

ARKANSAS FORESTS, 1988–1996: HIGHLIGHTS OF THE TIMBERLAND RESOURCE FROM THE SEVENTH FOREST SURVEY OF ARKANSAS

James F. Rosson, Jr.¹

Abstract—Highlights of the seventh forest survey of Arkansas are presented. Key elements important in assessing the sustainability of the forest resource are discussed. These include forest area, volume, growth, removals, and status of softwood plantations. Forest area and volumes appear stable or increasing or both. However, the amount of harvested acreage is high, and prompt and adequate stand regeneration after harvest will become more important in helping to meet the sustainability goals of the State.

INTRODUCTION

The highlights of the seventh forest survey of Arkansas are presented in this paper. There are numerous publications already released about this survey—four forest survey unit reports (Rosson and others 1995, 1997; Rosson and London 1997a, 1997b) and a county statistical report (London 1997). A comprehensive State analytical report is in preparation. Timber issues will be dealt with primarily in this paper; various aspects of the forest resource situation in Arkansas will be addressed by other papers in these proceedings.

The survey is dated 1995. Even though plots were measured between June 1994 and October 1996, the majority of plots were measured in 1995. A total of 3,198 forested sample plots had measurements recorded. On these plots, 70,044 trees ≥ 5.0 in. in d.b.h. were tallied and measured. Additionally, 41,353 trees ≥ 1.0 but < 5.0 in. in d.b.h. and 9,114 trees < 1.0 in. in d.b.h. were recorded and measured. Trend analyses, unless otherwise noted, are made between the 1988 and the 1995 forest surveys.

The survey is administered by the U.S. Department of Agriculture, Forest Service, Southern Research Station, headquartered in Asheville, North Carolina. The McSweeney-McNary Act of 1928 directs the Forest Service to conduct periodic assessments of the Nation's forest resources. Recent legislation has expanded the mission of the forest survey: (1) the Forest and Rangeland Renewable Resources Planning Act of 1974; (2) the National Forest Management Act of 1976; and (3) the Forest and Rangeland Renewable Resources Research Act of 1978.

FINDINGS

Timberland Area

Timberland area increased 1,147,500 ac (16.7 percent) since the 1988 survey to 18,392,300 ac. However, this is still below the 19,341,800 ac reported in 1951, the first year the entire State of Arkansas was surveyed. A total of 1,750,900 ac reverted from a nonforest use to timberland,

and 603,500 ac diverted from timberland to a nonforest use, resulting in the net increase of 1,147,500 ac of timber for the survey period. Increases in timberland area are the ongoing trend in other Mid-South States as well.

It is interesting to consider larger perspectives of scale when conducting such large-scale State surveys. Currently in the World, there are 8,505,936,000 ac of forest land (fig. 1). The largest plurality of this area is in the Americas. Seven countries account for 62 percent of forest land on the Earth. The United States ranks fourth at 517,847,788 ac (table 1). In the United States, Arkansas ranks fifth in the area of timberland (table 2). On the large-scale perspective, Arkansas contains < 0.3 percent of worldwide forest land and slightly < 4.0 percent of the 490,000,000 ac of timberland in the United States.

Most of the timberland in Arkansas is held by nonindustrial private forest (NIPF) landowners. Currently, they hold

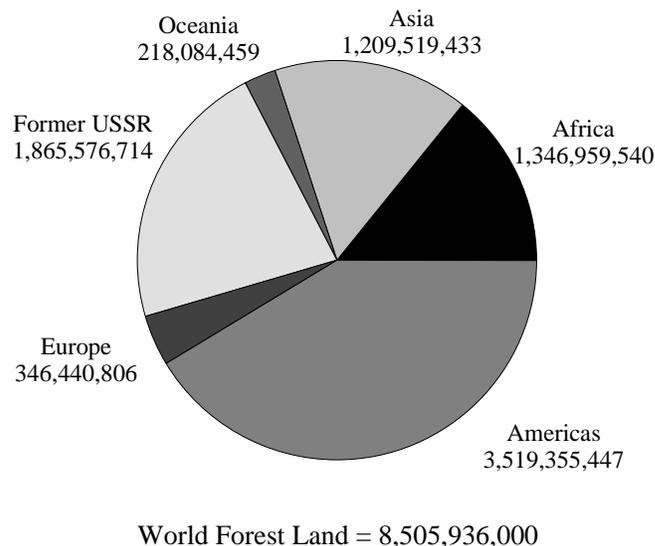


Figure 1—World forest land in acres (World Resources Institute 1994).

