

FORESTRY and the Mississippi Economy

By
Richard L. Porterfield
Thomas R. Terfehr
and
James E. Moak



MAFES

MISSISSIPPI AGRICULTURAL & FORESTRY EXPERIMENT STATION
R. RODNEY FOIL, DIRECTOR MISSISSIPPI STATE, MS 39762

Mississippi State University

James D. McComas, President

Louis N. Wise, Vice President



ABOUT THE AUTHORS

Dr. Richard L. Porterfield is Professor of Forest Economics in the Department of Forestry, School of Forest Resources and Forester in MAFES. He received his B.S. in Forestry and Business Administration at Ohio State University, his M.S. in Forestry and Economics at North Carolina State University, an M.Ph., M.S. and Ph.D. in Forestry and Economics at Yale University. He was Assistant Professor at the University of Arkansas before coming to Mississippi State in 1976.

Mr. Thomas R. Terfehr is a Planning Analyst with Champion International at their corporate office in Stamford, Conn. He received his B.S.F. from Northern Arizona University in 1975 and his M.S. in Forest Economics at Mississippi State University in 1977.

Dr. James E. Moak is Professor of Forest Economics in the Department of Forestry, School of Forest Resources and Forester in MAFES. He received his B.S.F. at the University of Florida, his M.S.F. in Management-Economics at Auburn University, and his Ph.D. in Forestry Economics at SUNY at Syracuse University. He has taught and conducted research at Mississippi State University since 1953.

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By

Richard L. Porterfield, Professor and Forester
Thomas R. Terfehr, Research Assistant
James E. Moak, Professor and Forester
All with the
Mississippi State University Department of Forestry

with the aid of the
Mississippi Research and Development Center
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Mississippi Agricultural and Forestry Experiment Station
Mississippi State, Mississippi

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FORESTRY

and the Mississippi Economy

SUMMARY

The purpose of this bulletin is to "tell the story" of Mississippi forestry in one publication. Obviously, everything cannot be covered in one publication but the breadth of treatment is sufficient to acquaint the reader with the ways in which the state's forests and forest industry influence the lives of Mississippians.

Availability of data needed to complete this study varied considerably, depending upon the factor or resource of interest. Generally, the study is based on 1975 data. (The exception is the input/output analysis which is based on 1974 data, the most recent available.) The 1975 statistics are probably conservative because

1975 was not a "typical" year for Mississippi forestry. For example, during the recession of 1975, total Mississippi employment fell 7% from 1974 levels, but forestry employment fell over 13%. Thus, the findings of this study leave little doubt about the essential role of forestry in Mississippi.

Highlights of the study are:

Mississippi's Forest Resources

1) Forests occupy 55% of Mississippi's land area.

2) Mississippi forests are well distributed over the state with the exception of the Delta.

3) The inventory of timber growing stock is slowly increasing.

4) Timber harvest has been increasing steadily.

5) Annual timber growth-harvest ratios indicate that growth and harvest are nearly equal for certain timber products and in certain

regions of the State.

6) Mississippi's forest land is more productive than typical forest land throughout the South or the Nation.

7) Current per acre timber growth in Mississippi is only 60% of the potential growth of fully stocked natural stands.

8) Over 70% of Mississippi's forest land is in nonindustrial private ownership.

9) The use and the value of

Mississippi forests for recreation are immense. Expenditures associated with just forestry-related hunting exceeded \$36 million in 1973.

10) Nearly \$14 million in ad valorem and severance taxes were paid on Mississippi forest land and timber harvested in 1976.

11) The ad valorem tax on Mississippi forest land is increasing rapidly.

The Private Nonindustrial Forest Landowner

1) "Factory workers", many of whom are former farmers and still live in rural areas, are the largest

forest ownership sub-class; 2.4 million acres.

2) Ownerships of less than 50

acres in size account for 53% of all nonindustrial private forest land.

3) A non-timber objective is the

principal reason for forest land ownership by 48% of the nonindustrial private forest landowners.

4) Nonindustrial private forest landowners prefer selective or partial harvesting to clear cutting.

5) No constructive forest management practice has been performed on 40% of the privately owned nonindustrial forest land.

6) Nonindustrial private forest landowners are aware of forest

services available but seldom use these services. The Mississippi Forestry Commission, for example, offers a variety of services to Mississippi forest landowners.

Mississippi Forest Industry

1) Forest industry activity, like the forest resource, is well distributed over all regions of the State.

2) Over \$327 million in wages were paid to about 45,000 forest industry employees in 1975.

3) One of every five manufacturing jobs in Mississippi is provided by forest industry.

4) The forest industry workforce generally is older, somewhat less educated, and more likely to live in a rural area than are other members of the Mississippi workforce.

5) The forest industry employs few females but has a high proportion of minority employment.

6) The forest industry has con-

sistently led all other manufacturing industries in the State in terms of new capital investments in recent years.

7) Mississippi appears to hold a substantial regional advantage in the production of paper products.

8) The forest industry has many hazardous occupations.

Forestry As Part of Mississippi's Overall Economy

1) Input/output analysis shows that forestry is an integral part of the Mississippi economy with major in-state purchases and sales.

2) The forest industry exported wood products valued at \$655 million in 1974.

3) Forestry and forest industry activities *directly* supported 21,000

jobs outside the forestry sectors in 1974.

4) Expansion of the Mississippi forest products industry will have a positive impact on the State's economy:

a. For each \$1 increase in final demand (sales) for forestry products total output of the

Mississippi economy increases \$3.56.

b. For each additional \$1 paid as wages to forestry labor total household income in Mississippi increases by \$3.94.

c. For each new forestry job created in Mississippi four to five new jobs become available in the non-forestry sectors.

The Future of Mississippi Forestry

1) Future demands for forest products are increasing in Mississippi and over the entire Nation.

2) Mississippi has the opportunity and potential capability to increase its share of the supply of forest products.

3) Expansion of the Mississippi forest products industry is unduly limited without change in the current level of forest resource management intensity. Using current annual softwood growth in excess of annual harvest would result in Statewide increases of only 0.7%, 0.8% and 1.2% in Mississippi's economic output, total household income and statewide employment, respectively.

4) More intensive forest resource management of Mississippi forest

industry lands is feasible and would result in increases of 2.0%, 1.7% and 3.0% in Mississippi's economic output, total household income and employment, respectively.

5) Intensifying forest resource management of private, nonindustrial forest lands is the largest challenge and greatest opportunity for Mississippi forestry. Increasing the productivity of these lands under *ideal* conditions would raise Statewide economic output by 9.4%, increase income to Mississippi households by 8.2% and add 14.1% more jobs in Mississippi.

6) Forestry is long-term and the economic impact of more intensive forest resource management, in

large part, cannot be considered immediate.

7) Intensification of forest management practices is a complex matter, particularly with regard to small, private nonindustrial forest ownerships:

a. Efforts to intensify forest resource management must fully recognize the multiple goals of ownership.

b. Low profitability and the long time period associated with growing timber hinder management intensification. Incentive programs are quite important.

8) A massive communication effort is needed to acquaint owners of forest land with their management opportunities and alternatives.

MISSISSIPPI'S FOREST RESOURCES*

Mississippi's forests are vast and vital. They serve as a foundation for the State's forest products industry and influence the lives of every Mississippian. In addition to supplying timber as a raw material for manufacturing, Mississippi's

forests provide a multitude of recreational opportunities--- hunting, camping, picnicking, nature walks and a host of other outdoor activities. Seldom recognized important benefits from the State's forests include their

positive impact on water quality, soil fertility, erosion control and even the air we breath. These factors and the fact that forests are perpetually renewable combine to make Mississippi's forests one of Her greatest natural assets.

Forest land area and timber inventory

Forests occupy 16.7 million acres or 55% of the Mississippi landscape (Van Hooser, 1973). These forests include natural stands of hardwoods, pines, mixtures of these, and man-created plantations, on a variety of sites. The U.S. Forest Service divides the State into five regions based on dominant forest species and physical geography (Figure 1). Most data presented in this bulletin are summarized by these forest inventory regions to facilitate identification of the contribution of forestry in each region to the total impact of forestry on the State's economy.

Each region of Mississippi has substantial forest land acreage (Table 1). The Delta is least forested

and has experienced the greatest change in forested acres in recent years. The increasing demand for soybeans led to extensive clearing of Delta forest land in the 1960's and early 1970's. However, preliminary results from the 1977 forest inventory in Mississippi indicate that the decline in forest land in the Delta has slowed and a period of stable forest land acreage is predicted.¹ Much of the recent clearing of forest land in other regions of the State has been to increase grazing acreage.

Mississippi's inventory of growing stock² increased from 10.3 mil cu ft in 1957 to 14.4 mil cu ft in 1976 (Table 2) but rate of growth has tended to decline with each es-

timate made since the 1967 inventory. However, preliminary data from the 1977 inventory indicate that earlier estimates may be conservative. For example, the new inventory predicts a 21% increase in the Delta since 1967 and a 78% gain in softwood volume in the North in that period.³ Also, the 1976 estimate of growing stock in the State includes an estimate of 3.1 mil cu ft in the North, considerably less than the 3.9 mil cu ft indicated by the 1977 inventory. Therefore, the rate of increase in total inventory appears to have slowed but there is little doubt that growing stock volume in the State still is increasing. Similarly, the 1976 estimates indicate that the

Table 1. Commercial Forest Land Area, by Survey Region, Mississippi, 1973.

U. S. Forest Service Survey Region	Number of Acres of Commercial Forest Land (1,000)	Forest Land as % of Total Land	Change in Forest Land Acreage since 1967 %
Delta	1,307	23	-13
North	4,142	51	- 1
Central	4,056	68	+ 2
South	4,447	72	- 1
Southwest	2,749	63	0
Mississippi	16,700	55	- 1

Source: Van Hooser, 1973

*A more detailed description of study results is available from the senior author, Department of Forestry, Mississippi State University.

¹Paul A. Murphy, "Mississippi's Fifth Forest Survey---A Preview." Paper presented at the Mississippi Forestry Association Annual Meeting, Jackson, MS, October 20, 1977.

²See the Glossary for the definition of this and other terms used throughout this publication.

³See Footnote 1.

