

# SURVEY IMPLICATIONS FOR PUBLIC FOREST LANDS

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**Abstract**—Public timberlands represent the smallest of major ownership classes in Arkansas; of the State's 18.38 million ac of timberland, the public owns 3.198 million ac, or 17.4 percent. Of that total, > 85 percent is in Federal ownership (70.8 percent in national forests). State lands account for 12.4 percent, and county and municipal lands, about 2 percent. Compared to other ownerships, public timberlands have higher levels of stocking, more area in sawtimber, and higher per-acre growing-stock and sawtimber volumes. Site quality in the national forests is poor relative to other public lands, where the difference between upland and bottomland physiography is somewhat higher. By total area, hardwood forest types dominate National Forest System lands in the Ozark and Ouachita regions. The archetypal species groups are shortleaf pine in the Ouachitas and hard hardwoods in the Ozarks. In both regions, the archetypal species groups show growth that is slightly less than the State average, removals that are much lower than the State average, and, as a result, a growth surplus that is from two times to three times greater than the State average. As described in the Forest Inventory and Analysis reports, data suggest two elements of concern about timberland conditions on national forest lands in Arkansas: removals exceed growth in the planted pine component of the Ozark region, and stands tend to be overstocked in the Ouachita region. Nevertheless, the data support the hypothesis that the public sector in general, and the national forests in particular, support timberlands with larger trees than other ownership classes in the State.

## INTRODUCTION

The public forests of Arkansas are among the State's most valued treasures. Many attribute Arkansas' identity as "The Natural State" to its forested nature and the many resources that its forests provide. Public forests include Federal, State, county, and municipal ownerships. However, management objectives within and among these different ownership categories differ with respect to tract size, management philosophy, and constraints related to social, economic, and legal issues of governance.

Federal forest ownership in Arkansas includes the Ouachita National Forest and the Ozark-St. Francis National Forest, which are managed by the Forest Service, an Agency of the U.S. Department of Agriculture. The U.S. Department of the Interior has jurisdiction over seven national wildlife refuges (managed by the U.S. Fish and Wildlife Service) and several national parks, scenic rivers, historic sites, and military parks (managed by the National Park Service). A third Federal agency, the Department of Defense, manages timberland on several large military installations, including (as of 1995) Fort Chaffee, Camp Robinson, Little Rock Air Force Base, and the Pine Bluff Arsenal. The U.S. Army Corps of Engineers, which is also under the Department of Defense, manages the dozen or so artificial impoundments of Arkansas waterways and the recreational lands that adjoin them.

State ownership includes an extensive system of nearly 50 wildlife management areas that, under the Arkansas Game and Fish Commission, encompass roughly 350,000 ac. The State owns 48 State parks, which are managed by the Arkansas Department of Parks and Tourism. Other significant State holdings include the 10,000-ac Poison

Springs State Forest, which is managed by the Arkansas Forestry Commission; lands managed by the Arkansas Natural Heritage Commission; and several forested tracts managed by the University of Arkansas System.

County and municipal forest lands constitute the smallest share of public ownership and provide primarily local outdoor recreation. If such lands qualify as timberland according to Forest Inventory and Analysis (FIA) standards, they would be included in these data.

The author has used results from the 1995 FIA Report for the State of Arkansas to characterize public forest lands. However, the FIA sample design limits the ability to make detailed interpretations across ownership categories. For example, each plot cluster represents, on average, 5,760 ac of forest. At this sampling intensity, the Poison Springs State Forest would be represented by only two plots, which could not accurately characterize current conditions, much less long-term changes in so small a tract. Nor can it facilitate comparison with other ownerships of small aggregate acreage.

Therefore, only the broadest characterizations of ownership are considered in this paper. The author's objectives are to quantify broad attributes of public forest lands in Arkansas relative to both the general conditions of the State's forests and the public sector data from earlier FIA reports.

## METHODS

### General Attributes of Public Forest Lands

In general, the national forests are the most actively managed public lands in Arkansas. Therefore, the public

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forest database was divided into two ownership classes—national forest and other public. Available FIA data for the State (London 1997) and the four Regions in the State (Rosson and London 1997a, 1997b; Rosson and others 1995, 1997) were used to compare attributes of these two ownership classes with regional and statewide averages. Several comparisons between 1988 and 1995 were possible using the 1988 FIA statewide report (Hines and Vissage 1988) and the 1988 Ozark region and Ouachita region reports (Hines 1988a, 1988b). A few long-term comparisons were made with statewide tables from 1959, 1969, and 1978 (Hedlund and Earles 1970, Staff of Renewable Resources Evaluation Research Work Unit 1979, Sternitzke 1960).

