

HARDWOOD CHIP EXPORT MILLS IN ARKANSAS— IMPLICATIONS FOR SUSTAINABILITY

John L. Gray and James M. Guldin¹

Abstract—Two new hardwood chip export mills (HCEM's) recently began operating in west-central Arkansas, and a third is planned. Together, they will require 1.1 million tons of nonhickory hardwood roundwood annually, primarily from the nonindustrial private sector. Overall, total physical and operable growth surpluses could support the new sector, but purchasable surpluses are barely adequate now and may be less than adequate by 2005. The HCEM's will generate about 630 direct and indirect jobs and \$16.75 million in yearly wages and stumpage payments. However, if all of the new demand is met by unsightly harvesting methods, tourism-related job losses after 15 years could offset HCEM-generated employment. Because HCEM's will increase competition for hardwood, some small sawmills may go out of business, although the turnover of small sawmills was high even before HCEM's entered the market. The HCEM market for small hardwoods is less than ideal, but these mills can process "rough" and "rotten" trees. HCEM harvesting is generally not good forestry; to date, it has tended to take the best trees and leave the worst. This could improve if landowners were better informed and willing to reinvest following harvest. The effects of HCEM's on Arkansas hardwood forests as a whole are not expected to be great. Although protection of soils and water quality has been inconsistent, the new sector appears to be committed to provide such protection on lands they harvest. The authors present six recommendations designed to promote a positive effect of new sector operations on the sustainability of timber resources and other forest values.

INTRODUCTION

In 1995, a new market for hardwoods of pulpwood size and quality, primarily from the Arkansas and Oklahoma highlands, opened along the Arkansas River. In that year, two major hardwood pulp chip production mills—Guthrie Wood Fiber at Van Buren and Canal Wood Corporation of Arkansas at Menifee—began operations. In addition, the Corps of Engineers granted a permit to the Weyerhaeuser Company to build a third mill at Dardanelle, which is scheduled to start operations in 1998. Initially, all will produce hardwood pulp chips for export to the Pacific Rim—primarily Japan.

According to mill officials (Barfield 1996, Cooley 1996, Poor 1996a), 37 Arkansas counties are in the planned wood supply area (WSA) of one or more of the three facilities (fig. 1). When all three hardwood chip export mills (HCEM's) are in full production, they will require approximately 1.1 million tons of hardwood pulpwood per year. Relative to 1994 levels, this represents a 53-percent increase in hardwood pulpwood production statewide, a 15-percent increase in the total hardwood harvest in Arkansas, and a 34-percent increase in the total hardwood harvested from within the WSA (Levins 1996).

All three mills will be using hardwoods only; conifers will not be taken. In addition, the mills will not use hickory, which is difficult to debark. The facilities will take trees as small as 5 inches in diameter at breast height (d.b.h.)—6 to 8 inches in diameter at the stump. They will also be able to process

trees in the Forest Inventory and Analysis (FIA) "rough" and "rotten" quality category (Barfield 1996, Cooley 1996, Poor 1996b).

An expanded demand for low-grade hardwoods provided by the HCEM's could be welcomed as a positive contribution to Arkansas' timber-based economy. The new market might also offer nonindustrial private forest (NIPF) landowners an opportunity to improve hardwood forest health, productivity, and personal income by selling the worst and keeping the best.

Instead, however, the market's arrival has been highly controversial. The chip export mill issue has been a subject of critical newspaper stories, organized opposition, petitions to the Corps of Engineers to reconsider permits for mill operations, and attempts to restrict expansion of the sector through legislation. The environmental community has voiced its concern and, less publicly, so have some individuals in the forestry and forest industry communities.

The new sector relies entirely on hardwoods, especially oaks. Oak is the most valued and valuable component of upland hardwood forests in the Interior Highlands and dominates Coastal Plain hardwood stands as well. The large-tree character of Arkansas hardwood forests is due mainly to the oak genus. Oak mast is among the most flexible food sources for wildlife. It is generally used by a broad array of species and an even broader array of game species than any other soft or hard mast in the State's forests.

¹ Forestry Program and Policy Consultant, Little Rock, AR, and Research Forest Ecologist, Southern Research Station, USDA Forest Service, Hot Springs, AR, respectively.

Citation for proceedings: Guldin, James M., comp. 2001. Proceedings of the symposium on Arkansas forests: a conference on the results of the recent forest survey of Arkansas; 1997 May 30–31; North Little Rock, AR. Gen. Tech. Rep. SRS–41. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 125 p.

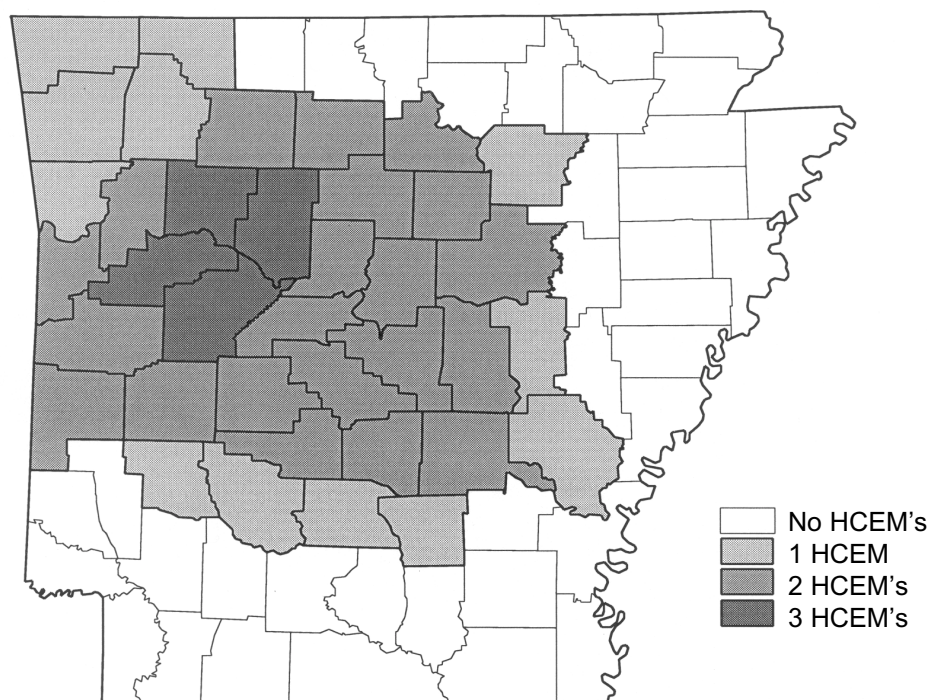


Figure 1—Counties in Arkansas in the wood supply area of the new sector. Shading indicates the number of the three hardwood chip export mills (HCEM's) that have identified a county in their procurement area.