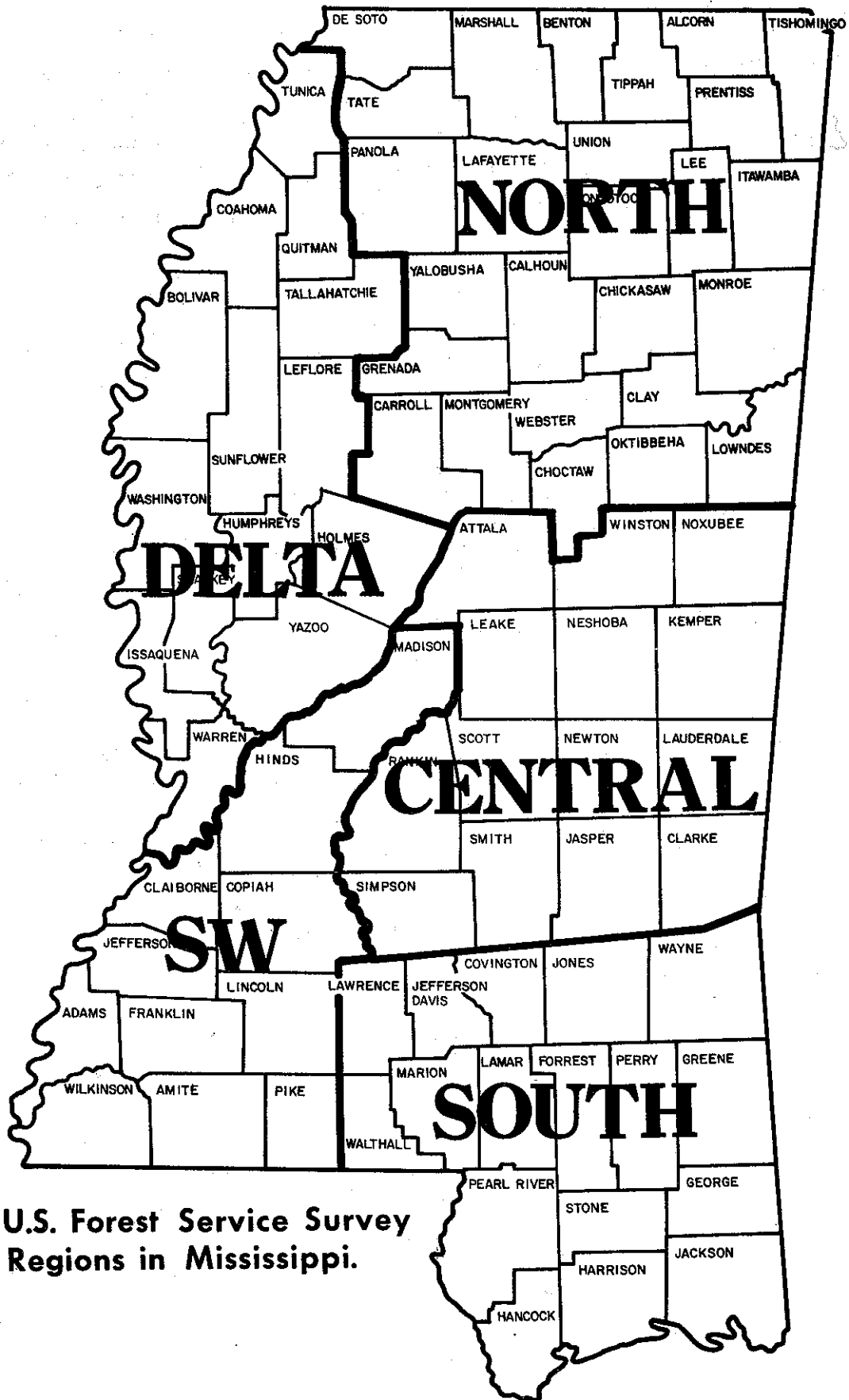


Figure 1. U.S. Forest Service Survey Regions in Mississippi.

volume of sawtimber in the State is increasing slowly.

The Central, South and Southwest regions of the State contain 82% of the softwood grow-

ing stock inventory and the Central region alone contains 30% of the State's softwood volume. The Delta and North regions are dominated by hardwood species,

with 94% of the Delta's total timber volume in hardwood species and 26% of the State's total hardwood inventory in the North.

Productivity and ownership of forest land

The State's favorable climate and soils provide for rapid timber growth and the productive potential of Mississippi forest land is high. For example, 46% of Mississippi's forest land is capable of producing 85 cu ft or more of wood per acre per year--only 34% of all U.S. forest lands and 35% of all forest lands in the South have this potential (Table 3). Mississippi has over 2 million acres of forest land capable of producing 120 cu ft or more of wood per acre per year. These estimates are based on the productive potential of sites occupied by fully-stocked natural stands. Therefore, timber growth would be higher under plantation management and/or if forest fertilization, forest genetics, improved utilization, or other such forest management practices are employed.

A major change in ownership of forest land in Mississippi has been the transfer from farmers to other private nonindustrial owners. These two ownership classes controlled 75% of the State's forest land in 1967 (Table 4) and results of a recent survey by the Mississippi Forestry Association indicate that the Mississippi forestry industry depends upon this acreage for 80% of its wood needs. Only 15% of the forest land in the State is owned by the forestry industry but the proportion varies by region, being highest in the South and lowest in the Delta.

The estimated average net growth of 52 cu ft/acre/year on the 16.7 million acres of forest land in Mississippi is only 60% of potential growth (based on productive potential of fully-stocked natural

Table 2. Trends in Growing Stock Volume of Mississippi Forests.¹

Year	Softwood	Hardwood	Total
-----million cubic feet-----			
1957	4,021	6,291	10,312
1967	6,555	6,479	13,034
1973 ²	7,133	7,042	14,175
1975 ³	7,161	7,111	14,273
1976 ³	7,187	7,205	14,393

¹Data for 1957 and 1967 are from U. S. Forest Service Timber Inventories. The latest inventory was completed late in 1977 and only preliminary data were available when this report was prepared.

²Data from a mid-cycle inventory and some change due to modification of measurement standards are reflected in the increase from 1967 to 1973.

³A forest service best estimate projection based primarily on severance tax reports and stand simulation techniques using growth rates from the 1973 survey.

Table 3. Productive Potential of Forest Land, United States, Southern United States and Mississippi.

Region	Capability of Forest Land as Measured by Growth Potential in Cubic Feet/Acre/Year				
	165	120 - 165	85 - 120	50 - 85	50
(percent of total forest land)					
United States	3	8	23	40	26
Southern U.S.	1	6	28	46	19
Mississippi	3	9	34	47	7

Sources: U. S. Forest Service, 1973; Van Sickle and Van Hooser, 1969

Table 4. Acres of Forest Land, by Ownership Class, with Comparisons, Mississippi 1967.

Ownership Class	Acres Owned	Percent of Total
(million)		
Public	1.7	10
Forest Industry	2.5	15
Farmer	6.2	37
Other Private	6.3	38
Total	16.7	100

Table 5. Actual and Potential Growth of Forests in Mississippi, with Comparisons.

Ownership Class	Mississippi		Actual as a Percent of Potential		
	Actual Net Growth	Potential Net Growth ¹	Miss.	Southern U.S.	U.S.
	(cubic feet per acre per year)				
National Forests	69	100	69	75	39
Other Public	64	96	67	61	57
Forest Industry	55	91	60	64	59
Farm and Other Private	49	87	56	55	49
	---	---	---	---	---
All Ownerships	52	87	60	57	49

¹The sum of site class capability times the proportion of acreage in that site class. Midpoint capability was used for each class except for the 165 cubic feet and greater and 50 cubic feet and less classes for which 175 and 40 cubic feet were used, respectively. (Sources: Van Sickle and Van Hooser, 1969; U. S. Forest Service, 1973; President's Advisory Panel on Timber and the Environment, 1973).

stands), but slightly better than the ratios of actual growth to potential growth for the Southern United States and nationwide (Table 5). Production of privately-owned forests in Mississippi is lower than

that of national forests and other public forest lands. The least productive forests in the State are on the 12.5 million acres controlled by farmers and other private non-industrial owners. Understocking

is the major reason for growth below potential. Nearly 88% of Mississippi's forest land was less than 60% fully stocked with desirable species in 1967 (Van Sickle and Van Hooser, 1967).

Timber harvest

Mississippi's total timber harvest has increased substantially since 1965. The 1974 harvest was the highest in recent years, followed by the general recession-related slowdown in 1975 (Table 6) and a recovery in 1976 to 70% above the 1965 harvest. Cubic foot volumes of sawtimber and pulpwood harvested in 1975 were about equal. The cut of softwood species was slightly more than twice that of hardwood species (Table 7). The hardwood sawtimber harvest is primarily in the Delta and North survey regions where hardwood volume is most abundant. The hardwood pulpwood cut, on the other hand, is principally in the Central, South and Southeast survey regions because of proximity to the larger pulpwood markets of southern Mississippi. The Central region leads in the production of softwood for both sawtimber and pulpwood.

Table 6. Volume of Timber Harvested in Mississippi, Selected Years, with Comparisons.

Year	Volume Harvested	Increase Over 1965
	000 cu ft.	%
1965	374,120	---
1970	590,061	58
1974	675,265	80
1975	545,082	46
1976	637,172	70

Table 7. Mississippi's Timber Harvest, by Product, Species Group and Survey Region, 1975.

Region	Sawtimber		Pulpwood	
	Softwood	Hardwood	Softwood	Hardwood
	(MBF) ¹		(Cords)	
Delta	6,331	68,957	41,985	101,769
North	76,527	82,078	441,180	139,502
Central	262,591	59,406	837,790	427,617
South	166,973	20,982	799,270	219,869
Southwest	167,767	51,182	458,037	284,068
Total	680,189	282,605	2,578,262	1,172,825

¹1,000 Board Feet

Table 8. Ratios of Annual Growth to Timber Harvest, by Inventory Class, Species Group and Survey Region, Mississippi, 1975.

Region	Ratio of Volume Growth to Harvest ¹			
	Total Growing Stock		Sawtimber only	
	Softwood	Hardwood	Softwood	Hardwood
Delta	1.4	1.8	0.9	1.8
North	1.2	1.4	1.1	1.3
Central	0.9	1.2	0.8	1.3
South	1.1	1.5	1.0	1.4
Southwest	1.2	1.3	1.3	1.1
Weighted average	1.1	1.4	1.1	1.4

¹Ratios are interpreted as follows: The weighted average of 1.1 for softwoods (for total growing stock and for sawtimber only) means that 1.1 cu. ft. of softwood was being grown for each cu. ft. harvested in 1975, or that average softwood growth in the state exceeded harvest by 10% in that year.

These ratios are based on the latest available estimates and likely will be revised when data from the 1977 U.S. Forest Service survey become available.

Table 9. Value of the Mississippi Timber Harvest, by Survey Region, 1975.

Region	As Standing Timber	Delivered to Mill (f.o.b.)
Delta	\$ 5,457,885	\$ 13,508,024
North	10,158,481	24,744,128
Central	35,749,673	74,678,883
South	26,345,098	57,386,161
Southeast	22,971,219	46,632,022
Total	100,682,356	216,949,218

Annual growth-harvest ratios

Ratios of annual volume growth to harvested volume indicate that annual harvest in Mississippi is approaching annual growth, particularly for softwood species (Table 8). Both softwood categories in the Central region and the softwood sawtimber component of the Delta actually are being harvested faster than new growth is occurring and growth just matches harvest of softwood sawtimber in the South survey region.

