

# **An Economic Assessment of Arkansas' Forest Industries: Challenges and Opportunities for the 21st Century**

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## Executive Summary

This report identifies the economic contributions of Arkansas' forest products industries, opportunities for further economic development, and possible action strategies by which Arkansas' timber-based economy can grow. The following list highlights the major findings of this report

### Current status of Arkansas forests and timber industries

- 58% of Arkansas, 18.6 million acres, is commercial timberland.
- 58% of Arkansas' timberland is held by non-industrial private owners.
- While public ownership of timberland is relatively stable, forest industry is selling land and non-industrial private owners are buying.
- In the period of 1995- 2002, 240,000 acres of timberland were added in the state, and total standing volume of timber increased from 21 to 26 billion cubic feet.
- Timber is the third leading forest crop in Arkansas, with payments to landowners of \$537 million in 2003.
- Arkansas forest products industries shipped goods worth \$7.4 billion dollars in 2001 and provided employment for 43,371 workers. The total economic impact of forest industries was \$12.4 billion dollars of output and 97,183 workers in 2001.
- Arkansas is 4th in the nation in softwood lumber production and first among southern states.
- In 41 of 75 Arkansas counties, the forest products industry ranks in the top five for value of shipments.
- In 36 Arkansas' counties, forest industry wages exceed average wages by \$81 to \$894 dollars per week.
- Arkansas forest industries generate 75% of their energy needs from wood waste but still consume 21% of all electricity and natural gas used by manufacturing businesses in the state.

### Development potential

- Arkansas ranks 9th among all U.S. states in terms of wood production, but only 21st in terms of value-added processing.
- Arkansas ranks 12 of 13 among southern states in terms of forest research scientists (Ph.D.) and in terms of federal funding of cooperative forest research.
- Management levels, productivity, and environmental compliance on non-industrial private forestlands are considerably lower than government and industrial forestlands.
- Arkansas' extensive water transportation network is underutilized by the forest products industry.
- Increasing value-added processing in Arkansas could increase the industry output to as much as \$17 billion dollars annually and a total economic impact of \$30-40 billion dollars.

**Action strategies**

- Private landowner education programs that focus on forest management.
- A regular, periodic Governor's conference on forest resources.
- Provide formal, comprehensive educational programs for the logging sector.
- Development of a fair tax structure for forest industries that eliminates sales tax on machinery and utilities and creates incentives for wood energy and fuel production.
- Maintain the existing amicable regulatory environment at both state and local levels.
- Improve the public's perception of timber industries by establishing a dialogue with state and community leaders and improving environmental performance.
- Funding for research and development of new wood-based economies, especially engineered wood products, modular construction systems, and wood-based fuel/energy production.
- Develop market-based economies for forest outputs such as biodiversity, clean air, clean water, and aesthetics to encourage more production of these goods by private forest landowners.
- Lead in the creation of a statewide business plan that identifies the state's economic strengths and builds on clusters of related business sectors.

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# An Economic Assessment of Arkansas' Forest Industries: Challenges and Opportunities for the 21st Century

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## OVERVIEW

The purpose of this study is to investigate the current economic contributions of Arkansas' forest products industries and to identify critical issues and opportunities to promote economic development of this industry. This study was funded by the United States Department of Commerce and was conducted by the University of Arkansas-Monticello School of Forest Resources.

### *Current Status of Arkansas' Forest Products Industry*

The forest products industry is a vital part of Arkansas' economy. The industry employs 43,371 people directly in the manufacturing of solid wood products, pulp and paper, plywood, and engineered wood panels, furniture, and prefabricated buildings and homes. Service jobs in this sector include tree planting, silvicultural operations, and forest management consulting. Forest industry businesses interact directly with 97% of all business sectors in Arkansas resulting in employment of more than 97,000 people in the state. The direct value of Arkansas' forest

***The forest industry interacts directly with 97% of all business sectors in Arkansas, annually employing more than 97,000 people and producing \$12.4 billion dollars worth of output.***

industry output is \$7.4 billion dollars per year, and the total economic effect on all business sectors in Arkansas' economy is \$12.4 billion dollars per year.

While the largest manufacturing facilities are located in the southern half of the state, the forest products industry is economically important throughout the state. In 41

of Arkansas' 75 counties, the forest industry ranks among the top five economic sectors in output. Even in the Mississippi River delta region, counties with wood processing facilities have higher wages and employment than counties without forest industries. Although wages are highest in the paper and engineered wood products sectors, forest industry wages compare favorably with Arkansas manufacturing wages and are considerably higher than the state's average wage. In 36 Arkansas counties, the average forest industry wage exceeds the overall average wage by more than \$80 per week and in 18 counties by \$150 or more per week.

### *Resources Needed by the Forest Products Industry for Development*

Forest products industries need wood fiber, energy, labor, transportation infrastructure, access to capital, a favorable tax structure, and research and product development resources. Arkansas' forest resources are growing faster than they are being harvested, with overall growing-stock volume increasing from 21 to 26 billion cubic feet of wood in the period from 1995 to 2002, an increase of 22%. In the same period, the acreage of timberland increased by more than 240,000 acres. Arkansas ranks 9th in the nation in the production of industrial roundwood, and fourth overall in the production of softwood sawtimber (first in the southern United States). The production of industrial roundwood, however, is not matched by in-state value-added prod-

***Arkansas forests are growing faster than they are being harvested, adding 5 billion cubic feet of volume between 1995 and 2002.***

cessing, where Arkansas ranks 21st among states in the total value of production.

Forest industries consume more than one-fifth of all electricity and natural gas used by manufacturing businesses in Arkansas and are the largest single consumer of energy in the state. Arkansas' forest industries also generate between 50-80% of their own energy needs through conversion of wood waste and byproducts into steam and electricity. Arkansas' energy costs are competitive with other southern states, but are higher than the neighboring states of

***Arkansas' forest industry ranks 9th in the nation in the production of industrial roundwood and 4th in terms of softwood lumber production, but only 21st in terms of in-state value-added processing.***

Texas and Louisiana. Nationally, Arkansas ranks 35th in the cost of electricity and 32nd in the cost of natural gas, which are the two largest sources of energy for the forest products industry.

