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ARKANSAS' TIMBER RESOURCE: YESTERDAY, TODAY AND TOMORROW

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ABSTRACT

Demand for forest products continues to rise. Arkansas provides about 4% of the U.S. total forest production and about 12% of the south central region production. Questions exist about the ability of current forest resources to completely meet anticipated future demand. In 1985, the U.S. Forest Service and the Arkansas Timber Study Committee began to analyze the existing forest base to determine whether future demand could be met from the current forest, or if not, what management changes were needed to help meet future demand. In 1985, Arkansas forests covered approximately 48% of the total land area of the state. However, the forest land base has changed drastically over the last 20 years. Projections show that changes in forest acreage, ownership, and management types will continue for the next 40 years. Greatest changes in land ownership will occur in the nonindustrial private forest (NIPF) landowner sector. Forest industry lands will show the greatest changes in timber type. Public forest ownerships will continue to be a significant part of the state's total resource base, but will not undergo the significant changes of other sectors. This paper discusses these trends and the reasons for changes that are occurring.

INTRODUCTION

Total U.S. aggregate demand for forest products is a function of population and the health of the economy. Long-term U.S. forest products consumption correlates highly with the traditional economic growth estimators. These general economic trends form the basis of forecasting long-term demand. Short-term market place fluctuations are generally not considered in long-term projections.

Long-term economic indicators suggest that demand for forest products will continue to rise steadily for the next half century according to the U.S. Department of Agriculture, Forest Service (U.S.D.A., 1987). In 1985, the Forest Service, began an in-depth evaluation of the ability of the nation's forests to meet forest products demand in the near and long term future. Because of the South's large forest acreage and fast timber growth rates the southern region was the focal point of the study. The head of the state forestry agency in each of the southern states was asked to appoint and chair a broad-based committee to provide information for the U.S. Forest Service's southwide study and to simultaneously assess the forests of the individual states. This paper is a report of the Arkansas Timber Study Committee's analysis of the past and present forests of Arkansas and its projections concerning the future forest.

METHODS

The Arkansas Timber Study Committee consisted of representatives of forest industry, private non-industrial forest landowners, forestry consultants, the Arkansas Forestry Commission and forest research specialists. Committee members were appointed by and served under the leadership of the State Forester. Because of previous forest resource assessment experience, researchers from the Department of Forest Resources, University of Arkansas at Monticello, were selected to act as principal investigators in the study.

The study was divided into several phases. The initial phase was an assessment of the trends in forest acreage and management intentions by ownership class in the state. The first step was to compile resource data from the last U.S. Forest Survey of Arkansas (Quick and Hedlund, 1979a,b,c,d; van Hees, 1980), the Midcycle Survey (Beltz *et al.*, 1987), a U.S. Forest Service special report (U.S.D.A., 1987), and other information from the Arkansas Forestry Commission (unpublished data,

Arkansas Forestry Commission, 1986). Additionally, to validate the analysis, 50 forest managers in the state were surveyed regarding their personal and/or company's plans for changes in the future. The summary provided both qualitative and quantitative information regarding current trends in forest production, anticipated future production changes, and the effect of differing management strategies on their lands. General management implications for Arkansas' total forest base were developed based on the committee's assessment and the survey results. The survey and initial assessment were completed by late 1986.

In the second phase projections of forest acres by management type and ownership class were formulated. These projections were made based on long-term and more recent trends and upon the survey responses.

Third, the projections of future acreage and management practices which were developed in the first two phases of the study were used to estimate future timber production for the state. This projection was compared with that developed by the U.S. Forest Service (U.S.D.A., 1987).

Differences in projections made by the Forest Service and by the Arkansas Timber Study Committee were noted and reconciled where possible. In some cases, the Arkansas Timber Study Committee's projections were accepted as being the most likely future scenario because they were based on more specific data and better knowledge of unique conditions.

Where the Arkansas Timber Study Committee projections and the U.S. Forest Service projections were in close accord the U.S. Forest Service is cited as the original source. Where substantial differences were apparent, the projections of the Arkansas Timber Study Committee were accepted. Findings of other studies are also reported here to complete the present and future picture of the forest resource of the state.