The ratios of growth to harvest reflect the relatively slow recent growth of timber inventories. Because current growth is only 60% of potential growth statewide

(Table 5), timber growth conceivably could be improved by better timber management. This would, however, require a genuine long-time commitment by the farmers and other private nonindustrial owners who control 75% of the State's forest land.

One method of improving growth-harvest ratios immediately is to use existing timber supplies more fully. An estimated 55 million cu ft of growing stock (12% of harvested volume) remained in the woods as logging residue in Mississippi in 1966 (Van Sickle and Van Hooser, 1969). Use of

hardwoods is particularly poor, with logging residue typically amounting to about 20% of harvested volume. Use of multiple-product, tree-length harvesting would "stretch" timber supplies by 10 to 15% (Porterfield and von Segen, 1976). More complete harvesting also lessens the general public's negative reaction to the immediate post-harvesting scene.

Growth-harvest ratios also can be improved by making more complete use of timber delivered for processing. Small sawmills, for example, produce unused residues amounting to an average of 20% of their volume of log purchases.

Table 10. Taxes Paid by Mississippi Forest Owners, by Taxation Category and Survey Region, Mississippi, 1976.

Region	Severance Tax	Advalorem Tax on Forest Land ¹	Fire Protection Tax ¹	All Taxes
Delta	\$ 90,400	\$ 711,023	\$ 27,722	\$ 829,145
North	301,641	2,728,293	83,904	3,113,838
Central	632,066	2,725,540	79,190	3,436,796
South	548,020	3,624,987	85,046	4,258,053
Southwest	370,425	1,809,453	55,094	2,234,972
Total	1,942,552	11,599,298	330,956	13,872,804

¹Estimates derived using the number of commercial forest land acres from Van Sickle and Van Hooser (1969).

Timber value

Value of the 1975 harvest delivered (f.o.b.) to the first processing plant was more than \$200 million (Table 9). Value of the harvested wood as uncut raw material still standing in the woods (stumpage) was more than \$100

million, much of which was paid to farmers and other private nonindustrial forest land owners. These values are considerably below those of the 1976 and 1977 harvests because the volume harvested in 1975 was much below the average

of recent years and prices reflected the recession-related slowdown in 1975. For example, the stumpage value of the 1975 harvest would have been \$150 million at 1977 prices.⁴

Public revenue from forest lands

The direct contribution of Mississippi's forests to the support of government services in the State is significant. Funds for this come from transfer of receipts from sale of timber from national forests, from sales of timber from 16th section land, and from severance, fire protection and ad valorem taxes.

The 1.1 million acres of national forest land in Mississippi are not taxed but counties from which stumpage is cut receive 25% of the receipts in lieu of ad valorem taxes. These in lieu payments totaled \$1,553,758 in 1975, with distribution among the survey regions as follows: North, \$108,653; Delta, \$8,722; Central, \$166,557; Southwest, \$648,515; and South, \$621,311. Also, timber harvested from more than 300,000 acres of 16th section forest land provided in excess of \$2.1 million in direct

payments to local governments in 1976.

Timber is taxed when it is cut (severance tax), forested land is subject to a 2 cent/acre/year fire protection tax, and the land upon which timber grows is taxed annually (ad valorem tax). Taxes on timber and forest land in Mississippi totaled \$13.9 million in 1976 (Table 10). Forest land owners in the South survey region paid more taxes than owners in any other region; however, severance tax collections were highest in the Central region.

Ad valorem taxes on forest land in Mississippi currently are of great concern because of recent increases in the rate applied to forested (classified as uncultivable) land. Average ad valorem taxes per acre of uncultivable and cultivable lands, respectively, were \$0.60 and \$1.45 in 1974, \$0.63 and \$1.53 in 1975, and \$0.72 and \$1.58 in 1976.

The change from 1974 to 1975 represents increases of 5.0 and 5.5% for uncultivable and cultivable land, respectively. However, the 1975 to 1976 increase was 3.3% for cultivable land and more than 14.3% for uncultivable land. Regionally, the rate of change for cultivable and uncultivable land diverged importantly from the State average. For example, the ad valorem rate on the more than 4 million acres of forest land in the Central region increased 22% (\$0.59 to \$0.72 per acre) from 1975 to 1976 but remained at \$0.93 on cultivable land.

Ad valorem taxes are annual costs that have a tremendous impact on forest investment decisions because of the long time period required for timber production. The tax paid each year must be compounded at the market rate of interest until timber is harvested, and total tax is much

⁴Stumpage value of the record 1974 harvest would have been \$180 million at 1977 prices.

Table 11. Recreation Visits to National Forests, by Activity and Region, Mississippi, 1975.

Activity	Region					Total
	North	Delta	Central	Southwest	South	
	-----visitor days-----					
Camping	67,400	3,800	10,100	17,800	55,900	155,000
Picnicking	24,300	200	4,000	5,000	9,200	42,700
Swimming	41,100	---	5,000	3,600	9,200	58,900
Hunting	146,900	9,900	65,900	26,200	60,800	309,700
Fishing	19,500	1,100	8,500	2,400	13,000	44,500
Gen. Dispersed	95,700	800	36,800	6,900	126,000	269,200
Total	394,900	15,800	130,300	61,900	274,100	877,000

more than the annual rate times number of years until harvest. For example, total cost of a 72

cent/acre/year ad valorem rate for a 30-year rotation and a 10% interest rate is \$118.44,⁵ \$96.84

more than the \$21.60 resulting from multiplying the rate by years to harvest.

Non-timber forest resources

Grazing, nature walks, wildlife photography, hunting and a host of other activities add substantially to the value of Mississippi's forest lands. However, the value of non-timber forest resources can be estimated only crudely because such uses generally do not have established market prices and inventory or use data from which to begin assessment are sparse.

The 1.1 million acres of national forest land in the State are an exception to the above because numbers of visitor days are recorded (Table 11). The North survey region, which includes the Holly Springs and Tombigbee National Forests, has the greatest recreation use. Participation in each activity reported in Table 11 is projected to increase in the future (U.S. Forest Service, 1977).

Mississippi state parks and historic sites are administered by the Mississippi Park Commission. Recorded visitations (not visitor days as recorded for national forests) reached a record high of 4.3 million in 1975. The major purpose (87%) of these visitations was for

day-use activities such as picnicking. Native Mississippians accounted for 85% of the visitations in 1975.

Water and forage are valuable resources on all forested acres throughout the State. Water yield from national forests alone, for example, is about 2 million acre feet annually (65 billion gallons of good-quality water). More than 6,000 cattle grazed national forests in 1975 and an appreciable increase in demand for grazing on forest lands is forecast. However, the largest anticipated increases in demand on Mississippi national forests are for timber and recreation.

Mississippi has a large and diverse game resource and most species use forest land for food and/or cover. Forest-related game species include rabbit, squirrel, raccoon and woodcock as small game, deer and turkey as big game species. The 1971 white-tail deer population in Mississippi was estimated to be 250,000 and increasing. The turkey population

was estimated to be 53,000 (Halls and Stransky, 1971).

The dominance of hunting as a non-timber use of national forests (Table 11) is true for forest land throughout the State. According to a 1972 study of 636,700 households, at least one member of 35% of Mississippi's households participates in some form of hunting activity (Horvath, 1974). A questionnaire completed as part of this study identified almost 2 million acres of industrial forest land open to hunting, and the sample was not exhaustive. More than 1.4 million (70%) of the 2 million acres were available to hunters on a permission only basis, with no fees charged. The 1975 game harvest from the 270,000 acres in wildlife management areas maintained by a single Mississippi company included 1,500 deer and 425 turkeys.

Crude estimates of the value of hunting in Mississippi's forests can be made from examination of expenditures for licenses and by abstracting from results of two studies--one by the Environmen-

⁵This is a pre-income tax calculation. The amount after income tax would be less depending upon the tax bracket of the individual or firm.

tal Research Group of Georgia State University (Horvath, 1974) and one by the Mississippi Game and Fish Commission. Total fees from sales of licenses (combination hunting-fishing licenses and hunting licenses specific to game found in forests) amounted to \$2.6 million in 1975. Hunters spent over 3 million days afield in Mississippi forests in 1972 and estimated their expenditures conservatively at \$35 million (Table 12). Estimated value of forest-related hunting exceeded \$100 million in 1972.

Table 12. Days Afield, Expenditures and Value Received, Hunting, Mississippi, by Game Species, 1972-1973.

Item	Small Game	Large Game	All Game
	----- (1,000) -----		
Days Afield (No.)	2,233	985	3,218
Expenditures ¹ (\$)	22,352	12,696	35,048
Value Received ² (\$)	68,178	39,262	107,440

¹Include only variable costs . . . i.e., such items as travel to sites, shells, and licenses.

²Value placed on the hunting activities by the participants.

Source: Horvath, 1974 and unpublished results of a mail survey conducted by the Mississippi Game and Fish Commission.

PRIVATE NONINDUSTRIAL FORESTS

The future of Mississippi forestry will be determined largely by levels of management practiced on the 12.5 million acres of forest land in the hands of private nonindustrial owners. Levels of management will

in turn be governed by the occupations of the individual landowners, their age, education and income level, their reasons for owning forest lands, and their receptivity to management

assistance programs. The characteristics of owners summarized below are abstracted from several studies of individuals who own forests ranging in size from 20 to 500 acres.

Ownership

A distinctive characteristic of owners is their occupation. The 2.4 million acres owned by "factory

workers" account for almost one fourth of the forest acreage in the hands of private nonindustrial owners in Mississippi and 32% of the private nonindustrial owners in the State are "factory workers" (Table 13). About 85% of this occupation group were once farmers and still live on their rural properties. The shift from "farmer" ownership to "factory-worker" ownership likely will continue as Mississippi becomes more industrialized.

"Retirees" also own about 2.4 million acres of forest land but this occupation group accounts for only 23% of the private nonindustrial owners in the State. "Businessmen" and "professionals" combined account for 17% of all owners but control 2.3 million acres of forest lands. Only 9% of the private nonindustrial owners are "housewives" but they own almost 1 million acres.

Occupation of owners and

Table 13. Number of Owners, Percentage of Total Owners and Acreage Owned, Private Nonindustrial Owners of 20 to 500 Acres of Forest Land, by Occupation of Owners, Mississippi.¹

Occupation	No. of Owners	Percentage of all Owners	Total Forest Acres Owned
Factory Workers	38,176	32	2,404,400
Retirees	27,439	23	2,366,400
Farmers	19,088	16	1,683,200
Businessmen	13,123	11	1,577,000
Housewives ²	10,737	9	905,200
Professional	7,158	6	728,300
Other	3,579	3	249,500
All Occupations	119,300	100	9,914,000

¹Ownerships less than 20 acres and greater than 500 would bring total private, nonindustrial ownership in Mississippi to 12.5 million acres (see Table 7).