### **Attributes of National Forest System (NFS) Lands**

The FIA regions do not exactly correlate with the national forests' boundaries. For example, national forest land in the 10-county Ouachita region FIA report includes not just the Arkansas portion of the Ouachita National Forest but also the Magazine Ranger District (RD) of the Ozark National Forest. It excludes, however, several thousand acres of Ouachita National Forest land in the southwest Arkansas FIA region, and excludes the entire Oklahoma portion of the Ouachita National Forest. Similarly, the FIA's 17-county Ozark region includes all of the Ozark National Forest north of the Arkansas River, but does not include the St. Francis National Forest, which lies in the Delta region. Thus, Ozark region data used here exclude the Magazine RD and the St. Francis National Forest; Ouachita region data include the Magazine RD, and exclude a fringe of national forest land along the southern border of the Ouachita National Forest as well as all Ouachita National Forest lands in Oklahoma.

### **Assumptions Made During Data Manipulations**

Standard FIA definitions were used throughout this report (Beltz and others 1992). For example, understocking is used to describe stands having < 60 percent stocking; overstocking was used to describe stands having > 100 percent stocking.

The author defines "growth surplus" (called "net change" in FIA publications) as the difference between growth and removals (see core tables 20 and 23, Rosson and London 1997a). For purposes of this paper, growth, removals, and growth surplus were converted from the total region or statewide volume means presented in FIA publications to mean volumes per acre by dividing the total timberland volume data by timberland acreage in the respective sector (see core table 3 in Rosson and London 1997a).

It should be emphasized that transformations from total volume to average per-acre volume data may not reflect the actual per-acre data gathered in the field. Rather, the data reflect an averaging of all forested acres, not the average condition of a typical acre of forest in the State.

## **RESULTS**

### **Statewide Analysis**

**Public forest land area**—The public lands of Arkansas constitute the smallest of the major ownership groupings in

the State. Of the 18.38 million ac of timberland, the public owns 3.198 million ac, or 17.4 percent. Compared to information in the 1988 FIA report, this represents a 122,800-ac increase but a decline of 0.4 percent of total timberland, largely because of increases in nonindustrial private forest (NIPF) timberlands (Foster 2001).

Public lands include those within Federal, State, county, and municipal ownership. Of the 3.2 million ac of public lands, > 85 percent is in Federal ownership—70.8 percent in the NFS and 14.7 percent in other Federal ownership, including the National Park Service, U.S. Fish and Wildlife Service, and the Department of Defense. State lands (State parks, wildlife management areas, and one State forest) account for 12.4 percent of timberland and county and municipal lands, 2.1 percent.

Forest inventory data show that since 1959, the NFS landbase has declined slightly (fig.1). This decrease is not reflected in data kept by the national forests. For example, in its annual end-of-year reports, the Ouachita National Forest showed an increase of just under 48,000 ac between the end of fiscal year 1988 to the end of fiscal year 1995. The difference reflects a change in the way that FIA determined national forest acreage. In 1988, NFS acreage was calculated directly from the FIA sample; in 1995, it was based on enumerated data provided by the two national forests.

Conversely, the other public sector has expanded since 1959 (fig.1), especially since 1978. This reflects the addition of several large national wildlife refuges (Felsenthal and White River) to U.S. Fish and Wildlife Service holdings in the State.

### **Species composition, stocking, and site quality**

Differences in overall forest composition are apparent between the national forest and other public categories (table 1). National Forest System lands have higher percentages of softwood, oak-pine, and oak-hickory than the State as a whole. This reflects the upland geology and forest types common to the Interior Highlands. The other public lands have over 50 percent of their forest area in the oak-gum-cypress forest type, 40 percent in other hardwood types, and only 10 percent in pine. This reflects the bottomland hardwood influence in the Federal wildlife refuges and many of the State wildlife management areas of that sector.

One method that FIA uses to report stand density is by percent stocking, a relative value that assumes an established stocking standard. The higher the number, the more densely stocked the stand; optimally stocked stands fall within the 60 to 100 percent stocking class. Overall, public timberlands have better stocking than is found on other Arkansas timberland (table 1). The national forests have a slightly higher percentage of area in optimal stocking than the statewide average, and other public lands have a slightly lower percentage. The national forests have much less understocked area than the State average, a reflection of the attention that Forest Service professionals and technicians give to proper forest management. Understocked stands in the other public sector exceed the