¹ Research Forester, USDA Forest Service, Southern Research Station, Starkville, MS.

10,599,200 ac (58 percent) of timberland. Forest industry owns 4,497,400 ac (24 percent) and 3,295,700 ac (18 percent) is in the public domain.

The predominant forest-type group in Arkansas is the oak-hickory type (7,127,400 ac). This type decreased by 142,000 ac (2 percent) since 1988. Other minor shifts occurred in the oak-pine and bottomland hardwood forest-type groups (fig. 2). The greatest shift occurred in the loblolly-shortleaf forest-type group. Area increased by 885,000 ac, a 21-percent increase.

Since the 1988 survey, Arkansas' forests have matured as noted by the increase in acreage of poletimber and sawtimber stands whereas the proportion of sapling/

seedling-sized stands has decreased (fig. 3). Currently, 8,538,700 ac (46 percent) of timberland in the State are in sawtimber-sized stands. Such shifts to stands with larger trees are important for three reasons: (1) incremental growth is at an optimum in the later years of stand rotation; (2) the quality of the hardwood resource increases with size, e.g., larger diameters are a major component of the better hardwood tree grades; and (3) it may represent an increasing lack of desire by a segment of owners to manage for higher quality timber products.

Volume

Total live-tree volume for Arkansas is 23,784 million ft³ and 76,961 million board feet (International 1/4-inch rule). This

Table 1—Ranking of the top 7 countries by forest land area^a

Rank	Country	Area <i>Acres^b</i>
1	USSR	1,865,475,661
2	Brazil	1,398,584,137
3	Canada	610,733,877
4	United States	517,847,788
5	China	330,612,799
6	Indonesia	285,826,538
7	Zaire	280,002,471

^a From World Resources Institute (1996).

^b Includes reserved land.

Table 2—Ranking of the top 10 States in the United States by timberland area^a

Rank	State	Area <i>Acres</i>
1	Georgia	23,631,000
2	Alabama	21,932,000
3	Oregon	21,614,000
4	North Carolina	18,710,000
5	Arkansas	18,392,000
6	Michigan	17,442,000
7	Mississippi	16,991,000
8	Maine	16,987,000
9	Washington	16,238,000
10	California	16,200,000

^a Arkansas area based on 1995 survey; all others based on Powell and others (1993).

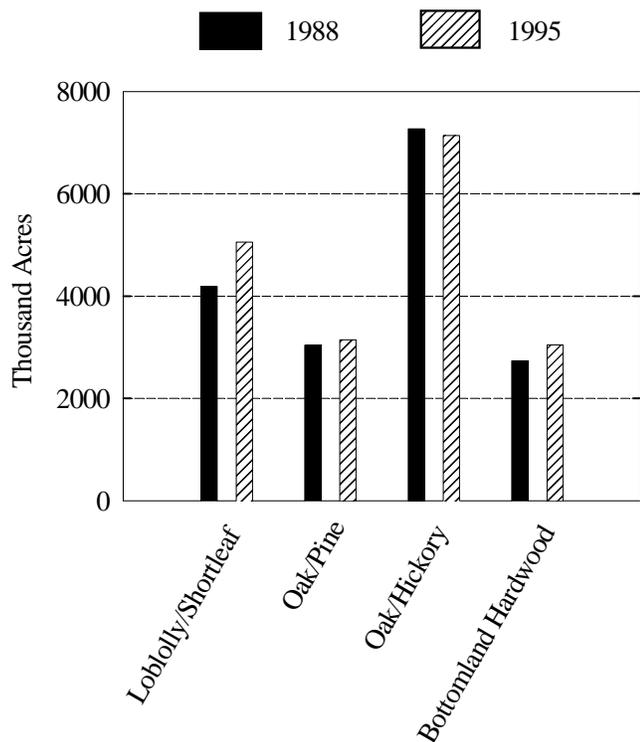


Figure 2—Changes in forest type group, Arkansas 1995.