²All women who hold deeds to forest land and are housewives.

Source: Survey by the Mississippi State University Forestry Department.

Table 14. Distribution of Ownership of 20-to-500 Acres, Private Nonindustrial Forests, by Occupation of Owners, Mississippi.

Occupation	Acres Owned						Total
	20-49	50-89	90-159	160-269	270-429	430-500	
	-----Percent-----						
Factory Workers	61	26	11	2	0	0	100
Retirees	48	31	11	8	0	2	100
Farmers	52	25	12	6	5	0	100
Businessmen	38	18	23	14	5	2	100
Housewives	64	18	6	6	6	0	100
Professional	48	19	24	0	9	0	100
Other	54	23	23	0	0	0	100
All Occupations	53	25	13	6	2	1	100

Source: Survey by the Mississippi State University Forestry Department.

acreage owned tend to be related directly to levels of timber management on private nonindustrial forest lands. Forest management opportunities are very limited for owners of small tracts (20-50 acres) and are even more limited for many, if not most, small ownerships because their acreage is not in a single tract but is split by fields, pastures, roads and other uses of land associated with farming. Also, many small tracts that are part of a farming operation consist of narrow uncultivable strips of woodland along stream bottoms. This acreage contributes little to timber supplies but is of great importance for wildlife habitat.

More than one half of the private nonindustrial forest ownerships in Mississippi are smaller than 50 acres and almost 80% are smaller than 90 acres (Table 14). However, total acreage in the smallest ownership category approaches 2 million and the combined acreage of the two smallest ownership categories is 3.7 million of the 9.9 million acres in the 20- to 500-acre ownership range. Percentages of owners with less than 50 acres are highest for "housewives," "factory workers" and "farmers." Percentages of owners with 160 acres or more are higher for "businessmen"

than for other occupation categories.

Land is an asset and landowners with higher asset levels are known to practice more intensive forestry. Therefore, the combined acreage of an owner's forest land and other land is an important determinant of levels of intensity of forest management. The average "businessman" forest owner controls more total land and more forest land than do owners in any other employment category (Table 15); "housewives" own the smallest acreage of total land and forest land ("other" occupation category

excluded).

Studies have shown that higher levels of educational attainment and total income of forest owners are associated with higher levels of forest management. The "businessmen" and "professionals" who own forest land in Mississippi have more formal education and earn higher incomes than forest land owners with other occupations (Table 16). "Businessmen" and "professionals" also are slightly younger than forest land owners with other occupations ("other" occupation category excluded).

Table 15. Average Size of Total Land and Forest Land Ownerships, Private Nonindustrial Owners of 20 to 500 Acres of Forest Land, by Occupation of Owners, Mississippi.

Occupation	Average Acres Forest Land	Average Total Acres Owned
Factory Workers	63	131
Retirees	86	135
Farmers	88	195
Businessmen	121	206
Housewives	84	125
Professional	102	153
Other	70	97
All Occupations	83	150

Source: Survey by the Mississippi State University Forestry Department.

Table 16. Age, Formal Education and Annual Income, Private Nonindustrial Owners of 20 to 500 Acres of Forest Land, by Occupation of Owners, Mississippi.

Occupation	Average Age	Average Education	Average Annual Income
	Years	Years	
Factory Workers	53	10	\$ 7,700
Retirees	63	10	4,700
Farmers	53	11	7,700
Businessmen	51	14	10,500
Housewives	59	11	6,500
Professional	48	14	11,200
Other	52	11	7,000
All Occupations	55	11	7,400

Goals of ownership and levels of management

One major objective of a Mississippi State University Forestry Department study was to determine why private nonindustrial owners acquire and retain ownership of forest lands. The study revealed that most owners (83%) had bought their land, the others had inherited it. Timber production was given as the major use by 52% of the land owners. Grazing was reported as the major use by 29% of the respondents and 12% reported a home site as the primary reason for owning forest land (Table 17). Many forest owners reported up to 100 acres exclusively for a home site;

however, 73% of the holdings used primarily as residential sites were smaller than 50 acres.

Percentages of owners reporting timber production as their primary goal were higher for "farmers" and "professionals" than for other occupational groups. Grazing was reported as the primary use of forest lands held by "factory workers." Most respondents in all occupational categories reported using their forest lands for more than one purpose.

The fact that only slightly more than one half of the owners had timber production as a primary goal suggests that intensity of

management practices would be low on many ownerships and this was confirmed by the study. No timber management practice had been performed by 40% of the owners and performance of individual management practices ranged from 3% for prescribed burning to 29% for timber stand improvement (Table 18). However, some owners in each occupation category performed more than one practice; therefore, management level indices were computed (indices for each occupation category ranged from 0 for no management practice to 11 for the highest levels of management activity, such as

Table 17. Major Reasons for Ownership, Private Nonindustrial Owners of 20 to 500 Acres of Forest Land, by Occupation of Owners, Mississippi.

Occupation	Major Reason for Ownership						Total
	Timber Production	Grazing	Residence	Recreation	Clearing for Agriculture	Miscellaneous	
-----Percent-----							
Factory Workers	37	43	15	1	2	2	100
Retirees	64	22	12	0	1	1	100
Farmers	67	17	8	0	8	0	100
Businessmen	54	25	5	7	2	7	100
Housewives	40	36	21	0	3	0	100
Professionals	67	14	10	0	0	9	100
Other	39	15	15	8	0	23	100
All Occupations	52	29	12	1	3	3	100

Source: Survey by the Mississippi State University Forestry Department.

the combination of planting, thinning and fencing).

"Professionals" had the highest percentage (29%) with the highest index (Table 19) and only 5% of "factory workers" performed management practices at the highest level. Only 11% of all respondents performed management practices at the highest level. "Professionals" also had the highest average levels of management, "housewives" the lowest ("other" occupation category excluded).

Higher levels of educational attainment tend to be associated with higher levels of management activity (Table 20). However, slightly less than 5% of the owners who performed no management practices had completed college while about one fifth of those owners who practiced management at the highest level were college graduates.

The association of levels of management with size of holdings showed no consistent pattern. Average size of the ownerships with a management index level of 6-10 was smaller than that of ownerships with lower management indices. However, average size of the ownerships with the highest level of management activity ranged from two to three times that of ownerships with lower levels of management. Also, ownerships with the highest levels of management accounted for 21% of the total forest acreage (Table 21).

Private nonindustrial owners of forest land appear to be relatively knowledgeable about the various landowner assistance programs. However, participation by owners

Owner attitudes toward timber management

The Forest Productivity Committee of the Mississippi Forestry Association surveyed 590 private nonindustrial forest owners in 1977

Table 18. Management Practices Performed, Private Nonindustrial Owners of 20 to 500 Acres Forest Land, by Management Practice, Mississippi.

Practice	Percent of Owners ¹
Planting	22
Timber Stand Improvement	29
Thinning	24
Firelanes	10
Fencing Out Stock	9
Prescribed Burning	3
No Practice Performed	40

¹Percentages do not add up to 100 because some owners performed more than one forest management practice.

Source: Survey by the Mississippi State University Forestry Department.

Table 19. Management Practices Indices, Private Nonindustrial Owners of 20 to 500 Acres Forest Land, by Occupation of Owners, Mississippi.

Occupation	Management Practices Indices ¹				Mean Index
	0	1-5	6-10	11	
	-----Percent-----				
Factory Workers	40	36	19	5	3.2
Retirees	46	3	12	11	4.35
Farmers	48	30	9	13	3.1
Businessmen	43	20	18	18	4.3
Housewives	55	24	15	6	2.7
Professional	14	43	14	29	5.9
Other	69	8	15	7	2.4
All Occupations	44	30	15	11	3.4

¹Indices for each occupation category ranged from 0 = no management practice to 11 for the highest levels of management activity, such as the combination of planting, thinning and fencing.

Source: Survey by the Mississippi State University Forestry Department.

ranged from a low of 2% in the services offered by private consultants and wood-using firms to a

high of only 34% in the programs of the Mississippi Forestry Commission (Table 22).

and the results provide valuable insights into the attitudes of owners toward timber management. However, the results likely

are more representative of attitudes of owners of larger tracts because of differences in the number of usable questionnaires

Table 20. Management Practices Indices, Private Nonindustrial Owners of 20 to 500 Acres Forest Land, by Level of Educational Attainment of Owners, Mississippi.

Management Practices Indices ¹	Education of Owners, Years				Average Educational Attainment years
	8	8-11	12-15	16	
	-----Percent-----				
0	31.6	32.2	30.4	4.7	10
1-5	19.3	31.1	38.7	10.1	11
6-10	6.8	27.1	54.2	10.2	13
11	22.0	26.8	29.3	19.5	12
All Owners	23.1	30.5	36.4	8.7	11

¹See Footnote 1, Table 19.

Source: Survey by the Mississippi State University Forestry Department.

Table 21. Average and Total Acreage, with Comparisons, Private Nonindustrial Owners of 20 to 500 Acres of Forest Land, by Management Practices Indices, Mississippi.

Management Practices Indices ¹	Acreage		
	Average	Total	% of Total
0	58	3,702,000	37
1-5	69	3,064,900	31
6-10	47	1,035,100	11
11	138	2,112,000	21
All Owners	83	9,914,000	100

¹See Footnote 1, Table 19.

Source: Survey by the Mississippi State University Forestry Department.

Table 22. Knowledge of and Participation in Landowner Assistance Programs, Private Nonindustrial Owners of 20 to 500 Acres of Forest Land, by Agency or Program, Mississippi.

Agencies or Programs	Knowledge of Agency or Program	Used Agency or Program
Mississippi Forestry Commission	87	34
County Agents	88	22
Extension Foresters	51	3
Soil Conservation Service	83	29
Federal Assistance Programs (ACP, REAP, ASCS)	58	16
U.S. Forest Service - Y.L.T.	65	13
Tree Farm Program	67	14
Soil Bank (Federal Program)	71	6
Wood Using Firms	50	2
Consulting Firms (Fee basis)	37	2

Source: Survey by the Mississippi State University Forestry Department.

returned for ownerships of different sizes---sizes of ownership, numbers of questionnaires returned and representation of that ownership in the total sample as a percent were, respectively, under 50 acres, 59 and 10%; 51-100 acres, 112 and 19%; 101-200 acres, 133 and 23%; and over 200 acres, 286 and 48%.

Forty three percent of the respondents had planted trees on some forest land in the previous five years. However, only 22% of the owners with less than 50 acres had planted any trees in that period. Numbers of acres planted ranged from 1 to 3,000 but plantings of 20 to 30 acres were most prevalent.

Almost one half of the respondents reported the performance of some cultural practices in the previous five years. Over 100 of the owners practiced timber stand improvement. However, performance of timber stand improvement practices was reported much less frequently by the smaller owners. Thinning and timber stand improvement (e.g., by removing undesirable hardwood species) were the most common cultural practices.