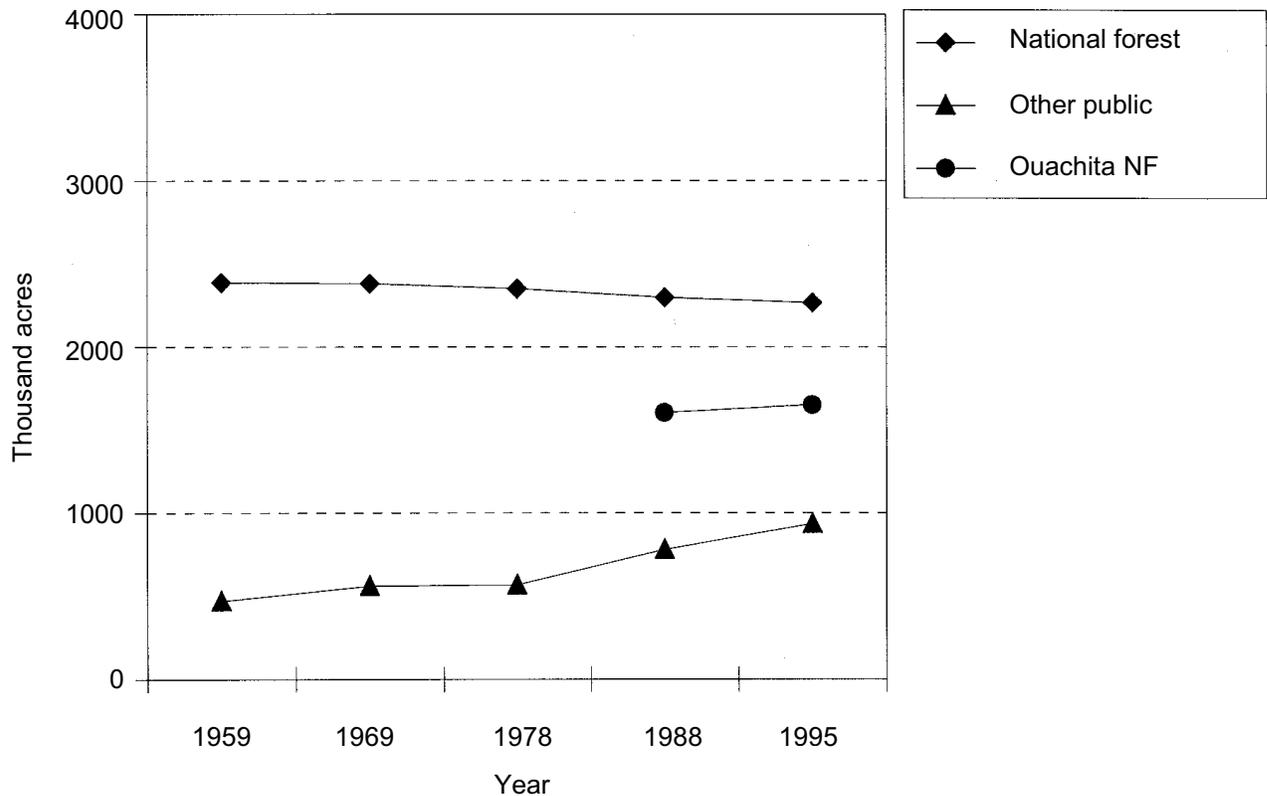


Figure 1—Area of public timberland in Arkansas 1959–1995, for the national forest sector and the other public sector, according to forest survey results, compared with data reported in FY88 and FY99 by the Ouachita National Forest.

**Table 1—Species composition, stocking, and site quality for the national forest and other public sectors compared to statewide averages in Arkansas**

Stand characteristics	National forest	Other public	Statewide
----- Percent -----			
<b>Species composition</b>			
Loblolly-shortleaf	34.0	10.0	27.5
Oak-pine	19.0	9.9	17.1
Oak-hickory	46.4	21.6	38.8
Oak-gum-cypress	.5	54.0	15.3
Elm-ash-cottonwood	0	4.5	1.3
<b>Stocking</b>			
>130	4.3	1.3	3.4
100–130	30.4	24.6	20.2
60–100	57.5	51.7	55.5
16.7–60	7.8	21.9	19.9
<16.7	0	.6	.9
<b>Site quality (cubic feet)</b>			
>165	0	11.4	4.8
120–165	2.6	13.9	14.0
85–120	16.0	34.9	27.5
50–85	64.0	28.7	38.7
<50	17.4	11.1	15.0

State average only slightly. More than a third of the timberland area in the National Forest System, and 25 percent in the other public sector, is overstocked relative to the statewide average.

Conventional wisdom holds that public timberlands occupy poor-quality sites. Recent FIA data bear this out for national forest lands but not for other public ownership (table 1). Over 80 percent of NFS timberland is classified as capable of growing < 85 ft<sup>3</sup> per acre (about a cord per acre) per year compared with just over 50 percent statewide and only 40 percent on other public timberlands. Conversely, the highly productive bottomland influence is apparent on other public timberlands; 25 percent of the total land area is in the two best site classes, compared with < 20 percent statewide.