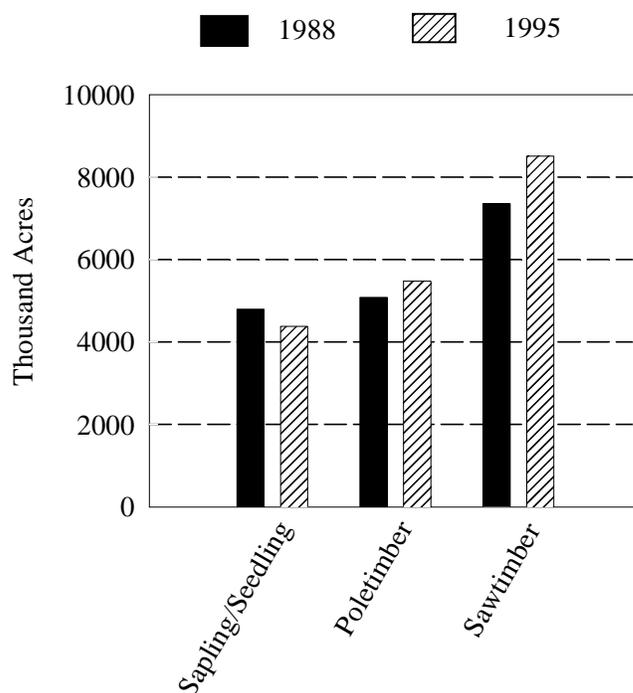


Figure 3—Change in stand size, Arkansas 1995.

represents a 13- and 15-percent increase, respectively, over volumes reported for 1988. Interestingly, softwoods make up 40 percent of cubic-foot volume but 51 percent of board-foot volume. This means that softwoods are generally larger in size than the hardwood component as Arkansas' stands become older. Loblolly pine (*Pinus taeda* L.) is the dominant tree in the State (21 percent of total live-tree volume), followed by shortleaf pine (*P. echinata* Mill.), white oak (*Quercus alba* L.), sweetgum (*Liquidambar styraciflua* L.), and post oak (*Q. stellata* Wangenh.) at 16, 9, 7, and 4 percent, respectively. These five species account for 56 percent of Arkansas' live-tree volume.

Softwoods—Softwood live-tree volume increased 18 percent from 8,085 million ft³ in 1988 to 9,542 million ft³ in 1995. This volume increase was distributed across the range of diameter classes below 22 in. (fig. 4) with sizable increases occurring in the 8-, 10-, 12-, 14-, and 16-inch diameter classes.

The softwood resource is not evenly distributed across the State. For instance, 67 percent of Arkansas' timberland is comprised of stands with < 500 ft³ per acre of softwood volume (fig. 5). On the other hand, 31 percent of the State's softwood volume occurs on only 6 percent of the timberland base. These are stands with > 2,000 ft³ per acre of softwood volume.

Softwood Growth, Mortality, Removals—Softwood gross growth increased substantially (44 percent) since the 1988 survey, from 418 million to 604 million ft³ per year (fig. 6). Mortality changed little at 49 million ft³ per year. Removals are running 433 million ft³ per year, up 6 percent since 1988. This means that Arkansas' softwood resource increased, on average, at the rate of 122 million ft³ per year