Many respondents who had harvested no trees in the previous five years were owners of less than

Table 23. Forest Acres Burned and Number of Forest Fires Suppressed by the Mississippi Forestry Commission, Selected Years.

Date	Acres Burned	Number of Fires
1970-71	54,779	4,995
1971-72	35,142	3,836
1972-73	32,136	3,525
1973-74	33,532	3,273
1974-75	41,926	3,400
1975 (Calendar year)	40,169	3,210

Source: Mississippi Forestry Commission

50 acres and 29% of the owners in this size group do not plan any harvest in the foreseeable future. However, 60% of all who responded had harvested trees in the previous five years and 40 acres was the most frequent size of the harvested area.

Partial cutting was preferred three-to-one over clear cutting--partial harvesting of stands apparently is more compatible with the multiple goals of owners of small forests (Porterfield and Moak, 1977). A major concern with partial harvesting is that inadequate consideration is given to stand regeneration. The pine in

mixed stands frequently is harvested and the less desirable hardwoods are left on sites. Professional forestry advice generally is needed to assure protection and perpetuation of the pine component of stands.

Many respondents expressed concern with the desirability of performing timber management practices in the future. Some consider forest management too complex. Also, the low profitability associated with growing softwood or hardwood stumpage (Porterfield and Moak, 1977 and Porterfield and others, 1977) hinders more intensive forest management in

some cases. However, the most frequently expressed causes of less intensive management were dislike of the damage resulting from harvesting and the inclination of many owners to save their timber and forest land for their heirs.

The negative reaction to harvesting is a concern of the Mississippi forest industry. However, opportunities exist for reducing the undesirable visual and physical impact of harvesting. Also, most forest land retained for descendants eventually will be available for harvest as timber matures (Turner, et al, 1977).

Mississippi Forestry Commission programs⁶

The Mississippi Forestry Commission (MFC) was established by legislative act in 1926. The primary purpose of the Commission is to provide service to Mississippi residents, particularly the private nonindustrial forest owners.

Fire prevention--The initial priority of MFC was protection of forest land from wildfire. This continues as a major concern; however, MFC programs now are concentrated more on fire prevention activities and forest management practices to reduce the need for fire suppression.

The forest area burned annually by wildfire has been reduced from an estimated 10 million acres in 1926 to less than 40,000 acres in

Table 24. Miles of Firelanes Constructed by the Mississippi Forestry Commission and Number of Owners Receiving the Service, Selected Years.

Date	Miles of Firelanes	Number owners
1970-71	2,174	2,012
1971-72	2,937	2,751
1972-73	2,697	2,460
1973-74	2,665	2,305
1974-75	2,023	1,689
1975-76	1,537	1,394

Source: Mississippi Forestry Commission

⁶Compiled from Annual Reports, Mississippi Forestry Commission and from information obtained from the State Forester's Office, Jackson, Miss.

1975. Numbers of fires also have declined over time and only 3,210 fires were suppressed by MFC in 1975 (Table 23). The major fire prevention efforts of MFC are firelane construction,

prescribed burning and the Rural Community Fires Protection Program. Firelane construction is a service provided landowners on a fee basis. More than 1,500 miles of firelanes were constructed for 1394 landowners in 1975-76 (Table 24). Prescribed burning of forests reduces ground debris so that less damage results if wildfire occurs and also is used to control undesirable species in forest stands. Use of this service by owners peaked in 1971-72 and only 22,538 acres were burned for 569 owners in 1975-76 (Table 25).

Table 25. Acres of Prescribed Burning by the Mississippi Forestry Commission and Number of Owners Receiving the Service, Selected Years.

Date	Acres Burned	Number of Owners
1970-71	23,496	388
1971-72	43,160	875
1972-73	43,143	874
1973-74	38,694	801
1974-75	27,213	716
1975-76	22,538	569

Source: Mississippi Forestry Commission

Federal Cost Share money was made available for the Rural Community Fires Protection Program in Fiscal 1974-75. This program enables rural communities to organize and equip rural fire departments.

Table 26. Record of Management Assistance Provided by the Mississippi Forestry Commission, by Service Provided, Selected Years.

Item	1972-73	1973-74	1974-75
General Assists (cases)	19,560	20,115	24,126
Reconnaissance or Diagnosis Cruise (cases)	9,946	9,577	9,697
Management plans:			
Number	946	1,133	1,386
Acres	121,071	125,729	138,103
Timber Marked			
MBF	41,884	38,146	16,306
Cords	47,913	63,224	31,367

Source: Mississippi Forestry Commission

Resource management---The Mississippi Forestry Commission provides technical advice and assistance on multiple-use management to (1) private forest owners and operators, (2) processors of primary and secondary forest products, and (3) public lands agencies. The resource management services offered are timber marking, developing management plans, reconnaissance and general assistance (Table 26).

Table 27. Number of Applications, Acreage of Forest Land Improved and Funds Approved, Federal Incentives Program, Mississippi, 1974-75 and 1975-76.

Item	Year	
	1974-75	1975-76
Applications (number)	739	868
Planted or Seeded (acres)	5,882	5,796
Improved by Release or Site Preparation for Natural Regeneration (acres)	4,139	2,100
Cost Share Approved for Above Work (dollars)	414,807	372,265

Source: Mississippi Forestry Commission.

The Federal Incentives Program (FIP) was created in 1973 to provide cost-share funds to private nonindustrial forest landowners and responsibility for the technical assistance provided by the program was delegated to MFC. Most applicants for assistance can be reimbursed for 75% of expenditures for such services as site preparation, tree planting or seeding, and timber stand improvement. Numbers of applications were larger in 1975-76 than in 1974-75; however, the acreage for which assistance was requested and cost-share funds approved were lower (Table 27).

The Forest Resource Development Act passed by the Mississippi Legislature in 1974 authorized cost-share funds for assisting private nonindustrial forest owners in tree planting, direct seeding, and other forest improvement practices. This program is similar to the FIP program and is administered by the MFC. The State program is financed by revenue from the timber severance tax. Numbers of applications, the acreage for which assistance was requested and cost-share funds approved were larger in 1975-76 than in 1974-75 (Table 28).

Sufficient time has elapsed for the Federal and State incentive programs to become fully operative -- forest owners generally are more aware of their opportunities and the public agencies involved have adjusted to providing administrative support and technical assistance. Therefore, the acreage for which assistance was requested and cost-share funds approved under both programs increased substantially in 1976-77 (Table 29).

Summary of services: 1. Protection from wildfire; the landowner pays 2 cents/acre/year tax for this

Table 28. Numbers of Applications, Acreage of Forest Land Improved and Funds Approved for Programs Authorized by the Mississippi Forest Resources Development Act, 1974-75 and 1975-76.

Item	Year	
	1974-75	1975-76
Applications (number)	546	827
Planted or Seeded (acres)	9,720	10,301
Released or Site Prepared for Natural Regeneration (acres)	5,119	5,606
Cost Share Approved for Above Work (dollars)	614,616	621,927

Source: Mississippi Forestry Commission

service.

2. Preparation of forest resource management plans; there is no charge to the landowner for this service.

3. Marking timber for sale; up to 40 acres annually per ownership is free of charge.

4. Marketing assistance; the landowner is furnished sample sale contracts and information on prospective buyers. There is no charge to landowners.

5. Growing tree seedlings in MFC

nurseries for sale to landowners at cost; prices are quoted each year.

6. Tree planting; a fee is charged when the MFC performs the service. A list of private vendors who perform the service is furnished landowners.

7. Release of desirable seedlings (TSD); a fee is charged when performed by MFC. A list of private vendors who perform the service is furnished landowners.

8. Mechanical site preparation; a list of private contractors (vendors)

Table 29. Funds Approved Under the State Forest Resource Development Program (FRDP) and the Federal Incentives Program (FIP), Mississippi, 1976-77.

Practice	FRDP		FIP	
	Acres	Cost-Share	Acres	Cost-Share
	No.	\$	No.	\$
Site Preparation (For Planting)	18,442	497,273	10,724	396,542
Planting	16,970	442,970	16,521	441,118
Release	6,232	106,929	3,336	75,866
Site Preparation (For Regeneration)	677	9,852	1,020	20,403
TOTAL	42,321	1,057,024	31,601	933,929
Fire Breaks	Linear Feet	Cost-Share	Linear Feet	Cost-Share
	111,890	\$2,259	89,670	\$2,242

Source: Mississippi Forestry Commission

is provided.

9. Firelane construction; a fee is charged when service is preformed by MFC.

10. Prescribed burning; a fee is charged when performed by MFC.

11. Incentives programs, both FIP and FRDP; resource manage-

ment plans are prepared free of charge along with information about the programs. Individual forest management activities are performed in connection with these programs.

12. Insect and disease control; the MFC provides technical per-

sonnel to examine and identify the causal agent and recommends treatment without charge.

13. Assistance to urban owners; the MFC provides advice on tree care and recommends treatment.

MISSISSIPPI'S FOREST INDUSTRY

Mississippi's forest industry firms are well distributed over the State (Figure 2) and serve as the basis of forestry's contribution to the Mississippi economy. Forestry

is a primary manufacturing industry and many secondary and service jobs depend on forestry-related employment. This dependency is true statewide but is

even more important at the local level where forestry employment may be critical to economic maintenance or growth, particularly in the small rural communities.

Employment and earnings

Employment---Forestry employment of individuals covered by the Mississippi Employment Security Law totaled 39,940 in 1975---37,937 working for forest industry firms (Table 30) and 2,003 working for self-employed individuals and firms engaged in harvesting saw-

timber and pulpwood. Additionally, 4,960 full-time self-employed individuals and unpaid members of their families not covered by Mississippi Employment Security Law worked as timber harvesters (1,570 in sawtimber harvesting and 3,336 in pulpwood). Therefore,

employment in the Mississippi forest industry totaled 44,846 in 1975.

Employment in forest management is much larger in the Southwest forest survey region than in other regions (Table 30) because of the large numbers of

Table 30. Employment by the Forest Industry, by U.S. Forest Service Survey Region and Type of Industry, Mississippi, 1975.

Industry	Survey Region					Total ¹
	North	Delta	Southwest	Central	South	
	-----Number-----					
Forest Management	179	93	635	167	338	1,675
Logging Camps and Contractors	316	90	562	451	547	2,003
Sawmills, Plywood and Millwork	4,643	2,323	3,220	3,951	4,450	18,664
Wood Furniture and Fixtures	953	163	1,934	(²)	561	3,618
Paper and Allied Products	436	415	2,241	428	2,730	6,350
Total	6,527	3,084	8,592	4,997	8,626	32,310
Upholstered Wood Furniture	6,919	(------all other regions = 711-----)				7,630
	Forest Industry Total					39,940

¹Includes any unclassified as to district and any failing to meet disclosure criteria.