**Size-class distribution and standing volume**—The stand size-class distribution of public timberlands differs from State averages (table 2). Both the national forest category and the other public category have a smaller percentage of timberland in the seedling-sapling and the poletimber-size classes. However, the national forests and the other public timberlands have 15 percent and 20 percent more forest area in sawtimber, respectively, than the statewide average.

Growing-stock volume by species group is consistent with these data (table 2). Compared with the statewide average, the public timberlands have a smaller proportion of growing-stock volume in planted pines and a larger proportion in hard hardwoods (oaks and hickories). Other public

timberlands have more soft hardwood volume and less natural pine volume than the statewide average. Conversely, the national forests have a smaller percentage of soft hardwood growing-stock volume and growing-stock volume that is more natural. Moreover, these data show that both public ownerships have a greater percentage of growing-stock volume in hardwood than in conifers: 51 percent on national forests and over 80 percent in the other public sector.

Sawtimber volume trends by ownership are similar to trends in growing-stock volume (table 2). Both public ownership categories show markedly less than average area in stands with volumes < 1,500 board feet per acre, with other public forests having slightly larger proportions in this volume class than national forests. Both are about the same as the State average in the 1,500 to 5,000 board foot per acre category. Again, both show about 20 percent more area than the statewide average in the category of stands having > 5,000 board feet per acre.

**Growth, removals, and growth surplus**—Public sector growing-stock volume growth per acre is less than the statewide average in both planted pine and natural conifers (table 3). This is due to the difference in distribution and growth of shortleaf pine (*Pinus echinata* Mill.) and loblolly

pine (*P. taeda* L.) across the State. Shortleaf pine is the dominant conifer in both plantations and natural stands on public lands in Arkansas, especially in the Ouachita and Ozark regions. Conversely, loblolly pine dominates the Upper Coastal Plain sites of the Southwest Region, and is also commonly planted in private ownerships statewide.

Natural stands of shortleaf pine in the Interior Highlands grow at roughly two-thirds the rate of natural stands of loblolly pine on the Coastal Plain, and the differences in plantation growth are probably even greater between the species. However, hard hardwood growth per acre in both public ownership classes exceeds the State average.

Growing-stock volume removals per acre on public ownerships are less than the statewide average across all four species groups (table 3). To some extent, it might be expected that removals are less where growth is less. Other reasons for lower removals on Federal lands may be the presence of forest management plans and a more conservative approach to forest management than is generally the case for private lands.

Growing-stock net growth (growth minus removals) in both public sectors markedly exceeds statewide averages, with the prominent exception of the planted pine species group (table 3). Hard hardwood growth in both is four times the statewide average, and natural conifer growth is six times the State average. However, planted pine net growth on public timberlands is < 25 percent of the net growth statewide. This may be due, in part, to the high net growth

**Table 2—Size-class distribution by size class, standing growing-stock volume, and standing sawtimber volume for the national forest and other public sectors compared to statewide averages in Arkansas**

	National forest	Other public	Statewide
Size-class distribution (percent of ownership)			
Size class			
Seedling-sapling	9.7	14.7	23.8
Poletimber	29.0	17.5	29.8
Sawtimber	61.3	67.9	46.3
All size classes	100.0	100.0	100.0
Growing-stock volume			
Species group (cubic foot per acre)			
Planted pine	69.8	67.3	94.4
Natural conifer	714.5	244.0	409.4
Soft hardwood	128.8	447.0	198.8
Hard hardwood	710.2	804.7	472.9
All species	1,623.4	1,562.9	1,175.7
Sawtimber volume distribution (percent of ownership by sawtimber volume class)			
Volume			
<1,500 bf/ac	17.1	22.9	36.5
1,500–5,000 bf/ac	32.0	23.7	30.6
>5,000 bf/ac	50.9	53.4	32.9
All volume classes	100.0	100.0	100.0

**Table 3—Growth, removals, and growth surplus for growing stock in the indicated species group for the national forest and other public sectors compared to statewide averages in Arkansas**

Species group	National forest	Other public	Statewide
----- Cubic feet per acre -----			
Growth			
Planted pine	2.7	1.6	8.7
Natural conifers	17.4	12.5	18.5
Soft hardwood	2.7	8.0	5.0
Hard hardwood	17.4	22.0	12.6
All species	40.2	44.2	44.7
Removals			
Planted pine	1.5	.7	3.7
Natural conifers	11.2	6.0	17.6
Soft hardwood	.3	3.5	4.8
Hard hardwood	2.7	6.5	9.2
All species	15.8	16.8	35.3
Growth surplus			
Planted pine	1.2	.9	5.0
Natural conifers	6.2	6.5	1.0
Soft hardwood	2.4	4.5	.1
Hard hardwood	14.6	15.5	3.4
All species	24.4	27.4	9.5

rates of pine plantations in the private sector (18.8 ft<sup>3</sup> per acre).