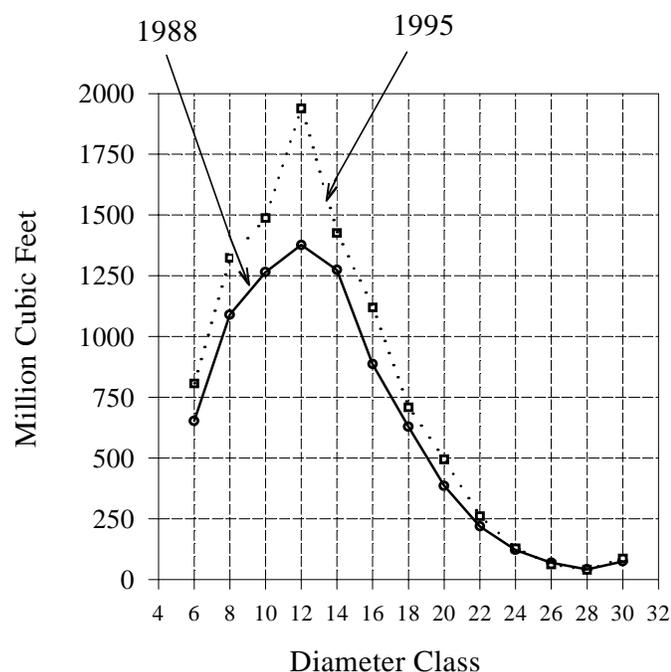


Figure 4—Softwood volume by diameter class, Arkansas 1988, 1995.

between survey periods (fig. 6). This is a turnaround from the 1988 survey when removals exceeded growth (1.09 to 1.0). The growth-to-removal ratio currently stands at 1.28 to 1.0. Based on the latest surveys of the Midsouth States, only Arkansas, eastern Oklahoma, and Tennessee are growing more softwood volume than they are removing. When all the Midsouth States are aggregated, the data shows the Midsouth in balance between growth and removals (1.03 to 1.0).

Hardwoods—Hardwood live-tree volume increased by 12 percent and stands at 14,242 million ft³ for the 1995 survey. This volume gain was most notable in the 10- to 18-in. diameter classes, with smaller gains throughout the larger diameter classes (fig. 7). This is encouraging in that the hardwood resource is maturing and, along with the increase in size across the d.b.h. spectrum, is the potential for increasing quality.

As was the case with softwood volume, the hardwood volume is not distributed evenly throughout Arkansas' timberland. However, the imbalance is not as pronounced as in the softwood distribution. Approximately 47 percent of the timberland acres in the State are occupied by stands with < 500 ft³ per acre of hardwood volume (fig. 8). In turn, 27 percent of the hardwood occurs on slightly < 8 percent of the timberland. These are stands with > 2,000 ft³ per acre in hardwoods.

Hardwood Growth, Mortality, Removals—There were very slight shifts in Arkansas' hardwood growth, mortality, and removals since the 1988 survey (fig. 9). Gross growth decreased 3 percent to 524 million ft³ per year. There was

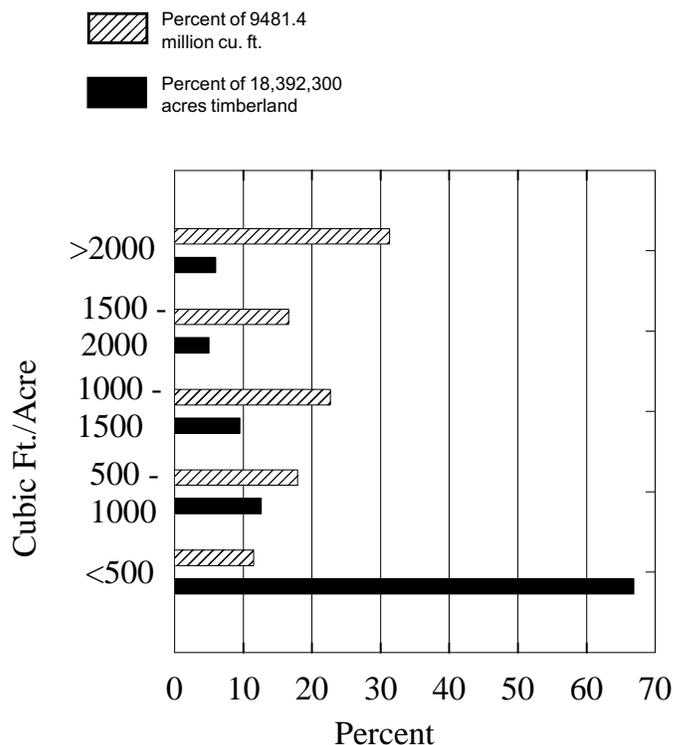


Figure 5—Effective density of softwood volume, Arkansas 1995.