²Negligible

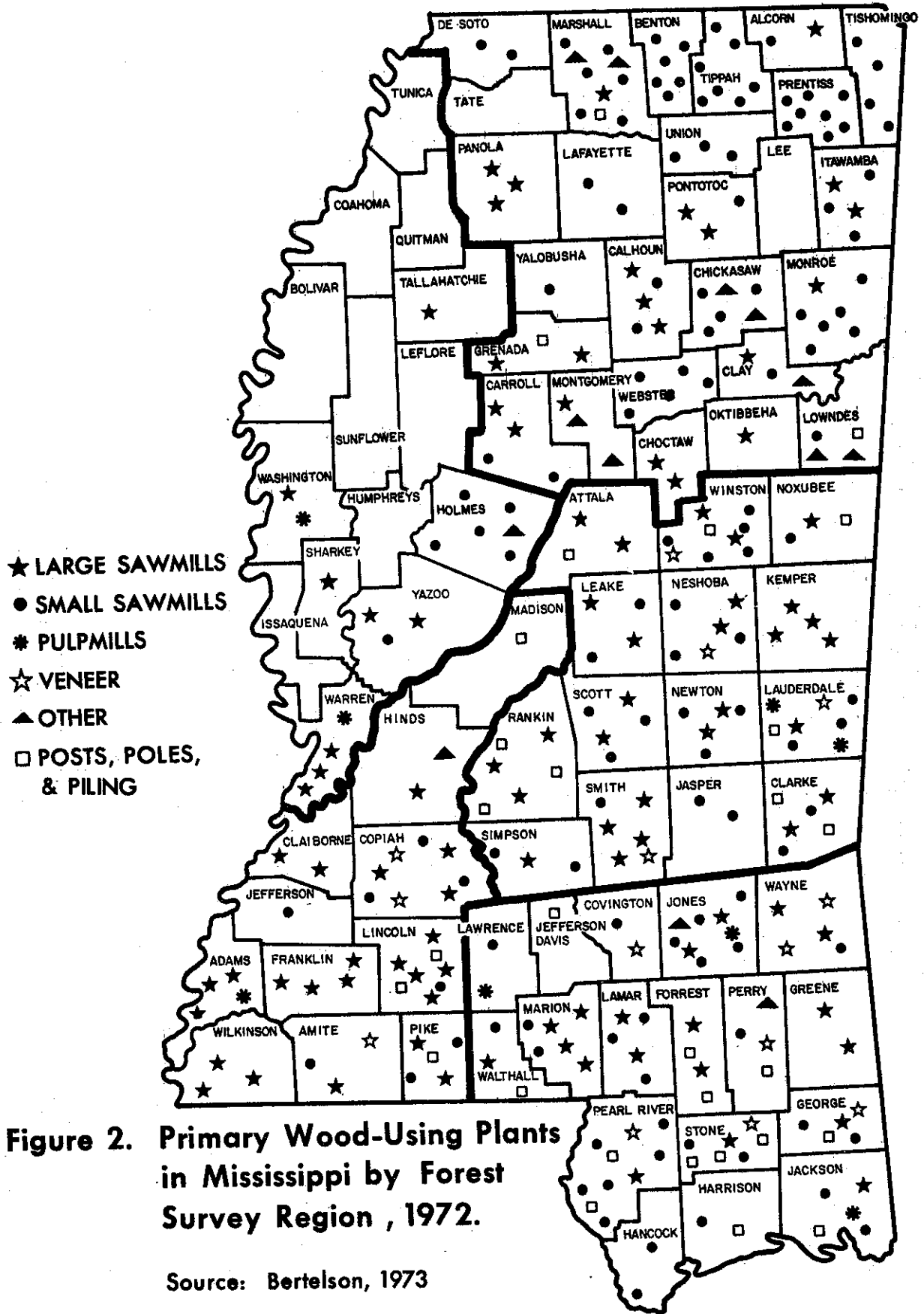


Figure 2. Primary Wood-Using Plants in Mississippi by Forest Survey Region , 1972.

Source: Bertelson, 1973

Table 31. Earnings by Forest Industry Employees, by U.S. Forest Service Survey Region and Type of Industry, Mississippi, 1975.

Industry	Survey Region					Total ¹
	North	Delta	Southwest	Central	South	
-----Thousands of dollars-----						
Forest Management	1,484	645	6,700	1,442	2,871	15,836
Logging Camps and Contractors	1,298	295	2,745	2,181	3,174	10,126
Sawmills, Plywood and Millwork	31,989	17,693	24,285	30,139	40,226	144,484
Wood Furniture and Fixtures	5,537	1,061	14,811	(²)	3,420	24,869
Paper and Allied Products	3,669	6,983	27,273	4,479	33,346	75,750
Total	\$43,977	\$26,677	\$75,814	\$38,241	\$83,037	\$271,065
Upholstered Wood Furniture	\$51,412	(-----all other regions = \$5,256-----)				\$ 56,668
					Forestry Industry Total	\$327,733

¹Includes any unclassified as to district and any failing to meet disclosure criteria.

²Negligible

Table 32. Employment and Earnings of Forestry Industry Workers, with Comparisons, Mississippi, 1975.

Industry	Employment		Earnings		Earnings Per Employee	
	No.	%	\$1,000	%	\$	%
Forest Management	1,675	---	15,836	---	9,455	---
Logging Camps and Contractors	2,003	---	10,126	---	5,056	---
Sawmills, Plywood Millwork	18,664	---	144,484	---	7,741	---
Wood Furniture and Fixtures	3,618	---	24,869	---	6,874	---
Paper and Allied Products	6,350	---	75,750	---	11,929	---
Upholstered Wood Furniture	7,630	---	56,668	---	7,427	---
TOTAL	39,940	---	327,733	---	8,206	---
All Manufacturing	202,092	19.8*	1,644,262	19.9*	8,136	101*
All Non-Agriculture Wage and Salary Workers ¹	692,592	5.8*	5,559,323	5.9*	8,027	102*
Agricultural Wage and Salary and Proprietors ²	115,612	34.5*	469,042	69.9*	4,057	202*

¹U.S. Dept. of Commerce, *Employment and Earnings*

²Bureau of Economics Analysis Estimates

*Forestry total as % of each specified industry.

Table 33. Distribution of Employees by Occupational Group and Industry and Educational Levels of Employees, by Occupational Group, Mississippi, 1970.¹

Industry	Occupational Group								Service Workers incl. Private Household	Farm Workers (self-employed and farm laborers)
	Professional, Technical	Managers, Administrators	Sales Workers	Clerical Workers	Craftsmen	Machine Operators	Transport Equip. Operators	Laborers		
	-----Percent-----									
MISSISSIPPI	12	8	6	13	14	17	5	6	14	6
Agriculture	3	.8	(2)	1	2	1	1	4	a	86
Mining	9	7	.7	5	19	47	7	3	1	
All Manufacturing	4	3	2	8	17	51	4	8	2	
Furniture, Lumber and Wood Prods.	2	4	a	6	18	38	7	22	2	
Paper and Allied Products	6	2	1	9	23	41	5	8	3	
Fabricated Metals Industry	4	3	1	8	25	50	3	4	2	
Food and Kindred Products	2	7	5	8	11	43	13	9	3	
Construction	5	8	(2)	4	56	5	5	16	1	
Entertainment and Recreation Services	19	20	5	9	7	.6	(2)	10	29	
Employees with at least a High School Education	91	75	69	84	44	36	28	21	53	22

Source: Adapted from table 180 and table 179 (percent of occupation group completing high school), Census of Population, characteristics of the population: Mississippi 1970. U.S. Dep. of Commer., Bur. Census, Washington, D.C.

¹See Appendix A for composition of industry groups.
aLess than 1 percent.

Mississippi Forestry Commission and U. S. Forest Service employees at each agency's central office in Jackson. Employment in the paper and allied products sector is concentrated heavily in the Southwest and South regions. Employment in the manufacture of upholstered wood furniture is concentrated in the North.

Earnings---Earnings by "covered" employees in the Mississippi forest industry (excluding the 4,960 "not covered" employees engaged in harvesting sawtimber

and pulpwood) totaled more than \$327 million in 1975 (Table 31). The \$83 million earnings in the South region where employment was highest were exceeded only by those in the North region, when the large numbers employed in the manufacture of upholstered wood products in the North are added in. Earnings in the South and Southwest regions reflect the importance of the paper and allied products sector.

Total employment by the Mississippi forest industry in 1975 was

19.8% of the total employment in all manufacturing activities and earnings of forest industry employees were 19.9% of all manufacturing earnings (Table 32). Average earnings of forest industry employees were slightly higher than those of workers engaged in other manufacturing and were highest for employees of the paper and allied products sector of the forest industry. The average forestry worker earned more than twice that of the average agricultural worker.

Workforce characteristics

Occupation and education---More than 70% of the Mississippi forest industry workforce is drawn from three occupational groups---

craftsmen, machine operators and laborers. Machine operators predominate, with 41% of employees in the paper and allied

products sector and 38% of those in the furniture, lumber and wood products sector supplied from this group (Table 33). Craftsmen rank

Table 34. Age Distribution and Median Age of Mississippi Forest Industry Employees, with Comparisons, 1970.¹

Sector	Proportion of Work Force (years)			Median Age (years)
	16-24	25-44	45+	
	(percent)			
Mississippi	18	43	39	40
Agriculture	14	32	52	44
Mining	18	54	28	38
Construction	15	42	43	42
Forestry related				
Logging	17	50	33	39
Sawmills, Plywood, Etc.	14	40	46	42
Misc. Wood Products	14	42	44	42
Paper and Allied Prod.	18	53	29	38
Furniture and Fixtures	25	50	25	37
Fabricated Metals	23	53	29	39
Chemicals and Allied Prod.	27	39	34	38
Wholesale and Retail Trade	21	40	39	38
Entertainment and Recreation Services	24	33	43	40

¹Adapted from Table 187, Census of Population, Characteristics of the Population: Mississippi 1970, U.S. Dept. Commer., Bur. Census Washington, D.C.

Table 35. Place of Residence of the Employed Work Force, by Industry, 1970.¹

Sector	Percent		
	Urban	Rural Nonfarm	Rural Farm
	-----%-----		
Mississippi	49	43	8
Agriculture	11	50	39
Mining	37	57	6
Construction	43	49	8
All Manufacturing	39	53	8
Furniture, Lumber & Wood Products	29	62	9
Fabricated Metals	42	51	7
Textile Mill, Apparel and Allied	27	62	11
Chemical and Allied	55	40	5
Motor Vehicles & Other Transportation Equipment	56	40	4
Wholesale Trade	62	33	5
Entertainment & Recreational	68	29	3
Elementary, Secondary and Colleges	57	36	7

¹Adapted from table 55 of Census of Population, Characteristics of the Population: Mississippi, 1970, U.S. Dept. of Commerce, Bureau of Census, Washington, D.C.

second in the paper and allied products sector and laborers rank second in the furniture, lumber and wood products sector.