Trends in sawtimber volume growth per acre parallel those of growing stock per acre, with some exceptions. Sawtimber growth is slightly less than the statewide average in both public ownership classes, with natural conifer growth per acre far greater than plantation sawtimber growth (table 4). Hard hardwood sawtimber growth on national forest lands, and both soft hardwood and hard hardwood growth in the other public ownership class exceeds the statewide average.

Sawtimber removals on public lands are less than statewide averages in all species groups (table 4). In the other public sector, removals are only slightly less than statewide averages for both hardwood groups; in the national forest sector, removals are slightly less for the planted pine group. Natural pine removals are about half the statewide average in both sectors.

Sawtimber net growth is greater on public lands than the statewide average for the hardwood and natural pine groups (table 4). For both public ownership classes, net growth in the natural pine group is about twice the State average, and net growth in the hard hardwood group is about four times the State average. However, planted pine net growth in both classes is less than the State average. On the national forests, planted pine sawtimber removals

exceed growth by a small margin. However, this difference is not statistically significant.

### Ozark-Ouachita Region Comparisons

**Public land area**—Recent FIA data show that the total timberland area in public ownership in the 10-county Ouachita region is just over 1.5 million ac, compared with 1.15 million ac in the 17-county Ozark region. However, the total timberland area of the Ozark region, at just over 6 million ac, is nearly double the size of the Ouachita region, at 3.4 million ac. Thus, 44 percent of the Ouachita region is in public ownership, but only 19 percent of the Ozark region (fig. 2). The other ownership classes also show prominent differences.

Conversely, the distribution of timberland by ownership category within the public ownership classes is remarkably similar in both regions (fig. 3). National forests constitute roughly 85 percent of the area, other Federal lands < 10 percent, and county and municipal lands < 1.5 percent. State holdings are larger in the Ozarks than in the Ouachitas, mostly due to a more extensive network of State wildlife management areas.

### National forest species composition and stocking—

Hardwoods occupy the majority of timberland acres in both FIA regions (table 5). The dominance of hardwoods is not surprising in the Ozark region. Some might consider it surprising that hardwood timberland area exceeds that of conifers in the Ouachita region because the Ouachita

**Table 4—Growth, removals, and growth surplus for sawtimber for the indicated species group by ownership compared to statewide averages in Arkansas**

Species group	National forest	Other public	Statewide
----- Board feet per acre -----			
<b>Growth</b>			
Planted pine	5.5	8.6	19.2
Natural conifer	97.7	73.7	101.2
Soft hardwood	6.8	41.7	19.5
Hard hardwood	59.9	87.3	45.8
All species	169.8	211.2	185.8
<b>Removals</b>			
Planted pine	7.5	2.7	11.5
Natural conifer	52.2	29.0	83.5
Soft hardwood	1.0	11.5	15.5
Hard hardwood	7.1	27.6	33.5
All species	67.8	70.9	144.0
<b>Growth surplus</b>			
Planted pine	-2.0	5.9	7.7
Natural conifer	45.5	44.7	17.7
Soft hardwood	5.8	30.2	4.0
Hard hardwood	52.8	59.7	12.4
All species	102.1	140.3	41.8

**Table 5—Species composition, growing-stock volume, and stocking by area for the national forests in the Ozark and Ouachita regions of Arkansas compared to statewide averages across all ownerships**

Stand characteristics	Ozark region	Ouachita region	Statewide
<b>Species composition (percent of timberland area)</b>			
Conifer types	14.4	48.1	27.5
Hardwood types	85.6	51.9	72.5
<b>Growing-stock volume (cubic feet per acre)</b>			
Planted pine	43.3	90.9	94.4
Natural conifer	275.6	1,043.9	409.4
Soft hardwood	197.5	71.1	198.8
Hard hardwood	1,096.7	423.2	472.9
All species	1,613.1	1,629.1	1,175.6
<b>Stocking (percent of timberland area)</b>			
>130	1.3	6.6	3.4
100–130	29.6	31.2	20.2
60–100	60.8	55.0	55.5
16.7–60	8.4	7.2	19.9
<16.7	0	0	.9