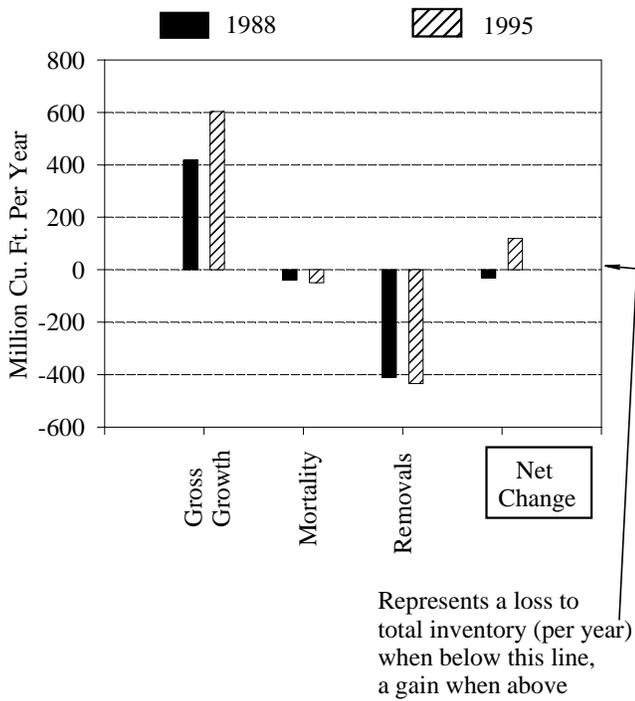


Figure 6—Softwood live growth, mortality, and removals, Arkansas 1988, 1995.

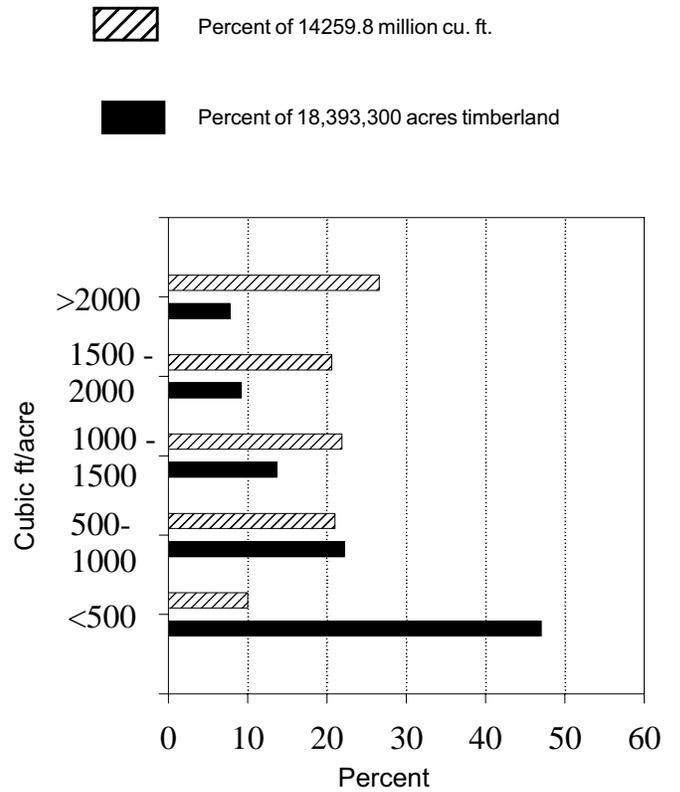


Figure 8—Effective density of hardwood volume, Arkansas 1995.