Employees of the Mississippi forest industry are drawn heavily from occupational groups with

lower educational levels. For example, only 21, 28, 36 and 44% of laborers, transport equipment operators, machine operators and craftsmen, respectively, had at least a high school education. These occupational groups ac-

counted for 77 and 85% of the employees in the paper and allied products sector and the furniture, lumber and wood products sector, respectively. The average educational level of employees in the paper and allied products sector

Table 36. Percentage of the Civilian Labor Force Working 50 Weeks or More and Relative Importance of Females and Minorities in the Work Force, by Industry, Mississippi, 1970.¹

Sector	Employed Labor Force		
	Working 50 - 52 Wks.	Female	Negro and Spanish Speaking
	----- % -----		
MISSISSIPPI	63	39	29
Industry			
Agriculture	53	7	48
Mining	68	5	8
Construction	58	4	25
All Manufacturing	68	34	27
Forestry Related:			
Forestry	(2)	13	20
Logging	41	4	56
Sawmills, Millwork	65	7	53
Misc. Wood Products	74	15	36
Paper and Allied	78	12	23
Furniture and Fixtures	70	24	31
Fabricated Metals	76	14	28
Apparel and Other Fabricated Textiles	58	83	14
Chemicals and Allied	79	17	25
Wholesale and Retail Trade	69	38	18
Entertainment and Recreational	56	35	27
Professional and Related Services (Health, Education, Welfare Services, etc.)	53	68	33

¹Adapted from tables 183, 184 and 185 of Census of Population, Characteristics of the Population: Mississippi, 1970, U.S. Department of Commerce, Bureau of Census, Washington, D.C.

(2) Unavailable

is higher because this sector draws more employees from professional and other more educated occupational groups. Agriculture has the least well educated workforce.

Age and place of residence---The median age of forest industry employees in 1970 differed only slightly from the 40-year median age of all persons employed in the State, ranging from 37 in furniture and fixtures to 42 in miscellaneous wood products and sawmills, plywood, etc. Age distribution of forest industry employees also did not differ greatly from that of all persons employed in the State. Major exceptions were the relatively high percentage of younger persons employed in furniture and fixtures and the smaller percentages of younger people employed in the two forest-related sectors where median age of employees was highest (Table 34).

More than 70% of the Mississippi forest industry's employees reside in rural areas (Table 35). This adds emphasis to the contribution of forestry to the State's economy. Incomes of rural residents who work for the forest industry generally are spent in urban (trade) centers. Therefore, the entire economy benefits from forestry employment. Also, the only employment in manufacturing in many communities is that related to forestry activities.

Weeks worked and workforce composition---The percentage of the Mississippi labor force working 50 weeks or more in 1970 averaged 63 for all occupational categories and ranged from 41 for logging to 79 for the chemicals and allied category (Table 36). Except for the logging and sawmills-millwork categories, percentages of the workforce working 50 weeks or

more were higher in forestry-related occupations than in all manufacturing. Employment in paper and allied product manufacturing appears especially stable.

Female employment in forestry-related activities ranged from only 4% of total employment in logging to only 15% in miscellaneous wood products. The State average for all occupations was 39%, and 34% of the employees in the all manufacturing category were female (Table 36).

The percentage of minorities in the workforce is higher in forest-related occupations than the State average for all industries and is higher in logging and sawmill-millwork than in other sectors of the forest industry (Table 36). Therefore, expansion of the forest industry can be expected to contribute significantly to minority employment.

Occupational hazards and costs of workmen's compensation

The lumber and timber products sector ranked second to general construction in number of work-related deaths in Mississippi in 1975. Forestry-related Workmen's Compensation claims and Workmen's Compensation payments led the State in 1975

(Table 37). Furniture and finished lumber products ranked just behind lumber and timber products in number of claims and total Workmen's Compensation payments. Numbers of claims by forestry industry employees declined from 1972 to 1975 but total compensation payments increased (Table 38).

Compensation for work injuries in Mississippi is paid by employers through the Mississippi Workmen's Compensation program. Each firm in an industry pays a basic rate per \$100 of payroll. The rate depends upon each industry's payments to workers injured while on the job and is a good general index of safety conditions in each industry. Logging and lumbering (pulpwood only, including drivers) had the highest rate in Mississippi in July 1977 and the increase since October 1975 was greater than for any other occupation (Table 39).

Available data not reported here indicate that forestry employment in Mississippi is significantly less hazardous than is typical of the entire U.S. forestry industry. However, forest industry employment generally is more hazardous than most employment alternatives in Mississippi and this is reflected in significantly higher costs for forest industry firms.

Capital investment

The combined capital expenditure of all sectors of the Mississippi forest industry has exceeded that of any other manufacturing industry in the State and has amounted to 25% or more of total investment in Mississippi in most recent years⁷ (Table 40). Results of a survey of Mississippi Forestry

Table 37. Deaths, Workmen's Compensation Claims and Workmen's Compensation Payments Resulting From Work-Related Injuries, Mississippi, 1975.

Sector	Deaths	Cases	Total Cost
	-----Number-----		\$
MISSISSIPPI	139	10,636	21,198,147
General Farms	0	34	62,615
Forestry	1	20	38,463
General Construction	20	1,163	2,916,138
Food and Kindred	6	700	927,576
Apparel and Other Textiles	1	370	550,727
Lumber and Timber Prod.	11	774	1,622,704
Furniture and Finished Lumber Products	2	727	1,134,097
Paper and Allied	2	139	217,463
Printing and Publishing	1	24	48,304
Chemical and Allied	2	343	609,415
Stone, Clay and Glass	7	365	649,825

Source: Preliminary Draft of the Twenty-Seventh Annual Report of the Mississippi Workmen's Compensation Commission, Jackson, MS

Table 38. Number of Workmen's Compensation Cases and Workmen's Compensation Payments, Forest Industry, By Sector, Mississippi, 1972-1975.

Sector	Year			
	1972	1973	1974	1975
Lumber and Timber Basic Products				
Cases (Number)	842	829	923	774
Total Payments (\$1,000)	1,011	1,131	1,461	1,622
Paper and Allied Products				
Cases (Number)	127	130	137	123
Total Payments (\$1,000)	178	245	257	217

Source: Preliminary Draft of the Twenty-Seventh Annual Report of the Mississippi Workmen's Compensation Commission, Jackson, MS

⁷The very large investment by the transportation equipment industry in 1970 moved investment in forestry manufacturing to second place and capital expenditure by the forest industry amounted to only 15% of total manufacturing investment that year.

Table 39. Workmen's Compensation Rates in July 1977 and Change From October 1975 to July 1977, Selected Occupations, Mississippi.

Occupation	Rate Per \$100	Change Oct. 1975
	of Payroll	to July 1977
	\$	%
Logging and Lumbering (pulpwood only, incl. drivers)	34.59	+42
Aircraft Operators - Public Exhibition	23.31	+18
Oil Well Rigging	20.64	+5
Window Cleaning Including Drivers	18.47	+16
Logging and Lumbering (sawtimber, N.O.C., incl. drivers)	14.78	+6
Sawmills	4.50	+3
Dairy Farms	4.07	-8
Veneer Manufacturing	3.68	0
Oil and Gas Lease Operators Incl. Drivers	3.00	+14
Police	2.91	+18
Planing or Moulding Mills	2.87	-9
Furniture Stock Manufacturers	2.39	+11
Clay Products Manufacturing	2.28	+5
Fireman	1.95	+15
Paper and Pulp Manufacturing	1.87	+11
Colleges and School Professors, Teachers, etc.	0.23	+15

Source: The Basic Manual of Rules, Classifications and Rates for Workmen's Compensation and Employer's Liability Insurance, 1934 (original printing), Rates effective October 1, 1975 and July 1, 1977. Office of the Insurance Commissioner, Jackson, MS

Association members indicate that the 1975 capital expenditures were allocated to pollution control (13%), new plants and equipment (34%), and maintenance and upkeep (53%). These expenditures represent a tremendous investment in the future of Mississippi forestry.

Many forestry firms have financed their capital investments through the sale of BAWI (Balance Agriculture With Industry) bonds. Forest industry investments financed through the sale of BAWI bonds were \$77.7 million in lumber and wood products, \$13.6 million in wood furniture, and \$21.1 million in paper and allied products from 1971 through 1976.

The massive capital investments in recent years have steadily increased labor productivity in most sectors of the forest industry and

the industry is now less labor intensive. However, the combined employment of production workers in all forest-related activity (lumber and wood products, sawmills and planing mill, millwork-plywood, furniture and fixtures, paper and allied products) still exceeds that of any other manufacturing industry in the State (Table 41).

Production workers in all sectors of the forestry industry work more 40-hour weeks per year than those in the industry that ranks second in number of production workers (apparel, other textile) and average annual wages per worker are higher (Table 41). The forest industry also is less labor intensive--wages of production workers as a percentage of total payroll, cost of materials and capital investment

are higher in apparel and other textiles than in any sector of the forest industry.

Average value added per hour worked by production employees in the forest industry increased from 83% of the average for all Mississippi industries in 1974 to 93% in 1975 (Table 42). Value added per hour worked in all forest-related activities other than paper and allied products was much lower than the average for all Mississippi industries in both years. Value added per hour worked in the paper and allied products sector was much higher than the State average for all industries.