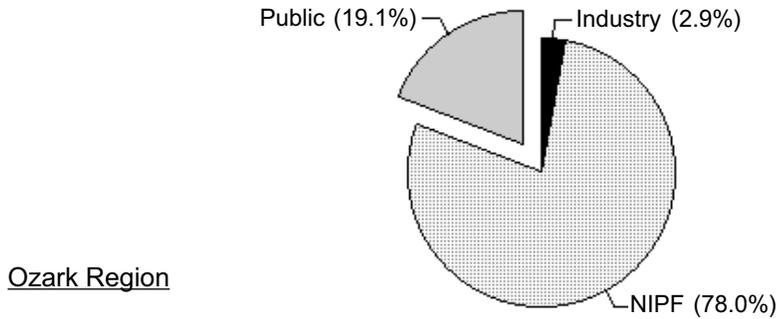
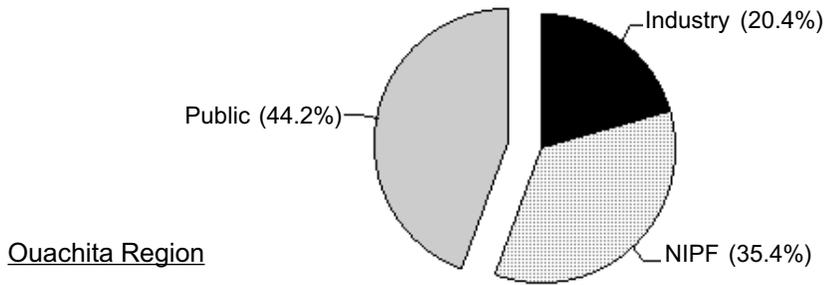


Figure 2—Percent of timberland by ownership in the Ouachita and Ozark regions.

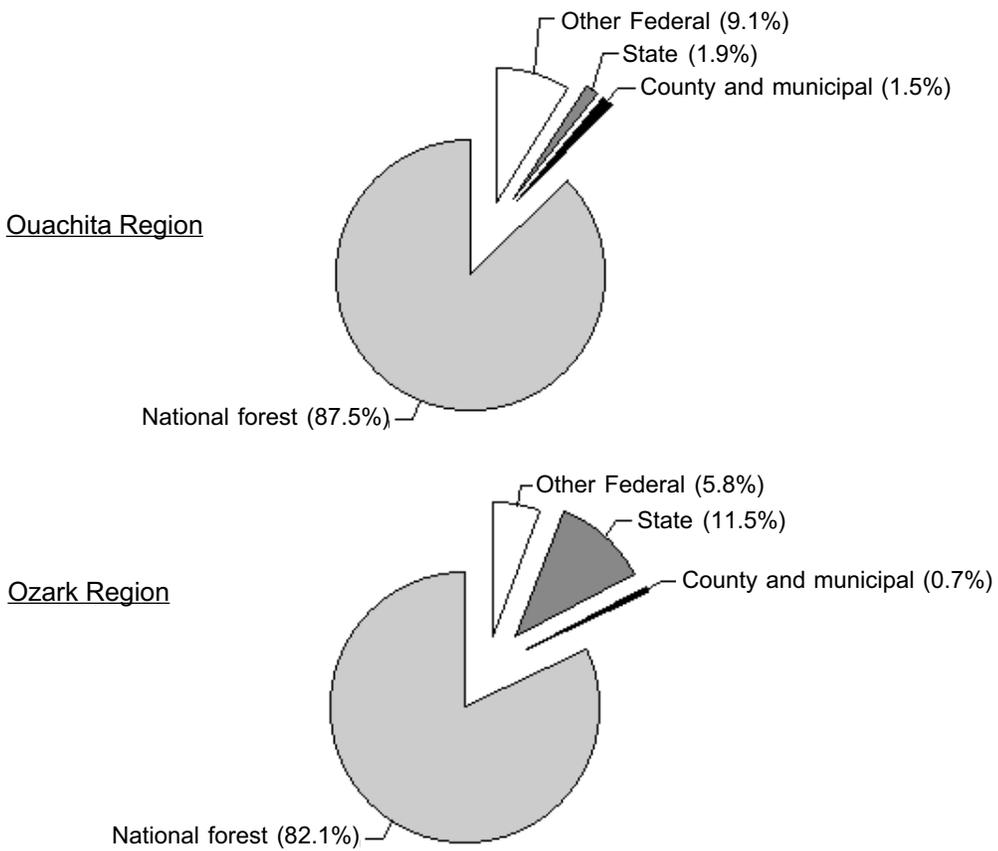


Figure 3—Percent of timberland in several ownership categories within the public sector in the Ouachita and Ozark regions.

Mountains have such a prominent shortleaf pine component. But FIA data from 1988 also show that hardwood timberland area slightly exceeded that of conifers. The total national forest timberland area in the Ouachita region increased from 1.31 million ac in 1988 to 1.32 million ac in 1995. The increase, which is not significant, is the result of a 55,000-ac increase in pine timberland area offset by a 44,000-ac decline in hardwood timberland area.