Forest products industries in the United States are the third highest consumers of energy, behind only petroleum and chemical sectors. Paper mills in Arkansas are the fifth largest producers of electrical energy – this fact clearly indicates the high demand for energy by forest industries in Arkansas.

Arkansas' population and labor resources, particularly in rural areas, are growing slowly. Arkansas' population growth is projected to be far less than other southern states between 2000 and 2025. The forest products sector is increasingly requiring computer technology skills in logging and wood processing. Primarily a rural state, only 36% of Arkansas' labor force resides in counties with significant wood-processing facilities. Twenty percent of Arkansans over the age of 25 have a college degree, 26% have some college or an associate's degree, and another 34% have graduated from high school. The latter two categories provide the bulk of the labor pool for forest products manufacturing firms. The University of Arkansas-Monticello (UAM) offers undergraduate

***The forest products industry makes huge capital investments in Arkansas. The value of Arkansas' five paper mills alone exceeds \$10 billion dollars.***

and graduate education in forest resource management at its main campus in Monticello. Technical education in logging is available through UAM-McGehee and a technical program in pulp and paper exists at UAM-Crossett.

Arkansas has a diverse system of navigable waterways, railroads, and public highways upon which logs, chips, and bark can be moved from forests to mills and wood products can be shipped to domestic and international markets. Arkansas has the second longest navigable waterway system (1,860 miles) in the United States, but shipped only 81,507 tons of wood products on this system in 2005. More than 3,500 miles of railroads exist in Arkansas and 3.4 million tons of wood products were shipped on them in 2000. Truck transportation accounts for the majority (more than 85%) of wood products shipments in Arkansas on more than 98,000

***Arkansas has a diverse water, highway, and rail transportation system that needs improvement and better linkages to forest industries.***

miles of public roads. Three intermodal facilities, in Little Rock, West Helena, and Yellow Bend, link these transportation networks.

Access to capital is critical because of the tremendous investments required to grow, harvest, and manufacture forest products. Rebuilding a paper machine typically costs \$60 to \$150 million dollars; a new paper machine may cost in excess of \$250 million dollars. Engineered wood-processing facilities require an investment of \$200 million dollars. The replacement value of Arkansas' five major paper mills exceeds \$10 billion dollars. Even logging operations require startup capital of \$1-1.5 million. The recent economic downturn has seen return on capital employed (ROCE) in the forest products industry drop to 3-4% in the United States from historical averages of 8-12%. The drop in ROCE has resulted in restricted access to needed capital for maintenance and upgrading facilities.

Arkansas' tax structure is quite favorable in terms of low property taxes, ranking 49th overall for local and state property taxes. This reduces the



annual costs of owning forest land and releases capital for management of forests, especially for non-industrial private owners. For businesses, Arkansas has one of the least favorable tax structures in the nation. Sales taxes are levied on energy and on equipment used in primary manufacturing in Arkansas – neighboring states exempt these items from sales taxes or tax them at a lower rate than Arkansas. Arkansas' sales taxes are among the highest in all southern states. Corporations in Arkansas

***Arkansas' business tax climate needs to be improved to promote business growth. Sales taxes on equipment and energy are particularly costly to forest industries.***

have income tax proportioned heavily on payroll and property, and would benefit if income taxes were based on sales. Arkansas has two forms of corporate double taxation that restrict capital for growth. The first is a tax on both corporate income and on dividends paid to owners. The second is a corporate stock tax that is levied based on the value of capital assets in the state and is paid regardless of a corporation's net income.

Research in forest management and forest products is conducted in Arkansas by the University of Arkansas system and a work unit of the USDA Forest Service Southern Research Station. The University of Arkansas at Monticello houses the UAM School of Forest Resources with 16 Ph.D.-level scientists. Additional forest research support in the University of Arkansas system is coordinated through the Arkansas Forest Resource Center. The AFRC includes scientists and technicians from other UA system work units and the University of Arkansas Cooperative Extension Service that support research, demonstration, and education efforts within the state. The USDA Forest Service Southern Research Station provides additional research and support from its work units in Monticello and Hot Springs, Arkansas. When comparing Arkansas to 12 other southeastern states, Arkansas ranks 12 of 13 in

***Research and education capacity in Arkansas need additional investment. Funding for forest research and scientists is larger in other southern states with smaller forests and less valuable forest industries.***

terms of university research full time equivalents and 12 of 13 in terms of federal cooperative research funding.

*Technologies for Economic Growth in Forest Industries*

The most valuable sector among Arkansas' forest industries is the pulp and paper sector. Global competition, relatively high energy, labor, and fiber costs make it highly unlikely that this sector will increase in terms of employment in the future. However, capital invested in maintaining and upgrading paper mill

technology will increase this sector's productivity and is critical to retaining this vital component of Arkansas' forest products industry. While pulp and paper may be a mature sector,

engineered wood products are emerging as a growth sector globally. Engineered wood products can utilize small, less valuable trees creating high value-added products such as structural wood beams, boards, and wood-plastic composites that can be used in situations that require moisture and rot resistance. Engineering design advances are leading to the development of modular systems for roofs, floors, and walls in custom built homes nationally. These modular systems reduce construction waste, building time, and improve the structural quality of finished homes. Arkansas is already a leader in lum-

***Arkansas is well positioned for growth in engineered wood products and wood energy.***

ber production, but needs additional research and development investment to promote the manufacturing of these high value-added products and to foster the use of the modular construction systems.

Opportunities exist for expanding wood's role in the generation of steam, electricity, and other biofuels, such as methanol, in Arkansas. Arkansas' forest industries already have experience with cogeneration facilities and the handling and processing of wood waste. Wood energy use reduces greenhouse gas emissions and the potential for global warming. Additional research and development of wood as a source of energy would also promote economic self-sufficiency in Arkansas' rural communities by reducing energy imports.