STUDY RESULTS

THE FOREST BASE AND PRODUCTION

In 1985, Arkansas forests covered approximately 48% of the total land area of the state (U.S.D.A., 1987). Of the total land base, 50% was in commercial forest and 29% was in row crops. Other land uses, such as urban areas, rights of way, water, and open land accounted for about 19% of the surface area. Arkansas forests were predominantly hardwood (54.2%). Natural or planted pines and mixed pine-hardwoods

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accounted for 27.4% and 18.3% respectively (U.S.D.A., 1987).

Production from Arkansas' forests has increased over time. Total production in 1965 was slightly less than 500,000 MCF (thousand cubic feet) and in 1985 was 542,208 MCF, an 8% increase. Production dips occurred in 1974-1976 (over 20%) and 1982-1984 (about 10%) and reflected dips in total U.S. lumber demand (Kluender *et al.*, 1988). Traditionally, Arkansas has provided slightly over 4% of the total U.S. production and over 12% of the south-central region's production (Kluender *et al.*, 1988).

Roundwood products had a combined stumpage value of about \$237.0 million in 1985. Production from private forest industry lands accounted for \$119.4 million or 50% of the total. Another 40% (\$95.0 million) came from stumpage payments to private non-industrial forest landowners and 10% (\$22.6 million) was for timber harvested from public ownerships (Kluender *et al.*, 1987.).

Table 1. Total Arkansas by management type, 1952 to 2030, in 1000's of acres.

Year	Pine		Mixed Pine-Hardwood	Hardwood		TOTAL
	Plantations	Natural		Upland	Bottomland	
1952	55	4481	2181	8500	4410	19627
1962	161	4690	2667	8351	4102	19971
1970	256	4180	2870	7779	2947	18032
1977	415	3882	2956	6691	2849	16793
1985	990	3377	2926	5970	2687	15950
1990	1486	3026	2743	5511	2775	15541
2000	2558	2296	2399	5076	2663	14992
2010	3027	2197	2132	4855	2537	14748
2020	3237	2158	2004	4697	2412	14508
2030	3348	2109	2001	4645	2346	14449

Source: Arkansas Timber Study Committee, 1988; U.S.D.A., 1987.

THE CHANGING FOREST LAND BASE

Arkansas' total forest land-base decreased from 19.9 million acres in 1962 to about 16 million acres in 1985 (U.S.D.A., 1987) (Table 1). Future reductions will probably lower the forest base to about 14.4 million acres by 2030. Reductions in the past were attributable to three principal causes. First, there was large scale agricultural clearing in the Delta (1960-1975). Most of this clearing removed bottomland hardwood stands. Second, many upland hardwood stands were cleared for grazing, especially in the Ozark Region (1970s). And, finally, many other stands were cleared for urban development. Future removals from the forest base will most likely be for increased urbanization and industrialization.

Forest acreage reductions were primarily in the private nonindustrial landowner sector (Table 2). Acreages owned by the private forest industry (Table 3) and the public sectors (Table 4) have remained nearly stable, so they now comprise a larger percent of the total state forest area. In the late 1950's, private non-industrial forest landowners held almost 70% of Arkansas' total timberland. By 1985, however, private nonindustrial forest landowner's holdings had decreased to 54% (Table 5). In 1985, private forest industry held 27% and public ownerships 18%. We project that by 2030 Arkansas will have 14.4 million forested acres of which 47% will be owned by private non-industrial landowners, 31% in private industry and 22% by the public (previously unpublished projections developed by the Arkansas Timber Study Committee, 1988; U.S.D.A., 1987.).

CHANGING MANAGEMENT TYPES

With the shift in control of forest lands has come a change in the nature of Arkansas' forest. The management styles of private forest industry and private nonindustrial forest land owners differ. Consequently, the distribution of forested acres by management type has also changed.

Acreage changes have occurred in all management types (Table 1). Decreases have occurred in the upland hardwood management group

Table 2. Private nonindustrial forest area by management type, 1952 to 2030, in 1000's of acres.