In addition, leisure travel and tourism are big business within the WSA. The area includes seven of the top 10 total-travel counties in Arkansas (Arkansas Department of Parks and Tourism 1995) and 32 of the 42 prime leisure-travel counties (Shiflet 1996). This is particularly true for the 10 Ouachita and 17 Ozark Highland counties. The main reason that out-of-state tourists visit Arkansas is "scenic natural beauty" (Davies 1997); autumn has become a major tourist season, and the Ozarks rank second only to New England for fall color (Davies 1997).

Wood chipping and chip mills are not new in Arkansas. The first pulp and paper mill facility with mill-drum debarker and chipper went into operation at Camden in 1928. Since 1956, sawmills have used log debarkers and chippers to process sawmill and veneer waste. Free-standing, stationary, satellite chip mills (similar to the three export mills but producing chips primarily for use by domestic pulp and paper mills) have been in place since 1971. Arkansas now supports seven such mills with a combined total annual chip production of nearly 1.8 million tons, 63 percent of which is hardwood (Edwards 1996).

Similarly, increases in hardwood demand and harvesting in Arkansas are not new. Between 1985 and 1995, total hardwood tonnage harvested for all products increased over 12 percent statewide and over 10 percent within the WSA (Levins 1996). Between 1954 and 1994, statewide production of hardwood pulpwood increased by 630 percent (Levins 1996). In spite of these increases, the three most

recent FIA reports (Staff: Renewable Resources Evaluation Research Work Unit 1979, Hines and Vissage 1988, London 1997) have shown continuing, statewide increases in total hardwood inventories on all timberland ownerships for growing stock of both pulpwood size and of sawtimber size (fig. 2).

The 1.1-million-ton requirement of the three mills could come from any of three sources. The first is forest industry lands. Two of the three mills do not own forest lands within the WSA. The third is operated by a major forest industrial landowner, which expects to draw about 5 percent of its hardwood pulpwood requirements from its own holdings (Cooley 1996). In this analysis, the third mill's probable tonnage requirement was reduced by that percentage.

The second possible source is national forest timber. Two mills do not plan to purchase such timber because of potentially negative public opinion; the third would do so "if offered" (Barfield 1996, Cooley 1996, Poor 1996b). However, the Ouachita National Forest is not offering hardwood in its regular sales program, nor does it intend to do so (Hammond 1997). Between now and 2005, the Ozark National Forest plans to sell 102,000 tons of hardwood timber annually: 63,000 tons of sawtimber, but only 39,000 tons of pulpwood. So far, there have been no sales to either of the two functioning HCEM's (Minehart 1997).

The authors assume that the 1.1-million-ton annual requirement will be met by hardwoods removed from NIPF

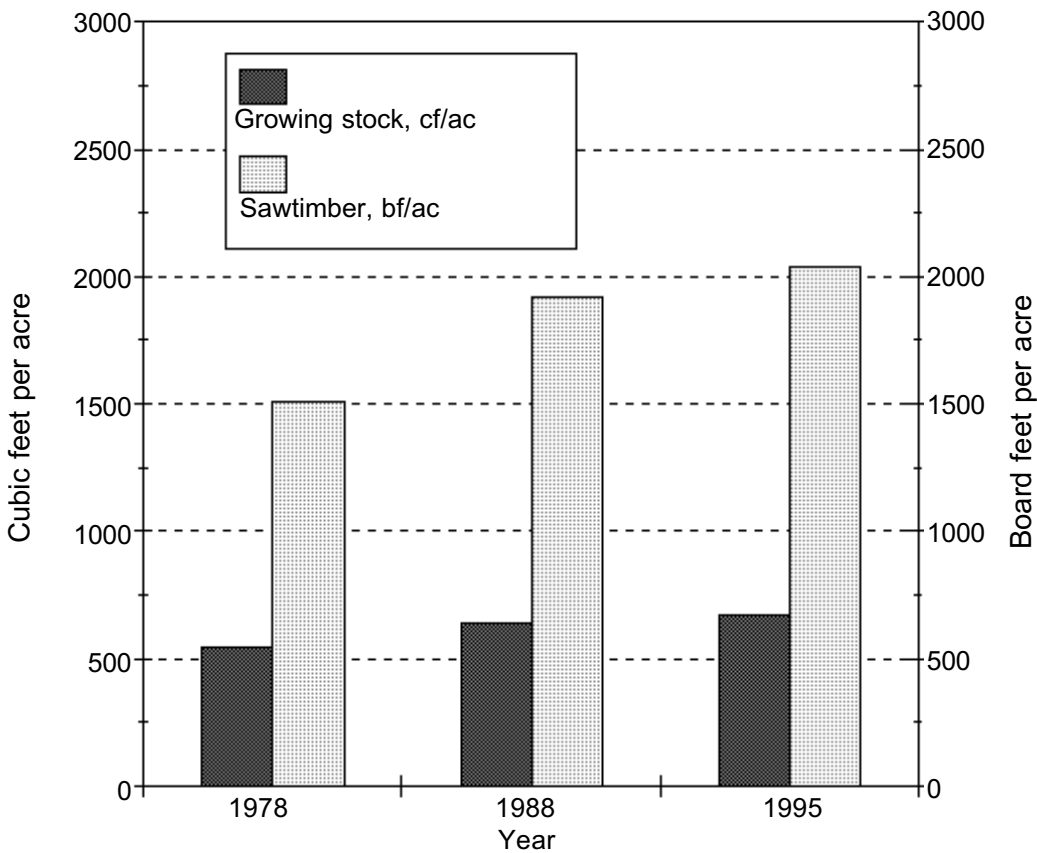


Figure 2—Changes in hardwood growing stock and hardwood sawtimber from 1978 to 1995 in Arkansas.

lands within the WSA. A major concern about the new sector is that its increased demand and harvest will, over time, produce a hardwood growth deficit with resulting declines in both inventory and growth on NIPF lands. Over the long term, this would reduce supply both for the new sector and for the 228 hardwood mills now operating within the WSA that currently depend on NIPF owners for all or part of their timber supply.

The objectives of this analysis are to quantify the hardwood resource sustainability of HCEM sector operations; examine job benefits and impacts that the new sector provides; discuss the silvicultural characteristics of the new sector; and review the new sector's commitments to protecting soil and water resources.

METHODS

Data from the recently completed FIA report for the State of Arkansas (London 1997, Rosson 1997) were used to evaluate sustainability relative to the new sector's operations. The authors analyzed other available data provided by Arkansas forest industry sources, Arkansas government officials, and others. Two broad categories of questions were addressed—economic and environmental.