In order to promote long-term sustainable forest production and health, better information technologies are needed in several areas. The first and most critical is support for landscape-level ecosystem management technologies. Biological assessments of critical habitats and threatened and endangered species

*Ecosystem land management will require better information technologies applied to forest management and the development of forest economies that reach beyond wood fiber production.*

need to be linked into common, spatially-referenced databases that can be used to direct conservation programs and define regions where high-intensity forest management techniques are appropriate. Private, non-industrial forest landowners need better access to market information for forest products and better information regarding financial returns from forest land investments. Forest economies beyond timber production are continuing to emerge, but market information for both producers and consumers is not readily available.

#### *Major Challenges for Arkansas' Forest Industries*

Individual interviews and focus group workshops were held in the spring of 2005 with 52 key people from various Arkansas forest industries, government agencies, consulting foresters, and non-government organizations. These stakeholders identified critical challenges to expanding the economic contribution of Arkansas' forest resources.

Public perception of forest management and the forest products industry is not a positive one. The public perceives forestry as an environmentally destructive process and the industry as environmentally insensitive. Forest industry jobs are seen as labor-intensive, low-paying, and not technologically advanced. Changing this perception will require education of the public and improved performance in protecting environmental quality. The community of stakeholders in Arkansas' forest industry is very diverse, including more than 200,000 forest landowners and more than 43,000 people working as foresters, loggers, and employees engaged in manufacturing lumber, engineered wood products, paper, contain-

ers, furniture, and manufactured buildings. This diversity is a strength in terms of widespread representation throughout Arkansas, but this "forestry community" needs to identify common issues and work cooperatively to solve them.

Forest management challenges in Arkansas center around the fragmentation of forest ownership which is making landscape-level planning and education increasingly difficult and costly. Furthermore, as forest land becomes fragmented, the level of technical and scientific knowledge applied to managing forests declines. Although Arkansas' population is not growing as fast as the rest of the South, increasing population and development pres-

*Many of Arkansas' forest development problems center on human dimension issues. Public perception of the forest industry's environmental performance is poor. Conflicts regarding forest resource use are growing. Workforce recruitment, education, and training for forest industries have not kept pace with the requirements of the industry.*

ures on forest management practices in certain regions of the state, particularly central and northwest Arkansas, are a concern. Prescribed burning, herbicides, pesticides, and fertilization of forest lands are management tools needed to sustain forest health and increase production of forest products at lower costs in the future. Continued research and education of land managers and the public are necessary to keep these tools and maintain forest health and productivity.

In terms of research and development capacity, Arkansas lags behind other southern states. In addition to research in human dimensions of forest resources and forest management, opportunities in the development and implementation of new engineered wood products are present. Manufactured structural units for custom home construction markets would increase the value-added to the state's softwood lumber industry, which is already the largest in the South. This strategy could put Arkansas at the forefront of the U.S. home building market, which is the world's largest wood-frame construction market. Engineered wood technologies improve utilization of small and poorer quality trees, improve the structural quality of wood products and expand their range of uses. Expanding the use of wood as a renewable



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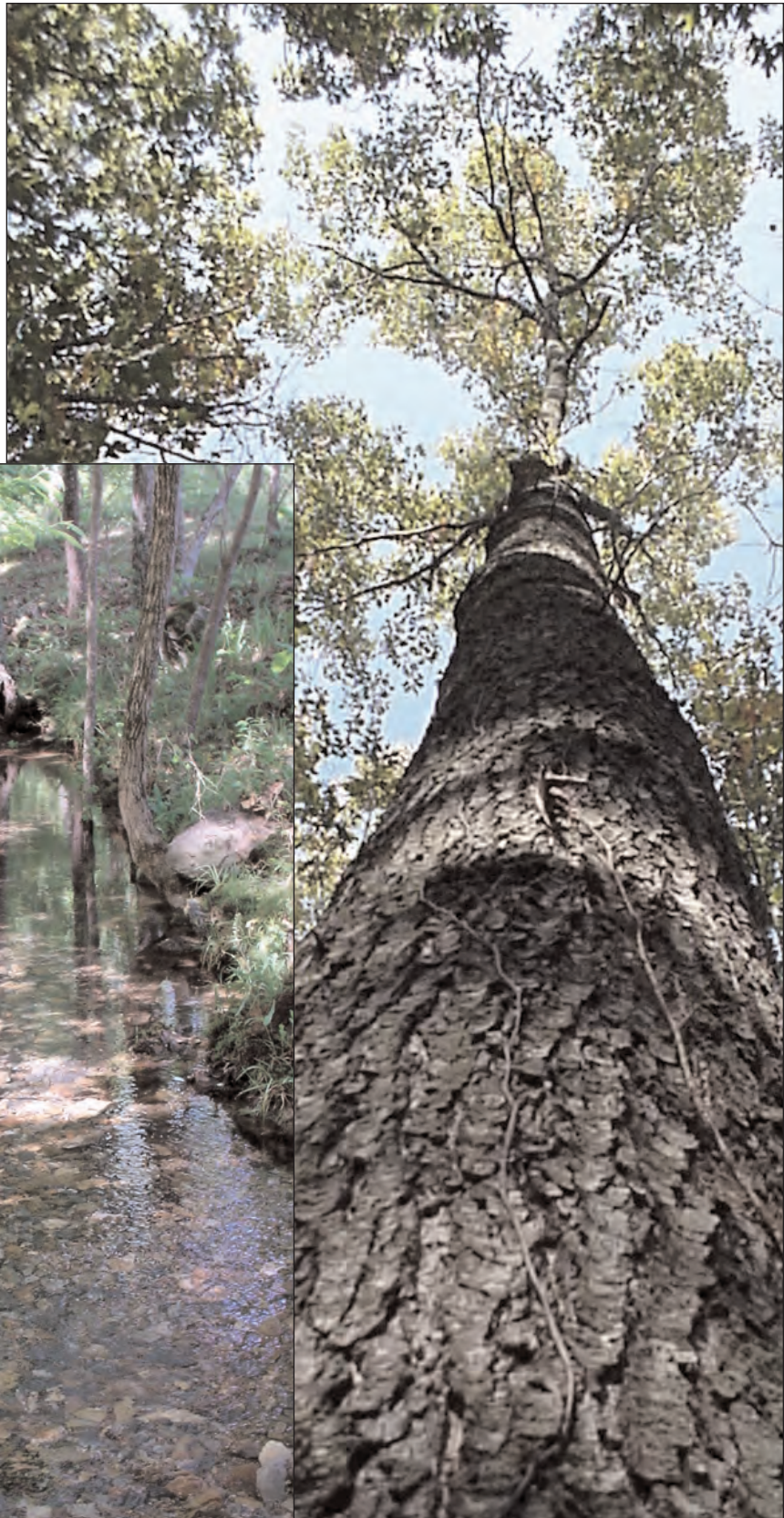
A massive Arkansas cherrybark oak tree.