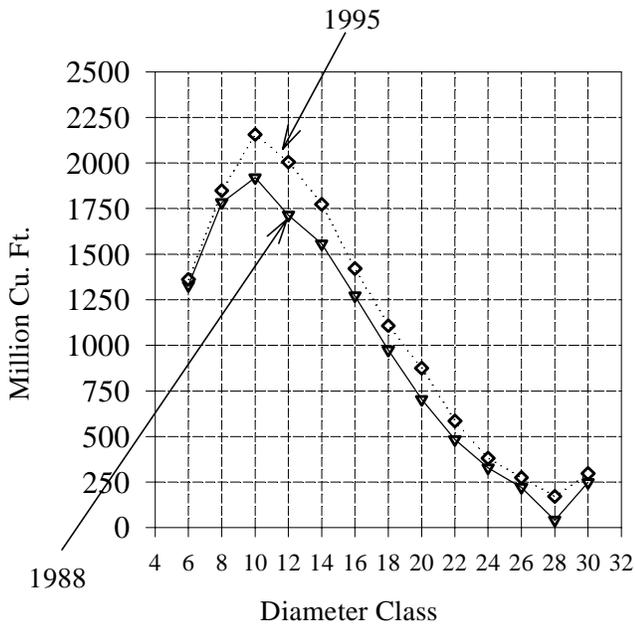


Figure 7—Hardwood volume by diameter class, Arkansas 1988, 1995.

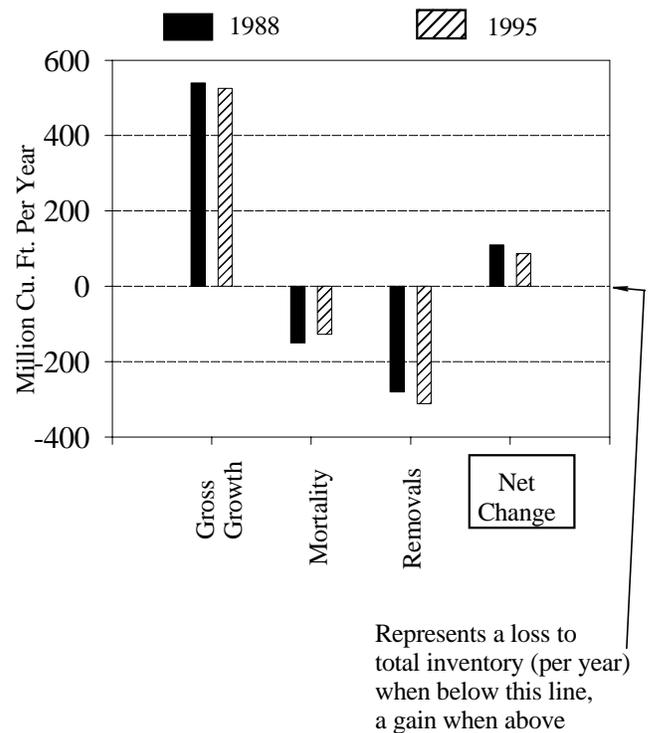


Figure 9—Hardwood live growth, mortality, and removals, Arkansas 1988, 1995.

also a slight decrease in mortality from 150 to 127 million ft³ per year. Removals increased 11 percent to 311 million ft³ per year (fig. 9).

Although mortality decreased (even with a maturing of the hardwood resource), the decline was not enough to offset the decrease in growth and increase in removals. Thus, even though Arkansas is still growing more hardwood volume than it is removing, it is doing so at a slower pace. In 1988, the net change for hardwood volume was an increase of 109 million ft³ per year. For the 1995 survey, net change dropped to 87 million ft³ per year. This means that the growth-to-removal ratio has dropped from 1.38 to 1.0 to 1.28 to 1.0. This is still on target for the Midsouth average—1.32-to-1.0. East Oklahoma, Tennessee, and Alabama are ahead of Arkansas in hardwood growth-to-removal ratios. Only one of the seven Midsouth States (Mississippi) is cutting more hardwood volume than it is growing.

Disturbance and Regeneration

Between 1979 and 1996, 7,852,500 ac (43 percent) of Arkansas' timberland underwent some form of commercial harvest (fig. 10). Harvesting on about 5,409,800 ac was a partial harvest, which left some form of a residual stand. Another 2,007,900 ac were clearcut.

Seventy-eight percent of clearcuts and 52 percent of partial harvests were implemented on pine-type stands. Based on this finding, it is important to examine the softwood resource on lands that were pine-type (> 25 percent stocking in pines) prior to harvest.