Economic Questions

Sustainability of timber supply—FIA data from the 1995-96 survey were used to calculate existing rates of growth

and removals in nonhickory hardwoods within the WSA; sustainability was evaluated by comparing net growth and removals (London 1997, Rosson 1997). Total physical supply was calculated as the nonhickory hardwood growth and removal levels for all timberland ownerships. Operable supply was calculated as the annual nonhickory hardwood growth and removal levels for all NIPF timberlands, subject to constraints imposed by steepness and wetness. Lands with 33 percent or greater slope were excluded, as were lands within the wetland elm-ash-cottonwood and cypress-tupelo types and the oak-gum-cypress subtype. These three limitations—ownership, steepness, and wetness—eliminated 53 percent of the total timberland area in the WSA. Annual growth and removals on the remaining 5.1 million acres form the basis for “operable supply.”

However, not everyone who owns forested acreage is willing to sell. In a recent survey of the opinions and attitudes of Arkansas NIPF owners, Williams and Voth (1996) found that 7 percent of NIPF land statewide and 19.3 percent of such land in the Ozarks were owned by those who had sold no timber nor had any plans to do so. The “purchasable supply” was, therefore, based on either 93 percent or 80 percent of operable growth.

Growth surplus was defined as the difference between growth and removal. But in table 1, growth surplus includes 75 percent of the nonhickory hardwood “rough” and “rotten”

Table 1—Timber supply sustainability on NIPF-owned forest land in the 37-county wood supply area. Supply is nonhickory hardwood. Growth surplus is hardwood growth minus hardwood removals, and includes 75 percent of “rough” and “rotten” nonhickory hardwood growth surplus. Hardwood removals are for existing industry, not HCEM’s

Type of supply	Hardwood growth	Hardwood removals	Rough and rotten	Growth surplus
----- Million tons -----				
1995				
Operable supply	3.4	1.8	0.3	1.9
Purchasable supply				
93% level	3.2	1.8	.3	1.7
80% level	2.7	1.8	.2	1.1
2005				
Operable supply	3.4	2.0	.3	1.7
Purchasable supply				
93% level	3.2	2.0	.2	1.4
80% level	2.7	2.0	.2	.9

growth surplus because HCEM’s are capable of using such material. The authors assumed that the two functioning HCEM’s had no impact on growth and removals reported in the latest FIA report since they did not begin to accept pulpwood until 1995. Therefore, all removals were attributed to the current hardwood industries.

The data also were projected to the year 2005, when the next FIA report is expected. Three assumptions followed: (1) there would be no change in hardwood growth rate; (2) there would be no expansion of the 1.1-million ton yearly wood requirement of HCEM’s; and (3) removals attributed to the preexisting hardwood industry would increase by 10.2 percent. This increase was based on the percentage increase in hardwood severance tax receipts between 1985 and 1996 within the WSA (Levin 1996).

Economic benefits of the new sector—Direct economic benefits of the new sector were assessed by interviewing mill officials. Direct employment included all mill workers and company procurement personnel and all loggers (whether under contract to the mill or working independently). Employment data included office staff and others whose jobs are directly linked to the mill. Direct payroll was then calculated according to standard rates of compensation per worker in the appropriate lumber and wood products industrial code category (U.S. Bureau of the Census 1994). Indirect employment data were obtained by applying the 1.7 Type 1 all standard industrial classification multiplier for Arkansas’ primary forest products industry to the direct employment data (Kluender and others 1991), and the average annual wage from that same category was applied to indirect employees to determine indirect payroll generated (U.S. Bureau of the Census 1994).

Economic effects on tourism—The effect of increased unsightly hardwood harvesting on tourism will be highly variable, depending on the size of area harvested, the pattern of harvests, the distance from the viewer, and the presence or absence of hickory, cedar, pine or other kinds of trees remaining after harvest. Location is critical. Unsightly harvesting can be especially serious in the viewsheds of scenic corridors, along approach routes to local, State, and Federal outdoor recreation areas, or along scenic and recreational stretches of streams. Depending on location and adjacent land use, unsightly harvesting may or may not have a serious negative effect on real estate values. The visual effect also will depend on what the landowner does with the cutover areas following harvest. For this reason, a detailed analysis of tourism effects would require spatially explicit information on sale locations, which FIA data do not provide.

In lieu of having such information, the authors have sought to link job loss in the tourism industry directly with increases in unsightly harvest. McLemore (1997a) suggested that the following formula be used to estimate the percent loss over time in jobs and payroll due to the effects of increased hardwood harvesting.

$$\text{Percent loss} = \frac{(\text{Area harvested annually}) (\text{Recovery time})}{\text{Total hardwood forest area in the WSA counties}}$$

The annual HCEM harvest requirement, at 1.1 million tons, will be produced by a combination of clearcutting and other harvest methods. However, the proportions by harvest method are not known. Therefore, three levels of clearcutting were considered—20 percent, 50 percent, and 100 percent. Williams and Voth (1996) reported that 20 percent of the forest land area sold by NIPF landowners

Statewide was sold on an “all-merchantable tree” basis; the other levels were based on statements by mill officials (Barfield 1996, Poor 1997).

The duration of visual effects depends on “recovery time”—time required to “green up” and lose its unattractive appearance, and the time required to recover full fall color attractiveness. Experts identified two recovery times for clearcut areas—10 years to “green up” and 30 years to recover fall colors (Davies 1997, McLemore 1997a). Both time frames were used to assess potential negative impacts.

To simplify the analysis, the authors assumed that all trees harvested, of both pulpwood and sawlog size, would be chipped. This approach does not consider the possibility that purchasers would sort sawlogs from pulpwood and sell them to sawmills (“merchandising”) because there were no data available to quantify that effect. Ignoring the impact of merchandising, the harvested material results in a conservative estimate of the possible effects on tourism. Merchandising would require the HCEM’s to harvest a larger area in order to meet the 1.1-million-ton annual requirement.

Effects on existing industry—The new sector’s requirements will produce a market over and above that which currently exists for hardwoods in Arkansas. Will the new mills have an adverse effect on the existing hardwood-using? To examine this, the authors calculated changes in the hardwood industry within the WSA between 1984 and 1994, based on comparing listings in the directories of the Arkansas Forest Products Industry (Arkansas Forestry Commission 1984a, 1994). Recent changes in existing hardwood mills were used as a basis for estimating possible effects of the new HCEM sector.