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Best Management Practices maintain excellent water quality in streams adjacent to timber harvests.

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energy source in Arkansas will help further lower the cost of wood products and improve rural economic self-sufficiency by lowering the dependence on energy imports.

In terms of educational needs, technical specialists in biostatistics, spatial information systems, wood products engineering, and forest management are needed at the baccalaureate and graduate levels. Education is especially critical for forest workers in timber harvesting, where the gap in knowledge between forest managers and the loggers who actually implement the plans in the forest has created a division between knowledge and application that is affecting the productivity and sustainability of the forest resource. Increasing regulatory and technical requirements for timber harvesting, as well as a greater need for strong business management skills, have created a need for continuing educational support for this sector.

Arkansas' state highway system has improved tremendously over the past decade, with a target of \$100 million dedicated annually for state highway improvements. Allocation of this money to develop interstate access into the southeast portion of the state would reduce the cost of access to markets for several of Arkansas' largest wood processing facilities. Just as critical for the forest industry are local roads, which are used to haul logs from the forest to primary wood-processing facilities. Local road infrastructure is deteriorating in Arkansas, and often local improvements and accompanying weight restrictions on "improved" roads are restricting access to forest resources, increasing costs of delivered wood to mills, and lowering forest landowner payments for their timber.

Access to capital resources is difficult for wood manufacturing businesses and loggers because initial minimum investments often exceed \$1 million dollars. Logging firms and other small businesses cannot obtain access to capital for necessary equipment upgrades and modernization to remain competitive in a global wood market.

The stakeholders identified government policy and regulatory issues critical to development. Arkansas' state sales tax on manufacturers' energy use is particularly harmful to forest industries, which, among manufacturers in the state, are the greatest consumers of energy. The state also needs to develop a comprehensive policy of incentives and streamlined permitting for renewable energy generation and to

encourage the development of forest and agricultural-based biofuels.

#### *First Steps for Economic Development of Arkansas' Forest Industries*

The forest stakeholders identified nine possible first steps towards enhancing Arkansas' forest-based economy.

The first is to expand forest landowner education in landscape-level forest management and the development of forest economies that reach beyond timber and pay forest landowners for the ecosystem services they provide society.

A Governor's conference on Arkansas' forest resources is needed to bring together stakeholders in Arkansas' forests, local and state government agencies and elected officials, business leaders, scientists and educators. This conference needs to identify common goals and objectives for Arkansas' forest resources as well as areas of dispute that need resolution. It should also provide a platform to educate the public regarding the importance of Arkansas' forest resources and the value of these resources to the state's economy.

Permanent state funding is needed for timber harvesting education. The Southeast Arkansas Community Based Education Center Logging Academy in Warren is part of the University of Arkansas-Monticello (College of Technology at McGehee) and if properly funded, this program could provide the necessary education to bring the application of timber harvesting in line with 21st Century knowledge of forest resource management.

The forest products industry needs to work with state legislature and the Arkansas Department of Finance and Administration to identify ways to improve the state's tax structure to promote growth in forest-based economies without reducing state revenue for public education and infrastructure.

The forest products industry must continue its positive dialogue with state, federal, and non-government agencies regarding environmental performance and maintain a positive working relationship regarding environmental regulations.

The forest industry must develop a dialogue with the public and government leaders at both local and state levels regarding forest management and the economic importance of forest resources in Arkansas. The industry needs to recognize the difference between perception problems and environmental performance problems and be responsive to the pub-

lic's concerns and needs.

The state needs to provide economic incentives to develop new engineered wood products and stimulate the use of wood for energy and biofuels. Engineered wood products and paper should be recognized as advanced manufacturing technologies in the state.

Forest economies that capture the benefits of tourism, recreation, and ecosystem services like clean air and water provide monetary returns to the landowners that produce them. This will promote sustainable economic growth in all aspects of Arkansas' forest resources.

The state of Arkansas needs to develop a comprehensive statewide business plan for economic development. Other forest-dependent states (Oregon, Wisconsin, Maine, Georgia) are undertaking efforts to promote not only their wood using industries, but to develop comprehensive plans involving government agencies and leading businesses to chart a course for their future. The forest industry, as a leading sector among all Arkansas' businesses, should support such an effort.

## INTRODUCTION

Arkansas' forest products industries are vital components of the state's economy. Employing more than 43,000 people in logging, sawmills, paper mills, furniture and manufactured buildings, this industry is diverse and interacts with more than 90% of all industry sectors in Arkansas. As such, the economic benefits of forest products industries are multiplied widely throughout the state. Forests cover nearly 60% of the state and timber is one of the leading income-producing crops in Arkansas.

The overall purpose of this study is to identify means by which the economic benefits of Arkansas' forest industries can be expanded. Funding for this research comes from the United States Department of Commerce's Economic Development Administration, which has specifically identified the following six outcomes:

- 1) An in-depth economic analysis of the forest products industry in the state,
- 2) An analysis of the economic development possibilities for Arkansas' forest products industries,
- 3) A description of available technologies that would benefit forest and related industries,
- 4) Development of goals and objectives to guide Arkansas' forest industries,

- 5) The establishment of an Arkansas Forest Resource Advisory Board, and
- 6) This final report.