The total growing-stock volume on national forest lands is similar within the two regions. The average stand has just over 1,600 ft<sup>3</sup> per acre, > 30 percent greater than the statewide average (table 5). However, each region is known for one prominent 'archetypal' species group—oaks and hickories (hard hardwoods) in the Ozarks, and natural (shortleaf) pine in the Ouachitas. The growing-stock volume of these groups is more than double the respective statewide averages (table 5).

Overstocking in both regions exceeds the statewide average (table 5). Thirty-eight percent of acreage in the Ouachita region is overstocked (15 percent greater than the State average), with over 6 percent of timberland in that region highly overstocked. Data do not reveal whether overstocking is in the hardwood component or the pine component.

**Growth, removals, and growth surplus**—Growing-stock growth on national forest land in both regions is less than the statewide average (table 6), but in each region the growth of the archetypal species group exceeds the State average. Planted pine growth in both regions is less than half the statewide average.

Growing-stock removals on national forest lands in the two regions are also well below the statewide average for all species groups (table 6). No combination of species group by region, including the archetypal species groups, shows removals that exceed State averages. Statewide, and across all species groups, national forest timberlands are being cut at less than half the rate for average timberland on all ownerships statewide.

Thus, the growing-stock growth surplus across all species groups is more than twice the statewide average in the Ouachita region and over three times the statewide average in the Ozark region (table 6). This trend is even more pronounced for the archetypal species; the hard hardwood growth surplus in the Ozarks is more than six times the State average, and natural conifer growth surplus in the Ouachita region is almost eight times the State average. However, data in table 6 also indicate a negative growth surplus (removals exceeding growth) in the Ozark planted pine component.

Sawtimber growth trends in the two region's national forests parallel the growing-stock trends (table 6). Total sawtimber growth is 15 percent less than the State average in the Ozarks and 6 percent less in the Ouachitas. However, hard hardwood sawtimber growth in the Ozarks is more than

**Table 6—National forest sector growth, removals, and growth surplus for growing stock by species group in the Ozark and Ouachita regions of Arkansas compared to statewide averages across all ownerships**

Species group	Ozark region	Ouachita region	Statewide
----- Cubic feet per acre -----			
<b>Growth</b>			
Planted pine	2.0	3.2	8.7
Natural conifers	10.1	22.7	18.5
Soft hardwood	4.2	1.3	5.0
Hard hardwood	25.8	10.8	12.6
All species	42.2	38.0	44.7
<b>Removals</b>			
Planted pine	3.2	.4	3.7
Natural conifers	6.4	14.9	17.6
Soft hardwood	.5	.2	4.8
Hard hardwood	4.0	1.7	9.2
All species	14.0	17.0	35.3
<b>Growth surplus</b>			
Planted pine	-1.2	2.8	5.0
Natural conifers	3.7	7.9	1.0
Soft hardwood	3.7	1.1	.1
Hard hardwood	21.8	9.1	3.4
All species	28.2	20.9	9.5

double the State average, and natural conifer growth in the Ouachitas exceeds the State average by about 30 percent.

Sawtimber removals are less than the statewide average in nearly all classes—less than half the statewide average in both the hardwood group and the total group (table 7), with the exception of planted pine removals in the Ozarks, which exceed the State average by > 35 percent.

Total sawtimber growth surplus for all species in both regions is double the statewide average (table 7). Hard hardwood growth surplus in the Ozark region is nearly five times the statewide average; and the natural conifer growth surplus in the Ouachita region is about four times that found statewide. However, as was reported for growing-stock data, removals of planted pine sawtimber in the Ozark region exceeded growth.

Generally, national forests of the Ozark and Ouachita regions are growing slightly less than the statewide average. However, removals are much less, resulting in a growth surplus that is more than double the State average across all species groups. The exception to these trends is found in the planted pine component within the Ozark region, where removals exceed growth, for both growing stock and sawtimber.

**Table 7—National forest sector growth, removals, and growth surplus for sawtimber by species group in the Ozark and Ouachita regions of Arkansas compared to statewide averages across all ownerships**

Species group	Ozark region	Ouachita region	Statewide
- - - - Board feet per acre - - - -			
<b>Growth</b>			
Planted pine	8.7	3.2	19.2
Natural conifer	43.8	137.4	101.2
Soft hardwood	9.5	3.7	19.5
Hard hardwood	95.3	29.8	45.8
All species	157.4	174.1	185.8
<b>Removals</b>			
Planted pine	15.6	1.7	11.5
Natural conifer	31.9	67.6	83.5
Soft hardwood	2.1	.2	15.5
Hard hardwood	12.7	1.8	33.5
All species	62.4	71.2	144.0
<b>Growth Surplus</b>			
Planted pine	-6.9	1.4	7.7
Natural conifer	11.9	69.8	17.7
Soft hardwood	7.3	3.6	4.0
Hard hardwood	82.6	28.0	12.4
All species	95.0	102.9	41.8

## DISCUSSION

Public forests have a more prominent big-tree character than private industry or NIPF ownerships in Arkansas. Both the national forest sector and the other public sector have higher levels of stocking, more area in sawtimber, and greater volume per acre than the private sector, relative to State averages. In the national forests, mortality is less than the State average; in the other public sector, hardwood mortality exceeds the State average, but conifer mortality is less.