Year	Pine		Mixed Pine-Hardwood	Hardwood		TOTAL
	Plantations	Natural		Upland	Bottomland	
1952	24	1946	1136	6059	3368	12533
1962	75	2180	1549	6229	3060	13093
1970	134	1784	1423	5929	1838	11108
1977	207	1482	1549	4745	1730	9713
1985	276	1225	1478	4106	1569	8654
1990	320	1112	1405	3661	1694	8192
2000	400	947	1216	3295	1671	7529
2010	500	900	1015	3167	1589	7171
2020	550	850	880	3073	1503	6856
2030	560	800	855	3052	1457	6724

Source: Arkansas Timber Study Committee, 1988; U.S.D.A., 1987.

Table 3. Forest industry by management type, 1952 to 2030 in 1000's of acres.

Year	Pine		Mixed Pine-Hardwood	Hardwood		TOTAL
	Plantations	Natural		Upland	Bottomland	
1952	21	1693	617	1114	733	4178
1962	57	1631	650	951	733	4022
1970	110	1554	912	609	800	3985
1977	186	1613	912	667	784	4162
1985	681	1392	909	603	780	4365
1990	1121	1174	710	626	732	4363
2000	2088	648	433	587	623	4379
2010	2447	533	352	510	550	4392
2020	2602	513	336	457	499	4407
2030	2693	509	330	427	465	4424

Source: Arkansas Timber Study Committee, 1988; U.S.D.A., 1987.

Table 4. Publically owned forest area management type, 1952 to 2030, in 1000's of acres.

Year	Pine		Mixed Pine-Hardwood	Hardwood		TOTAL
	Plantations	Natural		Upland	Bottomland	
1952	10	842	428	1327	309	2916
1962	29	879	468	1171	309	2856
1970	12	842	535	1241	309	2939
1977	22	787	495	1279	335	2918
1985	33	760	539	1261	338	2931
1990	45	740	628	1224	349	2986
2000	70	701	750	1194	369	3084
2010	80	764	765	1178	398	3185
2020	85	795	788	1167	410	3245
2030	95	800	816	1166	424	3301

Source: Arkansas Timber Study Committee, 1988; U.S.D.A., 1987.

(- 2.5 million acres), the bottomland hardwood group (- 1.7 million acres) and the natural pine group (- 1.1 million acres). Net gains in the mixed pine-hardwood (+ 745,000 acres) and pine plantation groups (+ 935,000 acres) have mostly been captured from the natural pine and upland hardwood groups (U.S.D.A., 1987).

Since 1952, private forest industry holdings have increased (+ 287,000 acres) and the acreages in various management types have changed. The greatest change in the character of private forest industry land is the increase in pine plantations from less than 1% (1962) to 16% (1985) (Table 2). Plantation acres are projected to increase to 61% by 2030. At the same time, natural pine stands have decreased from 41% to 32% (1962 to 1985). They will probably decrease to only 12% by 2030. The mixed pine-hardwood group will decrease from 21% (1985) to about

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Table 5. Distribution of growing stock, supply, and 1985 Growth:Drain ratios across landowners in Arkansas.

	Landowner Group		
	Private Forest Industry	Private Nonindustrial	Public
Acres Owned (%)	27	54	18
Supply Category			
Softwood			
Inventory (%)	39	40	21
Supply (%)	51	39	9
Growth:Drain Ratio ¹	1.16	1.52	1.29
Hardwood			
Inventory (%)	23	56	21
Supply (%)	29	62	9
Growth:Drain Ratio ¹	1.98	2.26	4.36
Total			
Inventory (%)	30	49	21
Supply (%)	44	47	9
Growth:Drain Ratio ¹	1.34	1.84	2.63

Source: U.S.D.A., 1987.

¹ Growth:Drain is the proportion of yearly forest growth removed in harvesting and other removals from the forest.

7% (2030). The acreage of both upland and bottomland hardwoods has been relatively stable since 1970 and now amount to 14% and 18% respectively on private forest industry lands. However, it is estimated that in 2030 upland and bottomland hardwoods will decrease to 10% and 11% respectively (U.S.D.A., 1987; previously unpublished projections developed by the Arkansas Timber Study Committee, 1988).