Of concern is the large discrepancy between naturally and artificially regenerated upland stands (fig. 11). Naturally regenerated sapling-sized stands have substantially more acres with < 200 softwood trees per acre than plantations. This is below the consensus established for optimum production and quality of softwoods (Hughes and Kellison 1983). Whether this is low enough to cause a volume shortfall later in stand rotation needs further study. Low stocking could be caused by an inadequate seed source or inadequate seedbeds. It is important that natural pine regeneration becomes established before competing vegetation takes over the site. However, young stands with marginally low initial stocking levels risk becoming understocked poletimber and sawtimber stands, especially where conditions (drought, competition, pests, disease, and poor seedling quality) increase softwood seedling and sapling mortality.

Reference to Arkansas' softwood timberlands being understocked is only in reference to maximized softwood production. It has been shown that total stand volume in poletimber- and sawtimber-sized stands is slightly higher in natural stands than plantations (1,549 versus 1,404 ft³ per acre) (Rosson 1995). However, the same study showed softwood volume higher in plantations (1,241 versus 958 ft³ per acre).

Plantation establishment is very expensive and may not be justified in offsetting many objectives of a multitude of owners for whom economics and esthetics both play a role. Natural reproduction of southern pine stands in conjunction

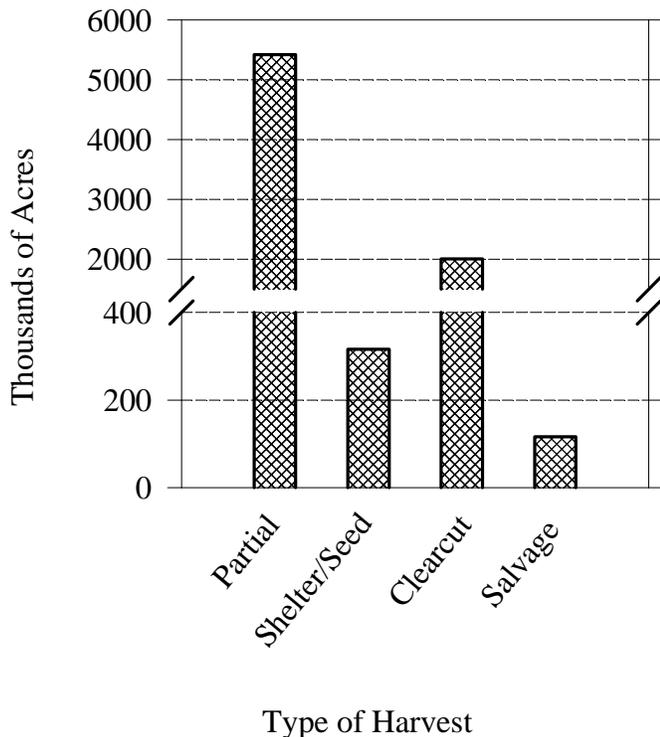


Figure 10—Area of timberland harvested, Arkansas, 1979–1996.

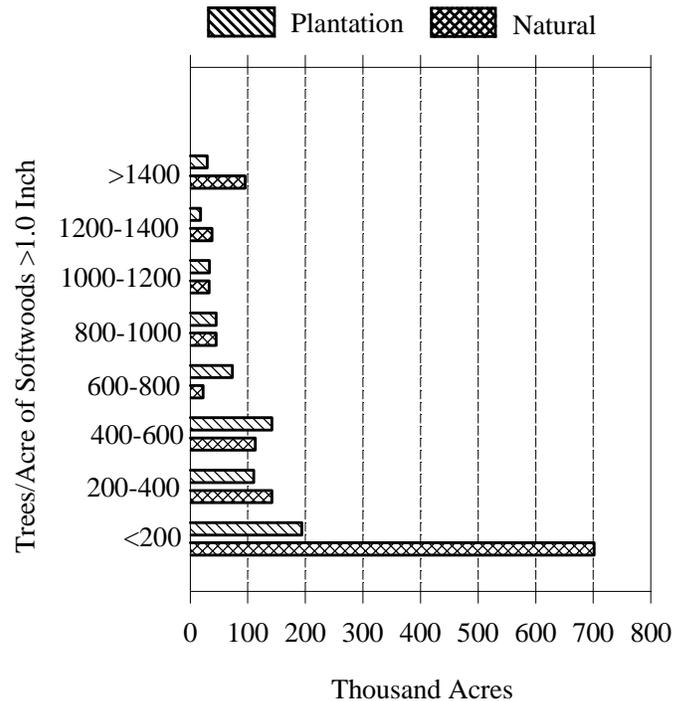


Figure 11—Area of upland sapling-sized stands (where pines are present or where formerly present) by stand density, Arkansas 1995.

with proper cutting methods is also an effective means of regenerating southern pines. This may be more in line with the majority of NIPF owners' economic criteria.