National forest lands in Arkansas are found on poor-quality sites. Eighty percent of national forest lands falls within the poorest two site classes, compared to about 55 percent statewide. Such sites are disproportionately poor relative to timberland in all ownership categories statewide. Conversely, lands within the other public ownership class are highly productive—a fact related to the bottomland character of those timberlands. Growing-stock growth on other public timberlands exceeds the State average, both in soft hardwood and in hard hardwood species groups, testifying to the hardwood productivity of those lands.

As reflected in comparisons of current and past FIA data, timber on public lands has matured substantially. Between 1988 and 1995, there was a general decline in national forest seedling-sapling and pole timber stand areas.

However, there was a concomitant increase in sawtimber area associated with those declines. This is reflected in declining rates of harvest on the national forests, and the maturation of young stands. In the other public ownership class, sawtimber growth rates are roughly two, three, and five times the statewide averages in natural conifers, soft hardwoods, and hard hardwoods, respectively.

Hardwood forest types are predominant in the Ozark and the Ouachita regions, although only marginally so in the latter. Hardwoods have high rates of net growth, especially the hard hardwood group in the Ozarks. These data contradict a popular opinion that public lands in general, and national forests in particular, are becoming 'pine tree farms' at the expense of hardwoods. In fact, as evidenced by the area in pine plantations, the opposite appears to be the case.

National Forest System lands constitute a minority ownership in the Ozark region, where < 20 percent of timberland is national forest. About twice that proportion in the Ouachita is NFS timberland. This suggests that the vigorous debates about forest management in the Ozarks may be misplaced. Management on private timberlands, which is generally regulated far less effectively than management on public timberlands, undoubtedly has a far greater influence on the overall quality of the timberland resource in the Ozark region.

Survey data show a decline in forest acreage within the national forest ownership class. However, empirical evidence from annual reports by the Ouachita National Forest suggests that NFS acreage is actually increasing. The difference is due to changes in the manner that FIA calculates acreage. In 1988, FIA tabulated national forest acreage directly from its sample plots. In 1995, it used enumerated data, i.e., the known acreage of the NFS timberland base. This accounts for the apparent decline in acreage.

Planted pine sawtimber shows negative net change (removals exceed growth) in the national forests of the Ozark region. Although data from the Ouachita region did not show that planted pine removals exceeded growth, the trend was similar. However, the experimental error of the growth-and-removal estimates exceeds the reported differences. This trend is probably the result of a small sample size. Because there are not many FIA plots in planted pine stands in the national forests of the Ozark region, harvest within one plot may inordinately influence the trends present in the data. On the other hand, the pattern could indicate that some management actions in these planted pine stands contributes to the loss of volume. Despite its lack of statistical significance, this trend should be observed carefully over time.

Data suggest that 35 percent of national forest timberlands and 40 percent of those in the Ouachita region are overstocked. This is well above the State average. Whether or not this is a problem depends on one's perspective. The term overstocking is used to describe a stand where trees are densely packed to the point where timber growth

declines; thus, overstocking represents a lost opportunity for timber production. Overstocking has also been shown to affect forest health. Two of the most prominent threats to timberlands in Arkansas—the southern pine beetle and the gypsy moth—are both more damaging in overstocked stands. Conversely, dense stands represent a natural condition and provide desirable variation in forest habitat across a landscape. Thus, this observation may trigger debate on whether, and by what methods, Forest Service officials should manage overstocked stands.

The net growth of growing stock and sawtimber on the national forests is double the statewide average for hardwoods in the Ozark region and for natural conifers in the Ouachitas. Growth rates are below average on NFS timberlands, but removals are far below average. The result is a net growth rate for growing-stock volume and sawtimber volume that exceeds statewide averages by three to five times.

Finally, data suggest that Arkansas' public forests are continuing to grow in size and volume over time. Size-class distributions are increasingly of sawtimber size on public lands when compared to State averages. In some ways, this is even more remarkable within national forest timberlands, given their inherently poor sites. Data support the hypothesis that the public sector in general, and national forests in particular, feature mature, big-tree forest lands more than other ownerships in the State. Therefore, if one seeks large trees and mature stands, FIA data suggest that Arkansas' public lands are the best place to find them.

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