## METHODS AND DATA SOURCES

The economic analysis of the state's forest products industries was modeled by the Impact Analysis for Planning (IMPLAN) software developed by the Minnesota Implan Group (MIG 2005). IMPLAN constructs regional economic accounts and input-output tables. The data used in IMPLAN are based on the United States Department of Commerce's Bureau of Economic Analysis National Input-Output table (USDC 1984) that is updated by the Minnesota IMPLAN Group. The most recent dataset available for Arkansas at the time of analysis was for the year 2001. Economic sector analyses were completed with IMPLAN following the methodology established by Miller and Blair (1985) and Munn and Henderson (2003) to determine direct, indirect and induced economic effects of the Arkansas forest products industry. The Arkansas Forestry Commission's (AFC) forest products industry database (AFC 2002) was obtained for a more detailed description of primary and secondary wood-processing industries in the state, as well as the Lockwood-Post directory (Matussek and Lees, 2004) of pulp and paper firms in North America.

The economic development analysis began with an analysis of Arkansas' forest resources ability to sustain additional timber harvests. The United States Department of Agriculture (USDA) Forest Service Forest Inventory and Analysis (FIA) group provided data for forest area, current standing timber volumes, forest growth, mortality, and removals for the period between 1995 and 2002 (USDA 2004a). Another FIA database provided timber product output (TPO) data for the entire United States (USDA 2004b). These data were used to compare Arkansas with other states in the efficiency of converting raw material into value-added products. A description of the educational infrastructure supporting the forest products industry in Arkansas was developed, as well as the corresponding research infrastructure. An assessment of the business climate in Arkansas was obtained through an independent study from the Tax Foundation (Tax Foundation 2004).

The forest industry in Arkansas has many diverse stakeholder groups. An estimated 200,000 private, non-industrial landowners own 58% of Arkansas'

forest land and play a vital role in sustaining Arkansas' forest industry sectors. Forestry support services include consulting foresters and other professionals that provide resource management assistance to landowners. Wood processing sectors include logging, lumber, engineered wood products, and pulp and paper manufacturing. Secondary wood processing sectors include furniture and manufactured homes and buildings. In addition to this there are state and federal agencies involved in resource management, universities, and non-government organizations that provide research and management support to forest landowners and the forest industry. These groups are diverse in structure and economic development issues, but are linked through a common resource and chain of production technologies. A thorough understanding of each of these groups is necessary in order to develop a successful economic development strategy.

Technologies that would support additional development in the forest sectors were compiled through interviews with forest stakeholders throughout the state. An initial list of candidate stakeholders was developed through membership lists for Arkansas landowner organizations, industry advocacy groups, and public forest advisory groups. From this list a representative sample was invited to participate in one-on-one interviews and focus group discussions.

The initial stakeholder interview process identified constraints and opportunities in various areas that impact Arkansas' forest industries. Stakeholders provided input on the biological capacity of Arkansas' forest resources to sustain economic growth. In addition, they provided input on economic factors, physical infrastructure, human resource issues, and scientific and technical problems that were either limiting factors or opportunities for growth. The results of these interviews were compiled and individuals' comments were aggregated into "economic development themes."

After individual stakeholder interviews, the process for establishing economic development goals involved two focus group meetings that brought together a cross section of representative stakeholders to discuss the outcomes from the initial interviews and present the economic development themes that arose from an analysis of those interviews. The focus group meetings provided an opportunity for additional input and modification of the economic devel-

opment themes and more importantly, for the identification of the most critical issues affecting economic development of the forest industry in Arkansas.

Finally, from the stakeholders, a group of 12-15 representatives have been invited to form an Arkansas Forest Resource Advisory Board, whose mission will be to take the results of this process and to continue to work the of promoting economic development of the forest products industry in Arkansas.

## RESULTS

The results are based on data available in the last quarter of 2004 through the first quarter of 2005. Fifty-two individuals were interviewed and 31 of those stakeholders participated in the focus group meetings that provided data used to determine the technology needs, identify critical issues and recommend first steps for economic development progress.

### ECONOMIC ASSESSMENT OF ARKANSAS' FOREST PRODUCTS INDUSTRY

Forest industries shipped goods worth 7.4 billion dollars in 2001, ranking only behind food products and construction sectors in Arkansas' economy. Forest industries employ 43,371 Arkansans in seven sectors. These sectors are diverse in their output of various products; they also exhibit remarkable integration in the use of their primary raw material, wood.

The Arkansas forest products industry can be divided into seven sectors of similar businesses. The **logging** sector deals with the felling and removal of standing timber and the transport of whole trees or logs to their point of primary processing. **Forestry support** is a sector made up of firms that provide technical services that focus on land management and planning and include the application of chemicals (fertilizers, herbicides, pesticides) to forest tracts. The **lumber** sector is comprised of sawmills that produce rough, resawn, and finished lumber and millwork for use in the construction of buildings and other secondary wood product manufacturing. The **engineered wood products** sector includes facilities that produce plywood, oriented strand board (OSB), and other reconstituted wood materials to manufacture structural wood beams and panels. The **manufactured wood buildings** sector manufactures mobile homes and other wood buildings (both preassembled and kits). The **pulp and paper** sector uses wood fiber



to manufacture a great diversity of consumer paper products, containerboard, and packaging paper. The **furniture** sector is comprised of those manufacturing firms that produce kitchen cabinets, wood furniture and upholstered, wood-framed furniture.

The status of forest product companies in Arkansas for the year 2001 is indicated in Figures 1-4. Employment and employee compensation for each industry subsector is shown in Figures 1 and 2. Figure 3 provides output, or the total value of shipments, for each sector. Figure 4 shows the valued-added for each sector. Value-added is determined by subtracting the value of inputs from the value of shipments (except cost of labor) and represents the increased value of goods added by the manufacturing process. Value-added is money that can be used to pay employees, taxes, and provide profits to stockholders.

Figures 1-4 highlight the direct effects from Arkansas' forest industries. Direct effects include sales (output), employment, employee compensation and value added that are a direct result of a business sector's activity. Within the state, forest products industries create demand for goods and services from supporting industry sectors such as wholesale trade, motor freight transportation, and machinery repair services. The output, employment, wages and value-added in these supporting sectors are termed *indirect effects*. A third category of economic effect, *induced effects*, comes from increased household spending supported by direct and indirect employment. The total economic impacts for the forest products industry were determined using input-output analysis in the IMPLAN model to assess the total economic contribution of forest products to the state's economy, as shown in Table 1. An economic multiplier expresses the ratio between a direct increase or decrease in sales, payroll, income, or employment and the total effects on the entire regional economy. Forest industries have good wage and income multipliers in the state as the industry has an excellent mix of labor intensive jobs and jobs with very high salaries in various sectors.