Between 1979 and 1996, 1,374,500 ac of timberland were put into softwood plantations following harvest. Currently, Arkansas has 2,565,000 ac in softwood plantations, of which 1,625,900 ac are in the southwest unit of the State. Most of these plantations are owned by forest industry (1,558,200 ac). Approximately 20 percent of the State's softwood volume is in plantations. However, only 13 percent of softwood sawtimber volume is in plantations.

Currently Arkansas ranks fourth in plantation area among the seven Midsouth States. Approximately 17,000,000 ac are in plantations in the Midsouth (17 percent of the 99,000,000 ac of timberland) (Rosson 1995).

CONCLUSION

When reporting the attributes of a State-level forest survey, it is important to examine the characteristics, that reflect upon the long-term sustainability of the resource. These include changes in: (1) timberland area, (2) tree volume, (3) growth-to-removal ratios, (4) amounts of harvested acreage, and (5) plantation dynamics and stand-establishment attributes.

The important changes for the 1995 forest survey of Arkansas include the 6.6-percent increase in forest area. Timberland area stands at 18,392,300 ac. Along with the increase in area was the increase in softwood and hardwood live-tree volume of 18 and 12 percent, respectively. Arkansas is currently growing more softwood and hardwood volume than it is cutting; the ratio of growth-to-removals stands at 1.28 to 1.00 for both softwoods and hardwoods. Harvested area is high—7,852,500 ac between 1979 and 1996. This provided the opportunity for the 34-percent increase in plantation acreage since 1988. Plantation area is currently 2,565,000 ac.

The forest resource situation in Arkansas is stable. Timberland area has increased and volumes are up. However, harvesting pressure is high and likely to increase. It is important that the harvested areas be regenerated quickly and with adequate stocking levels in order to ensure the long-term sustainability of the forest resource.

LITERATURE CITED

- Hughes, Joseph H.; Kellison, R.S.** 1983. Stocking control—silviculture thinning during the rapid growth years. In: Proceedings of the symposium on the loblolly pine ecosystem (east region); 1982 December 8–10; Raleigh, NC. Raleigh, NC: North Carolina State University: 136–145.
- London, Jack D.** 1997. Forest statistics for Arkansas counties—1995. Resour. Bull. SRS–17. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 86 p.
- Powell, Douglas S.; Faulkner, Joanne L.; Darr, David R. [and others].** 1993. Forest resources of the United States, 1992. Revised Gen. Tech. Rep. RM–234. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 30 p.
- Rosson, James F., Jr.** 1995. Forest plantations in the Midsouth, U.S.A. Res. Pap. SO–193. New Orleans: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 30 p.
- Rosson, James F., Jr.; Hartsell, Andrew J.; London, Jack D.** 1995. Forest statistics for southwest Arkansas—1995. Resour. Bull. SO–194. New Orleans: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 40 p.
- Rosson, James F., Jr.; Hartsell, Andrew J.; London, Jack D.** 1997. Forest statistics for Arkansas' Delta counties—1995. Resour. Bull. SRS–11. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 43 p.
- Rosson, James F., Jr.; London, Jack D.** 1997a. Forest statistics for Arkansas' Ouachita counties—1995. Resour. Bull. SRS–10. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 39 p.
- Rosson, James F., Jr.; London, Jack D.** 1997b. Forest statistics for Arkansas' Ozark counties—1995. Resour. Bull. SRS–15. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 45 p.
- World Resources Institute.** 1996. World resources 1996–1997. [Location of publisher unknown]: Oxford University Press. 365 p.