Environmental Effects

Resource attributes of new sector—Foresters often say that hardwood management options are limited by the lack of a market for hardwood pulpwood. Thus, the first thought of many foresters is to welcome the expanded hardwood pulpwood market created by HCEM’s since it should make selling hardwood pulpwood easier. However, the ideal market for small hardwoods and the market provided by HCEM’s may not be the same.

An ideal market for hardwood pulpwood would:

1. Take large trees not suitable for sawlogs, e.g., culls, “rough” and “rotten” trees, and others of poor form and condition that could not be sold as sawlogs regardless of size.
2. Have no limitations on acceptable species; all hardwoods, not just certain kinds, would be merchantable.
3. Take the material otherwise wasted—pulpwood from small trees and tops from sawtimber trees—during thinnings in sawtimber-sized hardwood stands.
4. Take the pulpwood and tops from pulpwood-sized trees within hardwood stands that are not yet of sawtimber size, or stands that are of a marginal sawtimber size.

The authors used observations, experience, and interviews with mill officials to subjectively determine the degree to which the new sector will provide an ideal market.

HCEM harvesting and good forestry—Scientists and others in the professional community have speculated about the impact of HCEM harvesting on the hardwood resource. Based on field observations of stands subject to HCEM harvest and current knowledge about oak regeneration, the authors have identified possible combinations of harvest and followup treatment associated with HCEM operations on NIPF lands:

1. Thinning from below, to improve existing poletimber or sawtimber stands. No immediate followup treatment is needed. Such stands will remain dominated by oaks after harvest and should continue to be dominated by oaks over time.
2. Clearcut the merchantable hardwoods; conduct site preparation to remove the unmerchantable trees and regenerate the stand using seedling sprouts and stump sprouts. Regeneration should have a prominent oak component, and over time, should develop into an oak-dominated hardwood stand.
3. Clearcut the merchantable hardwoods; conduct site preparation to remove the unmerchantable trees and plant pine seedlings. Regeneration should be dominated by pines with some hardwoods, and, over time, should develop into a fully stocked pine or pine-hardwood stand.
4. Harvest all desired species of commercial size, with no followup treatment. Regeneration should have some oaks, but these may be suppressed by hickory, cedar, and other unmerchantable trees that were not cut. Over time, this stand will probably develop into a marginally stocked, poor-quality hardwood stand with a low percentage of oak.
5. Following harvest, convert the land to a nonforest use, such as pasture. The area would, therefore, be removed from the forest land use category.

Areas harvested by the new sector will be compared to conditions described in this subjective classification, based on field observation.

Loss of hardwood forests under new sector

harvesting—There is concern that HCEM harvest of upland hardwoods will lead to a major decline in hardwood forest area in the WSA. Recent FIA data (London 1997, Rosson 1997) were used to calculate the average volume of nonhickory hardwood on NIPF land within the WSA. This statistic was then used to determine the annual area harvested, given the 1.1-million-ton demand of the new sector. Comparing this to the total forested area within the WSA provided a realistic percentage of possible hardwood forest loss.

Protection of soil and water resources—Passage of the Federal Water Pollution Control Act of 1972 (Public Law 92-500) codified national water quality goals and the process required to reach them. That process led to the identification and approval in 1981 of a set of Best Management Practices (BMP’s) for silviculture in Arkansas

in conformance with guidelines established by the Environmental Protection Agency. BMP's are designed to control nonpoint sources of pollution at a given site such as a harvesting operation.

Arkansas' silvicultural BMP's are voluntary, not regulatory (Arkansas Forestry Commission 1984b). The guidelines apply to soil and water protection, location of log landings, skid trails, drainage, road construction, treatment of waste and chemical materials, stream protection, maintenance of productivity, and related values. As stated in the "Best Management Practices Guidelines for Silviculture" issued by the Arkansas Forestry Commission, application of BMP's is "directed toward the prevention of water quality problems" (Arkansas Forestry Commission 1984b).

The authors conducted a subjective evaluation of compliance with BMPs based on visits to four sites harvested by chip mill operators. Interviews with company officials provided information about the direction that companies will follow with respect to future BMP compliance.

RESULTS

Economic effects

Timber supply sustainability—Findings are shown in table 1. Data show operable growth surpluses of 1.9 million tons now and 1.7 million tons in 2005, exceeding the HCEM's 1.1-million-ton need. In other words, growth of the operable hardwood resource on NIPF lands within the WSA exceeds the demand of both the current industry and the new sector, both now and in 2005.

However, this does not take into account owner willingness to sell. Purchasability is the key. If 93 percent of the growth and inventory is purchasable, growth surpluses are reduced to 1.7 million tons now and 1.4 million tons in 2005. These volumes also exceed HCEM needs. If only 80 percent of the growth and inventory is purchasable, the 1.1-million-ton growth surplus barely equals the current HCEM demand. In 2005, at 0.9 million tons, the growth surplus would fall 200,000 tons short.

Thus, for industries within the WSA that will depend on NIPF timber for all or part of their supply, landowner willingness to sell is the key factor for purchasable supply sustainability now and in any plans for future expansion. If purchasability falls below 80 percent, supplies will not be sustainable from growth alone.

Economic benefits of the new sector—Table 2 lists the direct and second-round indirect effects of the new sector on Arkansas' economy. The HCEM's will directly employ 370 people, and the need to fill indirect or support positions will create 263 additional jobs. Therefore, 633 total new jobs will be generated.

In terms of new annual payrolls, earnings of direct new employees will be about \$6.7 million, and the indirect payroll about \$5.2 million, for a combined total of nearly \$12 million.

Table 2—Positive annual economic benefits of the new HCEM sector in Arkansas

Category	Number of jobs	Yearly dollar value
Employment and payrolls		
Direct new jobs	370	\$ 6,663,000
Indirect new jobs	263	\$ 5,253,000
Total	633	\$11,916,000
Payments to landowners		
Purchase of standing timber		\$ 4,750,000

A second positive effect will be the income landowners receive from timber sales to the new sector. In 1996, the average Statewide price paid for standing hardwood pulpwood was \$4.46 per ton (Timber Mart-South 1996). When this price is applied to the new sector's 1.1-million-ton yearly wood requirement, annual payments to landowners will total \$4.75 million. In a number of counties, this represents a market for hardwood pulpwood that did not exist before.

Economic impact on tourism—Table 3 shows that the tourism industry supported approximately 11,250 direct and indirect jobs in 1995 within the WSA (Arkansas Department of Parks and Tourism 1996, McLemore 1997b). This includes full- and part-time jobs. Direct and indirect annual payrolls totalled \$161 million (McLemore 1997b, U.S. Bureau of the Census 1994). Total direct expenditures by leisure travelers and tourists were about \$460 million annually.

