2
Total	280.6	137.0	34.7	108.9	255.7	73.3	56.0	126.4
Individual								
Pine	398.7	164.1	69.1	165.5	335.2	107.1	68.9	159.2
Mixed pine-hardwood	199.2	129.6	41.0	28.7	231.3	91.9	49.8	89.6
Hardwood	22.8	123.6	46.8	52.3	252.7	116.6	46.4	89.7
Total	820.7	417.3	157.0	246.6	819.2	315.6	165.1	338.5
Nonindustrial private								
Pine	739.4	353.4	121.5	264.4	641.1	203.0	132.2	305.9
Mixed pine-hardwood	378.7	227.1	71.0	80.6	369.1	144.2	78.8	146.0
Hardwood	420.5	243.7	68.5	108.2	494.5	261.5	92.7	140.2
Total	1,538.5	824.2	261.0	453.3	1,504.6	608.7	303.7	592.2

*Rows and columns may not sum to totals because of rounding. Timberland that was harvested and changed to a nonforest land use is excluded. Timberland under lease to forest industry is included.

the success of regenerating pine stands, but also the conversion of mixed pine-hardwood and hardwood stands. The reforestation rate is defined as the total area of harvested pine stands divided by the area of harvested pine-site timberland that exhibits a high stocking of pine. The results indicate remarkable improvement in the regeneration of pine forests (fig. 9). At the time of the previous inventory, the reforestation rate was 47 percent. The reforestation rate increased to 73 percent over the most recent inventory period. By owner, the current rates are 66 percent for farmers, 84 percent for corporations, and 73 percent for miscellaneous individuals.

DISCUSSION

Although the rate of pine forest loss has slowed considerably, concern remains over the loss of 1.0 million acres of nonindustrial private pine forest in Alabama between 1972 and 1990. The 1990 inventory revealed two positive trends that suggest improvement is possible: (1) increased additions to pine forest from other land uses and (2) improvement in pine regeneration. The former was heavily affected by afforestation efforts of the CRP. The latter suggests that nonindustrial owners are improving their forest management practices and is very important because it took place along with an increase in harvest area. The overall increase in planting provides further evidence of management intensification. The Forestry Incentives Program of 1974 and Federal, State, and industry stewardship programs have all played important roles.

Given the limited investment capital available to many nonindustrial private owners, it is important to consider new research on alternatives to highly intensive management practices. This point is especially significant in light of findings that natural regeneration has the potential to yield a higher internal rate of return on investment than planting, 10.8 percent versus 10.1 percent (Dangerfield and Edwards 1991). Current research covering low-cost regeneration techniques for pine-site timberland offers promise (Edwards and Dangerfield 1990), as do inexpensive management treatments for rapid recovery of understocked pine stands (Baker 1989). Drastic improvement in natural regeneration of pine has been achieved simply by timing harvest to coincide with the dormant season (McMinn and Nutter 1988). Other re-

Table 6.—*Area of partial cut pine-site timberland by ownership, preharvest forest type, and pine stocking class, nonindustrial private owners, Alabama, 1972–81 and 1982–89*

Ownership and preharvest forest type	1972–81				1982–89			
		Pine stocking class				Pine stocking class		
	Total	Low	Medium	High	Total	Low	Medium	High
	*Thousand acres**							
Farmer								
Pine	285.6	63.2	124.2	98.3	260.8	33.7	115.9	111.2
Mixed pine-hardwood	155.3	80.8	62.6	11.9	207.8	105.8	72.7	29.3
Hardwood	133.2	110.9	22.3	...	249.1	279.7	58.6	10.7
Total	574.1	254.8	209.1	110.2	817.7	419.2	247.3	151.2
Corporate								
Pine	82.1	35.0	23.6	23.4	121.2	5.5	39.7	76.0
Mixed pine-hardwood	56.5	40.2	16.2	...	60.7	22.9	21.1	16.7
Hardwood	5.8	5.8	...	...	36.8	26.7	5.2	4.9
Total	144.3	81.1	39.9	23.4	218.7	55.1	66.0	97.6
Individual								
Pine	514.4	176.0	193.2	145.1	642.7	142.6	217.4	282.6
Mixed pine-hardwood	265.6	134.2	100.8	30.6	441.1	223.4	143.3	74.4
Hardwood	112.6	100.7	11.9	...	447.6	363.2	61.6	22.7
Total	892.6	411.0	306.0	175.6	1,531.4	729.2	422.4	379.8
Nonindustrial private								
Pine	882.1	274.2	341.0	266.8	1,024.7	181.8	373.1	469.8
Mixed pine-hardwood	477.4	255.2	179.7	42.5	709.6	352.0	237.1	120.4
Hardwood	251.7	217.5	34.2	...	833.5	669.7	125.5	38.2
Total	1,611.2	746.9	555.0	309.3	2,567.7	1,203.5	735.7	628.5

*Rows and columns may not sum to totals because of rounding. Timberland that was harvested and changed to a nonforest land use is excluded. Timberland under lease to forest industry is included.