The greatest concentration of forest products establishments in Arkansas are in close proximity to forest and water resources in the southern half of the

state. Figure 5 shows the output of all forest industries in Arkansas by county, and Figure 6 shows the percentage of total private output by counties for 2001. The forest industry is largely concentrated in and around the pine-forest dominated coastal plain of Arkansas, with a smaller, but locally-important concentration in the north-central Ozark Mountain region of the state. In most of these counties, forest products account for more than 15% of all economic production, and in four counties (Bradley, Dallas, Little River, and Ashley) forest products industries

*In general, every new job created in the Arkansas forest products industry creates the demand for a second new job in Arkansas. Every additional dollar of wages earned by a forest industry worker results in a second dollar of income earned by another worker in Arkansas.*

represent more than 50% of all economic activity. In sixteen Arkansas counties, forest industries are the largest economic sector, and in 41 counties, forest products are in the top five (Figure 7).

Employment in the forest products industry typically provides better than average wages throughout Arkansas. The overall wage rate in the forest industry is comparable with manufacturing wages, but those in the pulp and paper sector average nearly \$300 more per week than the average manufacturing wages in Arkansas, as shown in Figure 8. However, the importance of forest industry wages becomes clearer when compared to wages on a county-by-county basis. Forest products manufacturing is often located in rural counties with little economic diversification. In these counties, average wages in forest industries typically exceed overall average wages by more than \$100 per week (Figure 9). In Arkansas counties that contain a large pulp and paper manufacturing company (Ashley, Desha, Little River, Conway, and Jefferson), the average forest industry compensation exceeds the overall average county employee compensation by \$362 to \$894 per week (Figure 9). Even in counties with only lumber and engineered wood manufacturing (Faulkner, Fulton, Izzard, Lafayette, Lee, Nevada, and Poinsett), average weekly compensation in wood-processing facilities is \$200 a week more than the county average.

Trends in employment, wages, and industry structure are revealed in employment data from the Arkansas Employment Security Department (AESD 2004). Note that the data from AESD are slightly dif-

ferent from IMPLAN data because of differences in industry sector aggregation schemes. For example, the IMPLAN data contained in this report indicate only wood furniture sector data. This level of detail is unavailable from AESD, and so, furniture data from AESD include metal and other non-wood furniture products. Furthermore, forestry support services are absent in the AESD data. If the 3,814 jobs in the IMPLAN “Forestry Support” sector (Figure 1) were added to the data in Figure 10, there would be little differences in the two data sources.

In the logging sector, there has been a slight decline in overall employment numbers (Figure 10), and the number of reported logging firms has dropped from 686 in 1997 to 457 in 2003 (AESD 2004). The average logging firm in Arkansas in 1997 employed 4.9 people, in 2003 the average logging firm employed 7.1 people. This indicates two trends. First, numerous part-time and small logging firms ceased operations during the period of 1999-2002 as the demand for timber and timber prices fell nationally and throughout Arkansas. Most of these logging firms were less mechanized, owned older equipment, were less efficient and paid lower wages. Real wages in the logging sector (those adjusted for inflation to the buying power of year 2000 dollars) rose by 21% from 1996 to 2002. Second, a significant structural change in the logging industry occurred in 2002-2003, as the number of firms dropped from 576 to 457 (-20%) but total employment increased by 109 (+3%). Total wages paid in the industry dropped in 2002-2003 by \$3,392,926 in 2000 dollars, a loss of 8%. These statistics seem to indicate a shift to lower paying jobs in the logging sector and a likely shift to younger, less-experienced logging personnel. While logging firms have been increasing in size for the last decade, the majority of the increase (30%) occurred between 2002 and 2003. The logging sector continues to mechanize and consolidate as smaller firms go out of business and the remaining firms hire new workers at a lower salary in an attempt to keep production costs down in the face of increased operating costs and environmental regulations.

The lumber sector has seen the largest contraction in terms of employment, losing 5,205 jobs in the period between 1996 and 2003 (Figure 10). In general, Arkansas’ lumber sector can be described by geographic regions. South Arkansas has relatively large softwood sawmills that produce construction lumber and hardwood sawmills that produce flooring and

millwork. In north Arkansas, sawmills process both softwoods and hardwoods and there are numerous very small family-owned sawmills that operate only when there is a local demand for lumber or the price of lumber is high. Throughout Arkansas, the number of lumber producing firms dropped from 527 to 414 (-21%) as smaller, older sawmills with higher production costs were unable to compete during the economic slowdown that occurred between 1999 and 2002. Surviving sawmills continue to mechanize and upgrade equipment thus increasing production and lowering unit labor costs. Total production of saw-timber in Arkansas has steadily increased, from 1.5 billion board feet in 1990 to 2.4 billion board feet in 2003. Arkansas ranks fourth nationally and first among southern states in softwood lumber production (SPFA 2004). Arkansas has four of the largest 15 softwood lumber mills in the southern U.S. (Timber Mart-South 2003). These sawmills, located in Dierks, Warren, Prescott, and Leola have annual capacities of 162 – 240 million board feet per year. Economies of scale are being expressed in the industry due to high energy, labor, and raw material costs. Firms with the ability to purchase modern wood-processing technology are lowering their long-term average costs of production. Sawmills equipped with log-scanning systems, curve-sawing rigs, and optimizing merchandizing systems are lowering the cost of production by cutting more lumber from each log. Larger sawmills can more readily purchase and adapt new technologies and remain competitive in the face of low cost imports. The effect of Canadian imports following the lapse of the U.S.-Canadian Softwood Lumber Agreement has likely put further pressure on softwood lumber mills throughout the United States, maintaining lower lumber prices to domestic sawmills and forcing some sawmills out of business.