Table 4 shows annual, 10-year, and 30-year potential cumulative job and payroll losses that would be expected under various rate levels of clearcutting. At the 20-percent level, cumulative job and payroll losses under either the 10-year "greenup" period or the 30-year fall color recovery period are relatively minor (except for the affected employees). At the 50-percent or 100-percent levels, cumulative effects are more dramatic. For example, at the 50-percent level with a 30-year recovery period, the loss of

Table 3—Jobs, payroll and expenditures for recreational travel and tourism in the WSA

Category	Number of jobs	Yearly dollar value
Tourism jobs and payrolls		
Estimated direct jobs	7,600	\$ 88,100,000
Additional indirect jobs	3,648	72,900,000
Total	11,248	\$161,000,000
Annual expenditures		
Recreational travelers and tourists		\$460,000,000

Table 4—Potential negative impact on leisure travel and tourism yearly direct and indirect jobs and payrolls in the 37-county sourcing area in Arkansas of different rates of increase in annual pulpwood-type clearcutting and recovery periods

Rate of clearcutting	Acres clearcut annually	Potential job losses		
		Annually	After 10 years	After 30 years
----- Number of jobs -----				
Potential job impact				
220,000 tons (20%)	5,300	7.6	76	227
550,000 tons (50%)	14,600	20.8	208	625
1,100,000 tons (100%)	29,200	41.7	417	1250
----- Million dollars -----				
Potential payroll impacts				
220,000 tons (20%)	5,300	0.11	1.08	3.25
550,000 tons (50%)	14,600	0.30	2.98	8.94
1,100,000 tons (100%)	29,200	0.60	5.96	17.89

direct and indirect jobs is nearly equal to those created by the new sector, and payroll losses are nearly 75 percent of the new sector's payroll. At the 100-percent level, the cumulative job loss is nearly double that of the new sector, and payroll losses are 50 percent greater than payroll gains.

Effects on the current hardwood industry—In 1994, there were 536 primary and secondary wood product manufacturing concerns in Arkansas (Arkansas Forestry Commission 1994). Within the WSA, 228 were identified that required hardwoods or hardwoods and other species as their raw material. One hundred and thirty-eight accepted hardwoods only. Table 5 lists the 228 facilities by category and type. Sawmills and sawmill-planing mills predominate the list with a total of 146. One hundred and fifteen of this total were in the two smallest production capacity categories (processing less than 3 million board feet of logs annually).

Unlike the leisure travel and tourism sector, no source of data is available to tie employment and payroll to hardwood-using manufacturers within the WSA. Nor is there a rational way of using any available data to quantify the impact of the new sector's effect, positive or negative, on the current industry.

As shown in table 1, operable growth and purchasable growth at the 93-percent availability level would support the

Table 5—Hardwood-using manufacturers in the WSA in Arkansas

Category	Type	Number of facilities
Primary	Sawmill	123
	Sawmill-planer mill combination	23
	Handle blank	3
	Pulpmill (and paper)	1
Subtotal		150
Secondary	Furniture	32
	Furniture parts	4
	Pallets	19
	Finished lumber and millwork	12
	Flooring-panelling	3
	Wood treating	3
	Containers	2
	Handles	1
	Musical instruments	1
	Picture frames	1
Subtotal		78
Total		228

combined needs of current and new sector mills that depend wholly or partly on NIPF-owned timber. In 1995, the combined needs could be met with purchasable growth at the 80-percent availability level, but not in 2005, when it would fall short.

However, small sawmill survival was volatile before the introduction of HCEM's. From 1984 to 1994, 141 hardwood mills, or 38 percent of the 1984 total in WSA counties, went out of business, and 82 of them were small sawmills (Arkansas Forestry Commission 1984a, 1994). So, increased competition for the purchasable supply, coupled with likely increases in timber prices and wood costs, may simply reinforce the existing downward trend in small sawmill survival.

Environmental Effects

Resource attributes of the new sector—A subjective assessment of how HCEM's would address the four criteria used to describe the ideal hardwood pulpwood market led the authors to the following conclusions:

1. The new market can use large trees that do not have sawlog potential. Mill officials, as well as evidence in several recently cut areas, suggest that HCEM's process about three-quarters of the "rough" and "rotten" trees, which are often the unmerchantable sawtimber-sized component not removed in earlier selective sawtimber harvests.

It follows that the new sector provides a market for larger trees of poor form and quality. As discussed in the section on timber availability, FIA data show that this market could provide 200,000 to 300,000 tons annually. However, the poorest of the "rough" and "rotten" trees, such as those that are hollow within a significant portion of the bole, may not be taken. Nonetheless, leaving some of these could help maintain or enhance wildlife habitat.

2. The new market does not use all species of hardwoods. The HCEM's prefer oaks but also take most other hardwoods. However, they do not take hickory because of the physical difficulty in removing its bark. The FIA data show that for the typical NIPF stand within the WSA hickory accounts for 16 percent of all live hardwood trees per acre and 12 percent of the growing stock volume (Rosson 1997). Thus, HCEM harvest is "selective" by species. If necessary followup treatments are not carried out, the remaining forest is likely to become dominated by hickory and other unmerchantable trees.

3. The HCEM's can use pulpwood and tops left following harvest of hardwood sawtimber. However, mills will not actively solicit this material. Instead, they will accept it as "gatewood", delivered to the mill by independent loggers who are not under contract with them. In the past, opportunities to use hardwood pulpwood resulting from sawlog harvests were limited. The expanded pulpwood market will allow delivery of small volumes of pulpwood and tops which, if sold separately, might not be marketable.

4. In the authors' opinion, pulpwood thinning in pulpwood-sized hardwood stands is impractical. Company officials

reported that they require a minimum harvest of between 15 and 25 tons per acre. According to FIA data, an average NIPF hardwood stand within the WSA contains between 30 and 37 tons per acre. A thinning operation would yield only about 12 tons per acre from the pulpwood-sized trees (6 to 10 inches in d.b.h.) Additional harvest and use of some sawtimber-sized trees for chips would be needed to yield the minimum tonnage per acre.

The authors feel that HCEM's meet only the first and third criteria for an ideal market, and that the third would not deliver the required volume. Therefore, the prospect that HCEM's might fill an ideal hardwood pulpwood market in Arkansas is limited.

HCEM harvesting and good forestry—Of the five possible outcomes of HCEM harvesting, one converts the site to nonforest use. A second does nothing to ensure future stocking with desirable and productive hardwood stands dominated by oaks. Two restore productive forests—one in hardwoods and the other in pine—but only at substantial followup cost to the owner. They both require a classic silvicultural clearcut and, because of the followup treatment, will appear to the public to be even more intensively disrupted than by the initial harvest. The fifth alternative improves stand growth and development but requires a well-stocked stand initially, which is relatively rare.