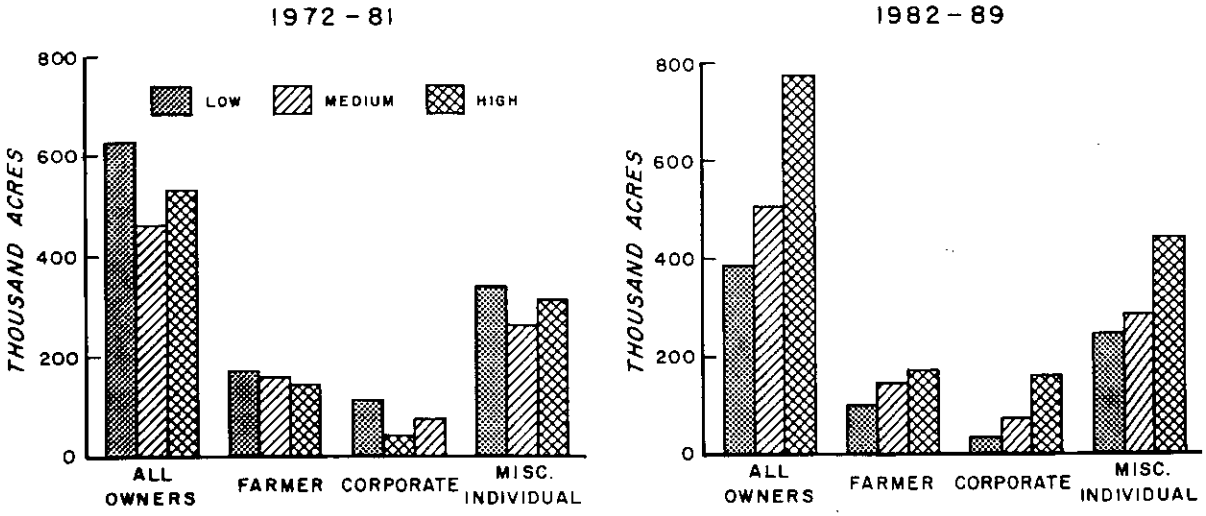

Figure 8. —*Area of commercially harvested nonindustrial-private pine-type timberland by ownership and pine stocking class, Alabama, 1972–81 and 1982–89.*

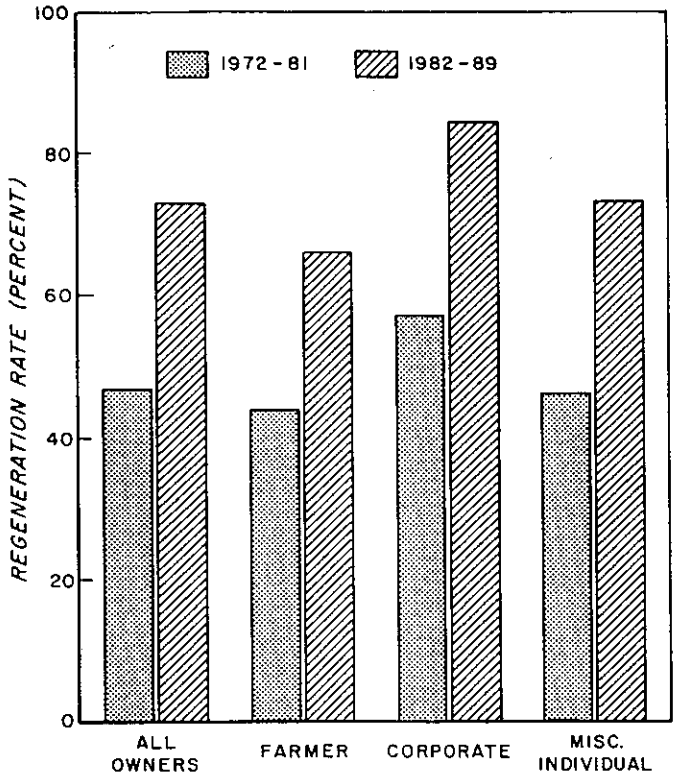

Figure 9. — *Pine reforestation rate on commercially harvested nonindustrial-private pine-site timberland by ownership, Alabama, 1972–81 and 1982–89.*

search has shown that mixed-stand management is a viable alternative for stands with a substantial hardwood component (Cain 1988, Phillips and Abercrombie 1987). The recent expansion of demand for hardwood fiber can make this approach profitable in some instances.

Alabama's forests are very dynamic. Factors that affect afforestation and reforestation vary considerably over time. Therefore, on-the-ground assessment should become a standard component of the forest inventory process. Such assessments can help decision-makers to formulate sound policies and research analysts to predict the character of future timber supplies.

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Recent trends in two factors underlie changes in the area of nonindustrial private pine forest in Alabama — afforestation and reforestation — are presented and discussed in this report. While the area of nonindustrial pine forest continues to decrease, it is decreasing at a slower rate than in the past.

Keywords: Conservation Reserve Program, forest stewardship, loblolly-shortleaf, planted pine, regeneration, timber supply.

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