In 1983, 3% of private nonindustrial forest lands were in plantations (U.S.D.A., 1987) (Table 3). That may increase to nearly 8% by 2030 (previously unpublished projections developed by the Arkansas Timber Study Committee, 1988). During the same period natural pine stands will probably decrease from 14% to about 12%. Mixed pine-hardwood and upland hardwood stands will remain at about 13% and 45%, respectively, in 2030.

Management types on public lands should not change significantly over the period of the analysis (Table 4). Of total public acreage, plantations will account for roughly 3%, natural pine about 24%, mixed-pine-hardwood about 24%, upland hardwood about 35% and bottomland hardwoods about 13% (previously unpublished projections developed by the Arkansas Timber Study Committee, 1988).

INVENTORY AND NET ANNUAL GROWTH

Softwood

Softwood inventories in the state should continue to increase until about 1990, and then begin a slow decline. This will happen due to volume increases in older plantations coming to harvest age followed by harvesting in these same plantations. Increasing harvest and other removals will exceed declining softwood net annual growth by 1990 if Forest Service projections are correct.

Private forest industry will increase its harvest while converting natural pine stands to pine plantations with higher stocking. The trend of softwood timber growth dropping below timber drain could continue until about 2020. For some time softwood net annual growth rates have been declining on both industrial and nonindustrial private lands. In the next few years, removals will exceed net annual growth for the private sector. However, projections indicate that softwood growth:drain ratios (net annual forest growth divided by harvest removals) will once again approach 1:1 by about 2020 (U.S.D.A., 1987).

Hardwood

Hardwood inventories in the state decreased in the 1970s and then began to increase. Projections indicate that hardwood inventory will peak around 2000 and then decline (U.S.D.A., 1987). Hardwood removals peaked in the early 1970s, coinciding with large scale agricultural clearings. The largest inventory declines were in the private

nonindustrial forest landowner sector. Hardwood net annual growth will fall below harvest beginning about the year 2000 if present cutting practices continue. Private forest industry removals of hardwood often coincides with the conversion of upland hardwood and mixed pine-hardwood stands to pine. Continued removal of hardwood at the present rate will reduce industry hardwood growing stock to the point that harvest will begin to exceed net annual growth by the year 2005 (U.S.D.A., 1987).

Hardwood inventory levels on private nonindustrial forest lands reflect a continued removal of less than growth until 1990. This may be followed by harvest exceeding net annual growth in the late 1990s. Harvests and other removals could continue to exceed growth until the end of the analysis period.

Public lands will continue to provide a major portion of hardwood supplies. In particular, the large Ozark and Ouachita National Forest hardwood resource will continue to provide at a high rate (previously unpublished projections developed by the Arkansas Timber Study Committee, 1988).

STOCKING LEVELS AND STOCKING PROBLEMS

Over half of Arkansas' forest acres are at least 85% stocked with trees that are not rough or rotten (van Hees, 1980). Over three-fourth carry 70% or better stocking. However, less than a third of the total forest acres carry 25% or better stocking of silviculturally desirable trees (i.e., the type that foresters would favor). In addition, only 50% of the state's forest acres are better than 70% stocked with trees that are acceptable (they meet the requirements of growing stock trees, but not of being desirable) (van Hees, 1980). In short, Arkansas forest lands carry relatively high total stocking levels, but little of the forest land may be characterized as having commercially desirable or acceptable trees growing on it (van Hees, 1980; Birdsey *et al.*, 1981).

In general, the most serious problems with low quality growing stock are on private nonindustrial ownerships. Many of these owners have repeatedly harvested the better pine and hardwood trees while leaving the undesirable trees. On pine lands, low quality understory hardwoods are often allowed to dominate the site after pines are harvested. Private forest industry lands, on the other hand, are generally in good condition in regard to the quality of growing stock. As a rule, the companies eliminate cull and undesirable trees in both their hardwoods and pine stands. On pine lands they control undesirable hardwoods to insure that pines continue to dominate the site. Regardless of species and class, most Arkansas sites are of sufficiently high quality to support greater inventory, growth and harvest levels. This is especially true in the pine and mixed pine-hardwood areas of the state.