Unfortunately, the easiest thing for the landowner to do, which provides the greatest income in the short run, is to perform no followup treatment. Such harvest would constitute little more than a high-grading to a pulpwood diameter limit. This is not good forestry.

Loss of hardwood forests under new sector

harvesting—The FIA data show that an average acre of NIPF hardwood type forest land of commercial size within the WSA contains 37.6 tons of nonhickory hardwoods per acre, including 5.7 tons of "rough" and "rotten" material (Rosson 1997). To meet the 1.1-million-ton requirement, and assuming all of the volume on an average acre is harvested, HCEM's would have to carry out approximately 29,200 additional acres of commercial timber harvests each year.

The same data show that hardwood-type forests in all ownerships within the WSA total 7.9 million acres (Rosson 1997b). Assuming that the total HCEM need is met through clearcutting NIPF hardwood forests of commercial size, the area clearcut annually (cf. table 5 at the 100-percent level) would amount to 29,200 acres, or 292,000 acres in 10 years. If all this acreage was taken out of forest use, the 10-year loss of forest would amount to 3.7 percent within the WSA, and 1.6 percent Statewide. This is a relatively minor reduction. Also, because some landowners will reforest their harvested lands using natural or artificial regeneration, the actual loss should be less.

Protection of soil and water resources—Of four sites visited by the authors that were harvested by chip mill operators, two did not meet BMP standards. One company, however, provided a written policy statement, and officials

of a mill not yet operating pledged to take positive steps to improve BMP compliance. Two of the three have indicated they will not accept wood from sites where BMP's are not followed. One has hired a BMP staff person whose primary duty will be to ensure compliance with BMP provisions.

DISCUSSION

In the previous sections we have considered four economic and four environmental concerns associated with the installation and operation of three hardwood chip export mills within a 37-county wood supply area in west-central Arkansas. These issues and concerns reflect the vital interests of individuals, industries, and communities statewide.

The following questions address these issues and concerns, and the discussions summarize evidence presented in the previous sections.

Is HCEM harvesting sustainable? Yes, if only the total physical and operable supply of nonhickory hardwoods on NIPF lands is considered. However, assuming the more realistic purchasable supply premise, sustainability may be marginal now and submarginal in the future. If owners of 20 percent or more of the NIPF operable hardwood timber growth and inventory within the WSA are not willing to sell at any price, the harvest of purchasable timber, by both existing mills and the HCEM's, exactly balances growth in 1995; harvest may exceed growth by 2005.

What will HCEM's contribute to the economy? They will provide about 630 direct and indirect new jobs, with a combined \$11.9 million annual payroll, and \$4.75 million in payments annually to landowners who sell their timber.

Will HCEM harvests hurt the tourism industry? The analysis is simplistic and inconclusive. However, rough calculations indicate that if all of the HCEM requirements are met by unsightly harvests, cumulative tourism-related job losses after 15 years could offset the employment generated by these mills.

Will the big new mills drive small sawmills out of business? This is unlikely. A large number of small sawmills in the WSA went out of business in the 10 years preceding the arrival of HCEM facilities. Greater competition for purchasable timber and possible price and cost increases will have an added effect on less efficient operations.

Do the new mills provide an ideal market for small hardwoods? Not exactly. They fall short of the ideal by being unable to take hickory or to thin pulpwood profitably from below in immature stands. However, they do take "rough" and "rotten" trees that were not salable before.

Is HCEM harvesting good forestry? Probably not, as it is being applied in a majority of cases. Empirical observations suggest that it is more oriented to cutting the best trees and leaving the worst, rather than the other way around. Nonetheless, there is potential for improvement if landowners are better informed and willing to maintain productive trees for additional growth or invest in regeneration following harvest.

Will harvesting by the new sector lead to a major loss of hardwood forests? Not to any great extent. In the most extreme situation, in which 100 percent of the new sector's need is met by unsightly harvesting with all of the cutover area converted to pasture or cropland, total hardwood forest area within the WSA would be reduced by only 3.7 percent. The actual decline should be considerably less.

Will soil and water resources be protected? The jury is still out on this one. Empirical evidence suggests that some sites are harvested in compliance with BMP's, others are not. Apparently, the HCEM owners are convinced that BMP's are important and are committed to working with landowners and loggers to apply them. Two of the three interviewed indicated that they would decline to buy from landowners unwilling to do so.

RECOMMENDATIONS

Based on these discussions, the authors developed six recommendations which, if implemented, would considerably improve the likelihood that the new sector will be a positive influence in the economy and environment within the WSA.

HCEM Responsibilities

The new sector's mill owners cannot harvest a single acre in the WSA without the landowner's signature on a contract. Clearly, the landowner has a legal right to disregard BMP standards and sell every tree, right down to the edge of the creek. However, no law forces a responsible forest products company to buy from an irresponsible seller. The public, fairly or unfairly, is more likely to blame the buyer. The buyer also has rights, which include the right to "walk away" from dealing with landowners who disregard appropriate forestry practices.

We suggest that HCEM's should be prepared to "walk away" from landowners unwilling to implement BMP standards. One company official has indicated that it is now doing this and a second says they plan to do so. The HCEM's also should consider "walking away" from clearcutting immature stands and from unsightly harvests in visually sensitive areas.

NIPF Owner Education

Within the WSA and statewide, NIPF owners hold title to two-thirds of the hardwood forest area. Yet, as a group they have the least knowledge of forest management and marketing options that fit their individual situations and goals. A major educational program in hardwood forest management and marketing options would help landowners make better decisions.

As much as possible, public agencies like the Arkansas Forestry Commission, the Cooperative Extension Service, and the Natural Resources Conservation Service should concentrate educational resources on these themes and within this area of the state. For example, the Arkansas Forestry Commission might refocus its current educational emphasis from public affairs to landowner education. The new Landowner Education and Assistance Initiative of the

Arkansas Forestry Association should give it a high priority as well.

NIPF Professional Advice and Assistance

Although owner education is important, helping the individual landowner decide specifically what to do on “the back forty” and how best to get it done is also important. One-on-one professional advice and assistance are often the key to a landowner’s success. Primary providers of such advice and assistance are the Arkansas Forestry Commission’s county foresters (33 statewide) and private consulting foresters (28 individuals or firms statewide). Landowners should be made aware of who they are and how to contact them.

Landowners who are looking for a more impartial source of professional advice and assistance than they feel is available from HCEM procurement foresters should be referred to their county forester before making a decision on whether or not to sell timber.