Employment data for engineered wood products are not reported separately by the AESD but are aggregated with the lumber sector. Arkansas has several engineered wood product establishments manufacturing fiberboard, medium density fiberboard, oriented strand board, and plywood. Arkansas is home to the largest plywood mill in the world. The Crossett, Arkansas mill produces approximately 680 million board feet of plywood annually. Also included in this sector are numerous small truss manufacturers which produce roof support units for homes and other buildings. Wages in the engineered wood sector are typically higher than those found in



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Arkansas' wood furniture sector produces kitchen cabinets, wood furniture, and upholstered, wood-framed furniture from milled and chipped Arkansas wood products.

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sawmills. This is an emerging sector with strong growth potential for high-value-added products.

The AESD data for the furniture industry include non-wood furniture. Furthermore, in 2000, the employment data switched from Standard Industry Classification (SIC) coding to the new North American Industry Code Standard (NAICS). The effect of this shift affected the furniture sector data more severely than the other sectors as reported by AESD, particularly in the number of firms operating. However, the general employment trend follows that of other sectors in the forest products industry, with a 16% reduction in total employment (Figure 10). The loss of employment was somewhat offset by a 15% increase in real wages (2000 dollars) between 1996 and 2003.

The pulp and paper industry has by far the highest wages in the forest industry, with weekly wages reaching \$900 in 2003. In fact, in 2003, of the four county economies with the highest average wages, Little River (\$693.47/week) and Ashley (\$614.72/week) are dominated by paper mills (AESD 2004). Employment in this sector has steadily declined since 1996, with a loss of 2,390 jobs (-16%). The closure of older, less-efficient paper and pulp mills has been spurred by global competition in the pulp and paper industry as newer facilities have lower production costs. The most visible change occurred in 2000 when the International Paper mill located in Camden, Ark., closed, with a loss of 849 jobs. By 2002, the loss of the paper mill jobs was reflected in a smaller total economy in Ouachita County. In 2002 there were 1,159 fewer employed people, \$29 million dollars less in labor income, and \$123 million dollars less in sales. Ouachita County and the surrounding region are recovering slowly, with some growth in the aerospace and defense industry resulting in the rehiring of paper mill workers. However, the average mill worker in 2000 earned \$22.47 per hour, while new defense sector jobs are paying \$10-15 per hour. The other paper sector jobs lost in the last ten years in Arkansas have come as a result of the consolidation of other packaging mills and additional mechanization in other establishments throughout the state. These types of changes have a less dramatic effect on the economy as production levels may be maintained while some jobs are lost; remaining employment is often at a higher average wage. With no new paper mills being established in the United States for nearly 20 years, it is clear that global competition is forcing

the pulp and paper industry to concentrate production at only the most cost efficient facilities in the United States.

### FACTORS AFFECTING THE ECONOMIC DEVELOPMENT OF ARKANSAS FOREST INDUSTRIES

The basic needs of any forest products industry include (1) an available supply of wood fiber, (2) low cost energy, (3) adequately skilled and competitively priced labor, (4) a good transportation infrastructure, (5) access to capital, (6) low taxes on land and instruments of production, and (7) research and product development (Vlosky 1997). These factors, as they apply to Arkansas will be discussed in the following section.

#### *Supply of Wood Fiber*

Forests are dynamic, changing systems that provide many renewable resources for Arkansas, one of the most economically valuable of these is timber. The amount of wood standing in forests as well as data on growth, mortality, and removals are collected by the USDA Forest Service Forest Inventory and Analysis (FIA) unit working with the Arkansas Forestry Commission. The status of Arkansas timber resources is available through the FIA Dataset (USDA 2004a) which is periodically updated with the most recent forest information. During the period between 1995 and 2002, rapid growth in all U.S. economic sectors was reflected in the timber industry in Arkansas. Timber prices and timber harvests rose to all-time highs in 1998, but fell slightly with the general economic slowdown that occurred in 2000 and 2002 (Figure 11). Through this period, the state of Arkansas added 100,894 acres of forestland (land at least minimally stocked with trees or former forestland that has not been converted to other land uses), and 240,140 acres of timberland (land that is generally capable of commercial timber production). Most of this land was agricultural land in the Arkansas Delta region that is reverting to its former status as forest and timberland. The total amount of timberland reported for Arkansas in 2002 was 18,632,270 acres, or 56% of the total land area of the state. The distribution of this timberland is shown in Figure 12, and Figure 13 shows the percentage of timberland in each county.

Not only did Arkansas increase total forest- and timber-land acreages, the total amount of timber volume available for harvest increased during this peri-

od by 22% (Table 2). Nearly 75% of the timber harvested in Arkansas is pine, yet net growth in pine exceeded removals by 11% during this period. Other softwoods, such as cypress and cedar, grew in terms of standing volume by 87%, but these species composed only 3% of the standing timber in Arkansas. Oaks, which include some of the most valuable hardwoods for the timber industry, increased their standing volume by 26%, and all other hardwoods increased by 28%. Total timber harvesting in the period 1995-2003 averaged 23.6 million tons per year. Payments to landowners in 2003 for stumpage (standing timber) were \$538 million dollars. The standing inventory of Arkansas' forests is more than 224 million tons of softwoods and 355 million tons of hardwoods. Clearly, the utilization of Arkansas' forests for industrial production is not exceeding capacity. Estimates of sustainable harvests in Arkansas range from a low of 30 million tons per year upwards to as much as 44 million tons per year, depending on the intensity of forest management applied.

As mentioned earlier, forest ecosystems are dynamic and the harvesting of timberlands involves a shifting pattern that depends on the maturity of the timber, the value of timber relative to other land uses and commodities, the demand by wood-using industries for those resources, and the willingness of landowners to sell timber. Furthermore, the FIA data for individual counties in any single survey period may reflect only a few data points. As such, individual county changes indicated by the FIA data should be viewed with caution and may not accurately reflect timber harvesting trends. In many Arkansas counties, timberland area has declined due to competing land uses and development, as shown in Figure 14. Note that timberland is not the same as forest land; these are lands that may still be forested but are no longer evaluated as being capable of producing wood at a commercial rate of growth. Most of the permanent timberland removals have occurred in the northwest and west-central portions of the state and are a result of conversion of timberlands to suburban development. Rapid population growth in Little Rock and surrounding communities, Hot Springs, Fayetteville and other northwest Arkansas' cities is permanently destroying forests. Forest losses in the eastern and southern portions of the state are more typically conversions to other agricultural practices, which are not permanent.