METHODS OF INCREASING THE FUTURE TIMBER SUPPLY

Arkansas' timber production could be increased by manipulating site quality, stocking level, and the quality of growing stock on the site. Each of these factors is controllable to some degree. Control, however, will require investments of time and money. Just under 40% of the total forest acres in Arkansas are in need of some cultural treatment to improve productivity. The majority (60%) of these 6.6 million acres are private forest industry lands (22%), and public holdings (18%). The 6.6 million acres that could benefit from cultural treatment fall into two categories. First, there are about 2.0 million acres that have never been actively managed, but have a high potential for increased production of timber. These acres could yield a return of at least 10 percent (real, net of inflation) on the required investment (U.S.D.A., 1987). The total cost of treating these 2.0 million acres would be about \$184 million, or an average cost of \$92 an acre (U.S.D.A., 1987). The increased timber yield on these acres would amount to an additional 105 million cubic feet of net annual growth. This would amount of over 52 cubic feet per acre per year. The majority of the acres in this category are on private nonindustrial forest lands.

Second, there are approximately 2.75 million additional acres which could yield a real return of at least 4 percent but less than 10 percent on the cost of applying cultural treatments to correct stand deficiencies (U.S.D.A., 1987). The total cost of treating these 2.75 million acres would be \$350 million, or an average \$127 per acre. The estimated net annual growth increase would total 108 million cubic feet, or an addi-

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tional 39 cubic feet per acre per year. In addition to increased growth and yield, additional forest cultural work would create jobs for Arkansas. However, most positions would be seasonal labor requiring little skill.



Figure 1. Past ■, USFS projected, ▲, and Arkansas Timber Study Committee projected, ●, production for Arkansas forests. Source: Kluender *et al.*, 1988; USDA, 1987; Arkansas Timber Study Committee, 1988.

FUTURE PRODUCTION FROM ARKANSAS' FORESTS

The Arkansas Timber Study Committee estimates that production will rise to 620 million cubic feet by 1990 (up 14% from 1985), and to 725 million cubic feet by 2030 (up 34% from 1985) (Figure 1). It is probable that an increasing number of unmanaged private nonindustrial lands will come under management for the first time in the next five to ten few years. Many landowners will use natural regeneration or low cost-low intensity methods of artificial regeneration. Many will elect uneven-aged management schemes. Several facts have lead us to these projections. The most important of these facts are as follows. First, there is an increasing tendency of landowners to manage for products that have a higher marketplace value (e.g. sawlogs rather than pulpwood). Second, both natural regeneration and uneven-aged management have lower initial cost than artificial regeneration. Third, there continues to be an intense interest by private nonindustrial forest landowners in non-timber forest values. These values are perceived to be at variance with some plantation management techniques. Fourth, uneven-aged management allows for frequent income flows from the forest investment. Fifth, many of the under-managed or non-managed sites in Arkansas are not well suited to intensive forest management practices due to site conditions or small tract size. Sixth, there are an increasing number of Arkansas landowners who are willing to perform forest management work on their land themselves.

After intensive study, the Arkansas Timber Study Committee makes the following suggestions in four areas for increasing long term supply from the state's forest lands. First, Improve and control stocking on all forest land in the state. This can be done by gradually replacing undesirable and unmerchantable stems with high quality growing stock. Desirable crops trees should also be released to grow free of competition. Second, increase the quality of forest investment opportunities. Low initial cost investment alternatives should be used on both industrial and private lands when ever possible. Qualifying landowners should utilize incentive programs such as FIP, CRP, etc. that can offer significant cost reductions and provide for higher internal rates of return on investments. Landowners should use the planning and management assistance that is available from public and private sectors of the forestry community to aid in decision making. Also the taxation climate for timber investment at the state and federal level needs to be improved

if forest investment is to be competitive. Third, improve markets for forest products. Research should be continued to develop forest products compatible with the long term timber resource of the state. In addition, export markets for Arkansas forest products should be pursued to provide additional outlets for Arkansas' products. Fourth, overcome factors restricting the development of Arkansas resources. Arkansas forest landowners need to be provided with continuing educational services to enable them to make good decisions. The major problems to be dealt with in bringing about major changes to the states' forests are not technical questions but rather turning individual landowners into active forest managers. Better road systems need to be provided into undeveloped but heavily timbered areas of the state. Better access will improve markets and the forest resource to management as it is in other places in the state.

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