In addition, many professionals would benefit from state-of-the-art factual information on the latest practical advances in hardwood management. Research scientists and extension specialists can help by developing field guidelines for upland hardwood regeneration and by training county foresters, consulting foresters, and HCEM procurement foresters in their use. A “manager’s handbook” for Arkansas’ upland hardwood forests, including photographs of representative forest situations, which would help landowners visualize harvesting options and their outcomes, also would be helpful.

Focus Programs on More Than Just Timber

As Williams and Voth (1996) brought out, educational and professional assistance programs should be tailored to help landowners reach a variety of goals, ranging from cattle grazing to improving wildlife habitat and recreational values, particularly in the Highlands. A program that emphasizes timber production and marketing only, to the exclusion of other resources and goals, will be ignored by owners with nontimber goals.

Programs should also focus on getting the biggest resource impact per dollar spent on education and professional assistance. A special effort should be made to communicate with landowners in the largest ownership size category. In the Ozarks and the Ouachitas, the 11 percent who hold 250 forest acres or more account for 55 percent of all nonindustrial private forest land.

Explore Ways to Use Hickory

The new sector should explore every possibility for utilizing hickory. Companies should ask whether increasing yield by 12 percent from harvested areas would, over the long term, be worth the additional cost of sorting out, treating, and storing hickory.

Although it is easy to recommend that mills harvest hickory, it will be difficult to make such harvest technologically feasible. One step would be for the hardwood fiber-using sector as a whole to ask the Technical Association of the

Pulp and Paper Industry (TAPPI), in partnership with the American Pulpwood Association and the USDA Forest Service Forest Products Laboratory in Madison, Wisconsin, to convene a select group of scientists, wood technologists, and manufacturers throughout the South for a state-of-the-art analysis of debarking and chipping hickory.

Survey of NIPF Owners Who Have Sold Timber to HCEM’s

The authors recognize that this analysis has many shortcomings. A major one is the lack of input from NIPF owners within the WSA who have sold hardwood pulpwood to the new sector. What was their goal in doing so? Was it met? If not, why not? Would they recommend that other NIPF owners sell to this sector? Why or why not? What information did they not have that other NIPF owners should have before making such a decision? Did they know where to turn for information and assistance? What help did they need that they did not receive? Were they made aware of BMP standards? Were these followed? If not, why not?

The Arkansas Forest Resources Center of the University of Arkansas has recently funded a formal study of the economic and socio-economic effects of the HCEM’s in the Ouachita and Ozark regions. The study should include a survey of NIPF owners who have sold timber to HCEM’s. Without such input, efforts to improve the use of this new market opportunity to the advantage of all involved, and to the resources, could fail.

ACKNOWLEDGMENTS

In preparing this paper, the authors visited, conferred, and corresponded with scientists, HCEM officials, former chip mill managers, professional colleagues in forestry, tourism, and recreation, and certain members of the environmental community. We are grateful to all who shared their knowledge and opinions with us. We express special thanks to Bob Levins, Paul Dahl, Jim Rosson, Charles McLemore, Rick Williams, and Dick Kluender. Our charter was to summarize, on as factual a basis as possible, the sustainability of the new sector. Any errors in fact or interpretation are ours alone.

REFERENCES

- Arkansas Department of Parks and Tourism.** 1995. Statewide comprehensive outdoor recreation plan (SCORP). Little Rock, AR: Arkansas Department of Parks and Tourism, State Parks Division. Unnumbered report. 150 p.
- Arkansas Forestry Commission.** 1984a. Arkansas forest industry directory. Little Rock, AR: Arkansas Forestry Commission. Unnumbered publication.
- Arkansas Forestry Commission.** 1984b. Best management practices for silviculture. Little Rock, AR: Arkansas Forestry Commission, Unnumbered publication.
- Arkansas Forestry Commission.** 1994. Arkansas forest industry directory. Little Rock, AR: Arkansas Forestry Commission. Unnumbered publication. 91 p.
- Barfield, John W.** 1996. President, Canal Wood Corporation of Arkansas. Personal communication, 28 September 1996.

- Cooley, M.** 1996. Raw Material Manager, Weyerhaeuser Co., Russellville, AR. Personal communication, 30 September 1996.
- Davies, Richard.** 1997. Executive Director, Arkansas Department of Parks and Tourism. Based on interview, 9 January 1997.
- Edwards, D.** 1996. Lumbermen's buying guide. Timber processing. 21(6): 30–81.
- Hammond, David.** 1997. Deputy Forest Supervisor, Ouachita NF, Hot Springs, AR. Personal communication, 3 January 1997.
- Hines, F. Dee; Vissage, John S.** 1988. Forest statistics for Arkansas Counties—1988. Resour. Bull. SO-141. New Orleans: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 68 p.
- Kluender, Richard A.; Pickett, John C.; Trenchi, Peter.** 1991. An input-output analysis of the Arkansas economy: with special reference to the forest products sector. Arkansas Business and Economic Review. 24(2): 1–6.
- Levins, Robert.** 1996. Field Auditor Supervisor, Arkansas Forestry Commission. Personal communication, 7 October 1996.
- 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.
- McLemore, Charles.** 1997a. Director of Research, Arkansas Department of Parks and Tourism. Personal communication, 13 March 1997.
- McLemore, Charles.** 1997b. Director of Research, Arkansas Department of Parks and Tourism. Personal communication, 15 April 1997.
- Minehart, Carl.** 1997. Forest silviculturist, Ozark-St. Francis NF, Russellville, AR. Personal communication, 16 April 1997.
- Poor, M.** 1997. Chief Forester, Guthrie Wood Fiber Co., Van Buren, AR. Personal communication, 10 May 1997.
- Poor, M.** 1996a. Chief Forester, Guthrie Wood Fiber Co., Van Buren, AR. Personal communication, 30 September 1996.
- Poor, M.** 1996b. Chief Forester, Guthrie Wood Fiber Co., Van Buren, AR. Personal communication, 7 June 1996.
- Rosson, J.** 1997. Unpublished data. Starkville, MS: U.S. Department of Agriculture, Forest Service, Southern Research Station, Forest Inventory and Analysis Research Work Unit. April.
- Shiflet, D.K.** 1996. Competitive and regional analyses: leisure travel (person—days base). Presentation to Arkansas Governor's Conference. Little Rock, AR: D.K. Shiflet and Associates, Ltd., unpublished report. 41 p.
- Staff: Renewable Resources Evaluation Research Work Unit.** 1979. Forest statistics for Arkansas Counties. Resour. Bull. SO-76. New Orleans: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 77 p.
- Timber Mart-South.** 1996. Stumpage price mart, standing timber, Arkansas, quarterly reports 1–4. Athens, GA: Daniel B. Warnell School of Forest Resources, University of Georgia. 4 p.
- U.S. Bureau of the Census.** 1994. County business patterns for Arkansas. Washington, DC: U.S. Department of Commerce, Bureau of the Census. 17 p.
- Williams, R.; Voth, D.** 1996. Unpublished data. Monticello, AR: School of Forest Resources, University of Arkansas at Monticello. 1996.