Current growing stock and the net change in growing stock values (Figures 15 and 16) provide a better picture of current timber supply and short-term trends in timber supply in Arkansas. Most Arkansas counties have experienced an increase in net growing stock, even those that have lost timberland acreage. With the exception of Cleveland County, the reduction in growing stock is a small percentage and is indicative of older, mature forests being harvested and replaced by younger forests with far less volume but very rapid growth rates. Cleveland County's reduction in growing stock is a combination of moderate population growth (13% from 1990 to 2000), harvesting of mature forests, and some conversion of forestland back to agriculture. Pine growing stock (Figure 17) and net change in pine growing stock (Figure 18) data indicate that the pine component in the northwest portion of Arkansas has declined substantially in recent years, while in the southern pine region of Arkansas, growth in pine generally exceeds mortality and removals. Reforestation costs in northern Arkansas are higher than in the southern part of the state, particularly for pine. Thus, there is a strong likelihood that the pine resource in northwest Arkansas is in decline. The distribution of growing stock and growing stock changes for other softwoods (Figures 19 and 20) and other hardwoods (Figures 23 and 24) indicate that removals and mortality may periodically exceed forest growth for a particular county, but in general the current production wood fiber exceeds demand. The distribution of growing stock and changes in growing stock for oak (Figures 21 and 22) shows areas in western and northern Arkansas that have been severely impacted by oak decline and an outbreak of the red-oak borer, an insect pest that reached epidemic levels in 1999, 2001, and 2003. USDA Forest Service estimates show nearly one-third of red oaks in the state, nearly \$300 million in standing timber, may already be dead from this insect. Harvest levels in the bottomland oak forests of eastern Arkansas counties have been high in recent years. Questions regarding forest regeneration in bottomland forests and the impact on timber harvesting by the recent discovery of the ivory-billed woodpecker may further curtail hardwood production in Arkansas.

Ownership of the 18.6 million acres of Arkansas timberland is split among three major ownership classes: industry, non-industrial private forestland (NIPF), and public land. Figure 25 shows the owner-

***Arkansas ranks 9th among states in total roundwood production....  
...but only 21st in terms of value of shipments of forest products!***

ship distribution among these three major classes and their subclasses (Guldin 2001). There is a shift in land ownership occurring in Arkansas. Industrial timberlands are being sold into other private ownership categories, including real estate investment trusts (REITs), timber investment management organizations (TIMOs), other corporate ownerships, and other non-industrial private forest (NIPF) ownerships. These ownership classes generally practice less intensive management and are less likely to fully comply with environmental regulations (Eagle and Hameister 2002, Wear and Greis 2002). Thus, the transfer of lands out of industrial ownership is likely to negatively impact the productivity of Arkansas' forests. However, because of the lack of hard data on the extent of ownership changes and the lack of data on how the new owners will manage these lands, the degree of impact cannot be precisely assessed without further research.

According to the US Forest Service Timber Product Output (TPO) reports, among all states, Arkansas ranks ninth in roundwood production (Figure 26), with the majority coming from private forestlands. Timber production from industrial forests on a per-acre basis is approximately twice that of non-industrial private forests. This emphasizes the point made previously regarding the impact that shifting ownership from industrial to non-industrial owners may reduce Arkansas' ability to increase wood fiber production.

While Arkansas ranks ninth in total roundwood production, it ranks only 21st among all states in terms of the value of forest products shipments of forest products (Figure 27). Arkansas provides raw materials in the form of logs and lumber that is manufactured into higher value-added products outside of Arkansas. In fact, Arkansas lags far behind in value-added processing. In the United States, the average conversion of a cubic foot of industrial roundwood results in \$19 in value of shipments of forest products; while in Arkansas, the average conversion is \$10 of products per cubic foot of roundwood harvested (USDA

2004b). Most other southern states have similar ratios to Arkansas, as shown in Table 3. It is

interesting to note that states having the highest value of shipments per unit of roundwood harvested (Kentucky, Missouri, North Carolina, and Tennessee) all have larger hardwood using sectors than Arkansas.

Using the aforementioned data on Arkansas' biological capability to produce roundwood and additional value-added production in Arkansas, a reasonable estimate of the potential production from Arkansas' forest industries is an annual value of shipments between \$11 and \$17 billion 2001 dollars (an increase of between 50% and 125%).

#### *Energy*

The forest products sector is the third largest consumer of energy in the United States, behind petroleum and chemical sectors (DOE 2005). In Arkansas, forest industries are the largest single user of energy in manufacturing, consuming 21% of the electrical and natural gas used in all manufacturing in the state<sup>1</sup>. More than 80% of the energy consumed by all forest products industries is used in the manufacturing of pulp and paper products, with solid wood products consuming less than 20%. The forest products industry does, through burning of wood waste and mill residue, generate about 50% of its total energy needs internally. Nationally, this industry sector spent \$7.6 billion in 1998 (DOE 2005) for energy and is the fourth largest consumer of fossil fuels in the United States. After wood waste and residues (48%), this industry relies most heavily on electricity (25%) and natural gas (17%). Coal and fuel oil make up 11% of the forest product sector's energy consumption.

***Arkansas could increase the value of its wood products output by \$4 - \$9 billion dollars annually.***

These trends hold true for Arkansas where the forest products industry generates 351.5 megawatts of electrical power, which makes it the fifth largest electrical power-generating entity in the state (ADED 2003).

Arkansas' electrical energy prices are relatively low at \$9.61 per million BTU and ranked 35th in the United States during 2000. These prices are compet-

<sup>1</sup> From unpublished research by Arkansas Department of Finance and Administration on state sales taxes generated by the forest products industry in fiscal year 2005.