SUMMATION OF THE SYMPOSIUM ON ARKANSAS FORESTS

B.G. Blackmon¹

This brings us to the conclusion of a wonderful 2 days together—the culmination of the symposium on Arkansas Forests. We heard from a wide range of speakers who presented details of the forest survey and those who interpreted that information in light of the important resource issues in Arkansas and the region. My task here is to summarize and possibly interpret the information we've been given. And that is a difficult, if not impossible, assignment.

The presentations by John Kelly and Jim Rosson gave us a lot of details about the survey itself. We heard about a net increase in softwood volume, unlike the 1988 survey, that showed a decrease. The hardwood resource is also on the positive side statewide, with growth exceeding removals, yet less than in 1988. Perhaps this should be watched carefully in the upcoming annual measurements as demands (e.g., the new chip export market) on the hardwood resource intensify in the future.

Several times during the symposium there were questions about error and accuracy of the FIA data. The survey publishes sampling errors, but generally speakers presented mean data without error bars—understandable as that would have required speaker access to original data. Nevertheless, the scientific community should follow up on that issue and better define the statistical parameters on the data. We should know if there is reason to be concerned about error in sampling and/or analysis.

Vic Rudis shared some of the wealth of nontimber and spatial information in the survey. Most of us didn't know that data existed. Apparently they are in huge and intricate data sets, available on the Internet. I encourage the Forest Service to offer some training sessions for users who want to access this important information.

Rick Williams' presentation was encouraging. He told us that Arkansas has more forested acreage than 30 years ago. He pointed out that statewide, we are growing more softwoods and hardwoods than are being harvested. He also sent up a caution flag when he pointed out that in several counties in south Arkansas removal is exceeding growth, if only by a small amount—raising questions about sustainability in that region. Someone mentioned that many of the pine plantations in that area are just now beginning to “come on line” and produce the kind of volume growth that potentially could make up the deficit. Chris Barneycastle

reviewed the industry's Sustainable Forestry Initiative. That program is only about a year old and, in my opinion, has a great deal of potential for addressing the sustainability issue in south Arkansas.

Dick Kluender raised a rather significant flag when he said that if current trends continue we may be mining forests on nonindustrial private lands. His presentation included a lesson on fundamental economics and told us that demands on the resource will continue in a major way. Dr. Kluender mentioned some possible solutions, such as new technology (presumably including better utilization), increased productivity, and shorter rotations, but, unfortunately, offered little optimism that trends would reverse. Does this portend the need for at least some discussion of statewide forest practices legislation? Perhaps the topic should not be ignored.

On the other hand, Jim Foster raised the point that even if removals exceed growth, one should interpret the severity of the trend by relating the amount of removals to amount of standing crop. Food for thought. During the discussion period following Kluender's paper, recycling was mentioned, and I would like to take the liberty of jumping on my soapbox about that issue. According to Dr. Kluender, recycling will help the resource supply issue, but not a lot, and I believe that to be true. But there are other compelling reasons to support recycling. Recycling lengthens the life of landfills, reducing society's costs of waste disposal. Additionally, many areas of the “Natural State” are badly littered, and recycling offers us the opportunity to improve the quality of our landscape. So let's support recycling; it's good for us! In his presentation, Bryan Kellar cited litter as a problem in terms of tourism, and he is correct.

Philip Tappe pointed out that we don't know much about populations of many wildlife species, e.g., neotropical birds. Dr. Tappe mentioned that the survey was not designed to inventory wildlife. As mentioned above, some of these data may be available on the Internet, but generally the public is unaware of its availability.

The paper by Ed Miller and Hal Liechty gave us good news about the relationship between forest management and soil and water. They also made some helpful suggestions about how FIA might be altered to improve its utility—a message to which we hope the Forest Service will give some attention.

¹ Dean, School of Forest Resources, Director, Arkansas Forest Resources Center, and Assistant Director, Agricultural Experiment Station, University of Arkansas, Monticello, AR.

Citation for proceedings: Guldin, James M., comp. 2001. Proceedings of the symposium on Arkansas forests: a conference on the results of the recent forest survey of Arkansas; 1997 May 30–31; North Little Rock, AR. Gen. Tech. Rep. SRS-41. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 125 p.

Jim Guldin reviewed the survey relative to public lands and gave us the top 10 things the FIA tells us about the public forest lands of the State. Among other things, he talked about the “sawtimberization” of public forests, a tendency for public lands to be overstocked relative to other ownerships, the negative growth/removal ratio in the planted pine component in the Ozark region, the inherently poor site quality on the national forest land base, and the big-tree character of public forests.

In her paper on socioeconomic assessment of private nonindustrial lands, Tamara Walkingstick helped us understand why private landowners hold their forest lands. These reasons included greenspace, preference for a rural style of life, and wildlife. It is interesting that income from timber was not in the top three reasons, even in the Coastal Plain region of the state. One of her messages was that we should listen to and honor the wishes of the landowner. With this I agree, except in cases where the landowner’s objectives violate principles of sustainability.

The long-awaited chip mill paper by John Gray and Jim Guldin reviewed the chip industry and its implications for sustainability. An attempt to answer eight important questions about that activity was made in their paper. Although most of the information was encouraging, some raised important questions. This is the first instance in the debate about chip mills where hard data supplemented

rhetoric in analyzing potential benefits and costs to the state. Reading this paper in its entirety is a must.

So, what does all this mean? Perhaps the question is “can we have a ‘working forest’ in the “Natural State?” Can we have profitability, preserve property rights, protect critical species and habitats, maintain scenic and pastoral vistas? The list could go on and on. “Can we have our cake and eat it too?” is what we are really asking.

Our forests and ecosystems are sustainable, and they can remain sustainable if all of us with varied interests, values, and paradigms are willing to work together and make it happen. But we have to make it happen, recognizing that compromise will most certainly be necessary.

We are the stewards of the land today. To be treated well by history, we must leave the land and its forests, water, and animals in as good or better shape than we found them. That’s what sustainability is all about. Generally I think we are practicing sustainability, but let’s make sure we are. Surely we would want no other alternative.

The planners of this symposium hope that this event has contributed in a positive way. We thank our speakers, our generous sponsors, and, finally, we thank you, our audience, for making this conference a success.