Low value added per hour worked is typical of lumber and wood product mills throughout the United States (Figure 3). Net value added per hour worked (value

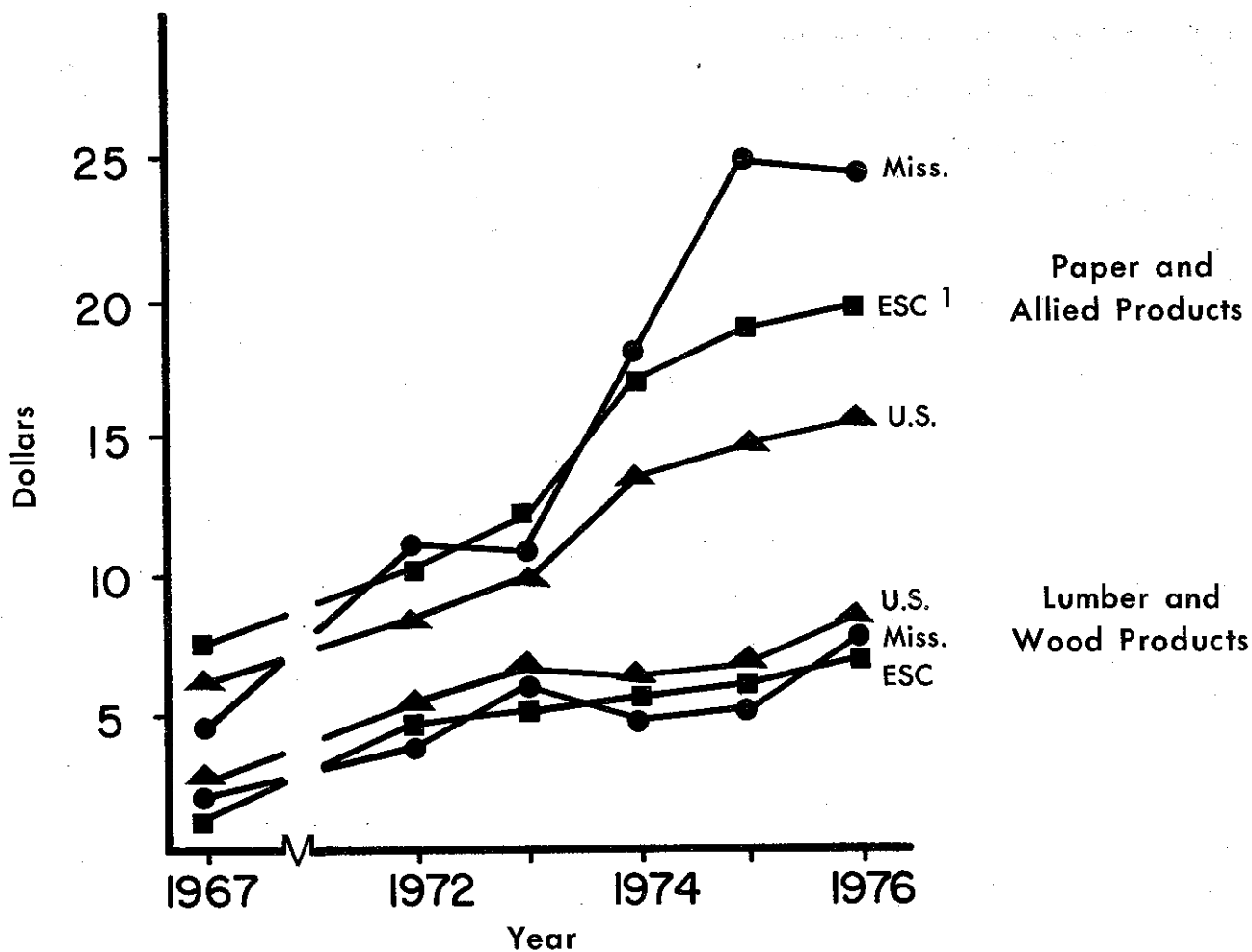


Figure 3. Net Value Added per Production Employee Hour for Paper and Allied Products and Lumber and Wood Products by Region

Source: Census of Manufacturers and Annual Survey of Manufacturers
 1 East South Central Region, Kentucky, Tennessee, Alabama and Mississippi

added per production employee hour minus wage per production employee hour) in the paper and allied products sector of the forestry industry has increased dramatically in the United States, the East South Central region, and Mississippi in recent years. However, gains have been greater in Mississippi and the State's paper industry is now far ahead of the Nation.

Factors contributing to the massive increases in investment by the Mississippi forest industry are proximity to raw materials (lower transportation costs), somewhat lower labor costs, and very favorable employee attitudes and work habits (Wangel, 1977). Such factors have provided Mississippi's paper and allied products sector an apparent comparative advantage over other regions. Capital investments in high technology equipment because of the favorable environment for expansion in Mississippi have greatly increased net value added per production employee hour in paper and allied products.

Table 40. Capital Expenditures By Selected Industries, Mississippi, Selected Years.

Item	Year				
	1968	1970	1972	1974	1975
	----- (million \$) -----				
MISSISSIPPI	143.7	274.7	235.9	319.7	260.1
Industry					
Food and Kindred	4.1	11.8	19.2	23.6	22.7
Apparel, Other Textile	3.0	5.6	8.1	10.1	11.6
Lumber and Wood Products	20.4	29.9	43.6	61.7	38.5
Sawmills and Planing Mills	(u)	7.9	11.3	20.4	11.1
Millwork, Plywood, Etc.	(u)	(d)	6.7	8.7	3.3
Furniture and Fixtures	2.3	4.1	11.4	10.3	5.0
Paper and Allied Products	25.6	7.0	6.4	22.1	21.9
Chemicals and Allied	19.3	15.2	15.8	43.4	23.7
Machinery, Except Elect.	5.4	6.5	24.6	14.7	12.1
Electric Equip.	5.4	10.2	16.0	30.6	14.5
Transportation Equip.	5.3	75.9	19.9	24.2	23.6
Lumber and Wood Products, Paper and Allied, and Furniture and Fixtures, as a Percent of Mississippi Total	34%	15%	26%	29%	25%

(u) unavailable

(d) withheld because of disclosure criteria

¹Source: Annual Survey of Manufactures and Census of Manufacturers

FORESTRY AS PART OF MISSISSIPPI'S OVERALL ECONOMY

Increased production efficiency in Mississippi's forest industry results in a greater gross state product, higher household incomes, and increased employment of the labor force. The direct contribution of the forest industry to the State's economy is important but a more comprehensive measure of the industry's importance can be obtained by considering the interactive effects of increased forest industry output among the interdependent sectors of the economy. Each producing sector in an interdependent economy sells to and buys from other producing sectors as each engages in its own production. Demand for output by other producing sectors is termed

intermediate demand. The remainder of each sector's production is sold to households, the Federal Government or is exported.

A major characteristic of the Mississippi forest industry is the large-scale in-state manufacture of raw materials purchased for the most part within the State. Some sectors of the industry sell primarily to other firms in Mississippi, others export the majority of their output. Each transaction stimulates the State's economy--larger purchases of raw materials put more dollars in the hands of forest owners, harvesting crews and haulers; sale of products to other firms in the State increases the circulation of dollars; and

exports bring new dollars into the State.

Input-output analysis is a technique for simultaneous evaluation of the interaction of the interdependent sectors of an economy and for evaluating each sector as an integral part of an economy. The technique also provides a means of estimating economic changes generated by growth and development of individual industrial sectors. A common procedure in input-output analysis (after coefficients describing interdependencies are calculated) is to *assume* a given expansion in a sector as a means of describing that sector's importance within the economy.

Table 41. Number, Weeks Worked, Average Annual Wages, and Labor Productivity of Production Workers, by Industry, Mississippi.

Sector	Production Employees		40-Hr Work Week Equivalents	Wages per Production Worker		Wages of Production Workers as a % of Total Payroll, Cost of Materials, and Capital Invest.
	1974 (1,000)	1975	(1975) No.	1974	1975	(1975) %
MISSISSIPPI	169.3	157.2	47.4	6,338	7,155	15
Industry						
Food and Kindred	12.7	12.6	49.8	5,504	6,175	6
Apparel, Other Textile	35.2	32.5	43.1	4,480	4,769	29
Lumber and Wood Products	20.0	17.0	48.2	6,045	6,371	16
Sawmills and Planing Mills	8.0	6.9	48.9	5,550	6,116	20
Millwork Plywood	2.9	2.4	53.1	6,620	7,333	17
Furniture and Fixtures	12.8	11.0	46.8	5,680	6,309	23
Paper and Allied Prod.	5.1	4.6	50.5	10,373	11,717	16
Chemical and Allied	3.8	4.1	47.0	8,658	9,583	10
Machinery, Except Elect.	7.7	7.4	51.7	7,558	8,243	19
Electric Equipment	15.4	12.5	48.0	6,305	6,752	20
Transportation	17.7	22.0	48.5	8,028	9,732	21

Source: Annual Survey of Manufacturers, 1975, M75 (AS-6) U.S. Dept. of Commerce, Washington, D.C.

Table 42. Value Added, Total and Per Production Employee Hour, Mississippi, by Industry, with Comparisons, 1974 and 1975.

	Value Added			
	Total		Per Production Employee Hour	
	1974	1975	1974	1975
	--million \$--		-----\$-----	
MISSISSIPPI	3,785.9	3,685.5	11.71	12.36
Industry				
Food and Kindred	305.9	349.9	12.19	13.94
Apparel and Other Textiles	344.0	340.3	5.50	6.08
Lumber and Wood Products	307.5	261.5	7.67	7.97
Sawmills and Planing Mills	107.6	84.3	6.48	6.24
Millwork, Plywood, Etc.	42.7	49.6	7.12	9.73
Furniture and Fixtures	180.4	177.0	7.45	8.59
Paper and Allied Products	236.4	283.3	22.95	30.46
Chemical and Allied	338.5	347.2	45.13	45.09
Machinery, Except Elect.	204.3	208.6	12.93	13.63
Electrical Equipment	324.2	294.5	10.77	12.27
Transportation Equipment	458.3	430.5	14.23	10.08
Lumber and Wood Products, Paper and Allied and Furniture and Fixtures as a Percent of Mississippi Total			19%	20%
			83%	93%

**Source: Annual Survey of Manufacturers, 1975, M75 (AS-6).
U.S. Department of Commerce, Washington, D.C.**

Effect of forestry industry expansion on gross state product, household income and employment⁸

Assume that a sawmill-planing mill complex to be located in Mississippi will have annual sales of \$7 million (a 2.5% increase in value of the total sawmill sector output) and that the mill will provide 70 new jobs. How would operation of the new mill impact on the Mississippi economy?

One half of all purchases by the sawmills and planing mills sector

are in-state (Table 43); therefore, sales of \$7 million by the new mill would be associated with an increase of \$3.5 million in direct purchases from other Mississippi industries. Adding the indirect purchases by other industry sectors and the purchases induced by increased household spending brings the total increase in statewide economic output to \$22.8

million.⁹

Employment and household income effects of the new sawmill also would be substantial. New jobs created by the new mill would total 250 (70 in the sawmill plus 180 created in other sectors as a result of operating the sawmill).¹⁰ Also, the \$7 million in sales generated by the new mill would result in \$1.47 million of additional direct income paid to Mississippi households. The multiplier effect would bring the total increase in household income to more than \$5.6 million.¹¹

A concise comparison of the contribution of each forestry sector and of all other producing sectors to increases in total output, employment and household income in Mississippi can be made by referring to Table 44. Realizing the potential output, employment and household income gains from increasing forestry output, as for other industrial sectors, requires an increase in final demand (sales) for products. Further, because there must be a stimulus for the original \$100,000 output increase, the best opportunities for output increases in Mississippi center upon products with strong demand outside the Mississippi economy. Increases in out-of-state demand are therefore critical to future increases in forestry output in Mississippi because of the high proportions of exports from some of the more important sectors of the State's forestry industry.

Table 43. In-State Sales and Purchases as a Percent of Gross Output, by Industrial Sector, Mississippi, 1974.

Sector	Sales	Purchases
	-----%-----	
Livestock and Agricultural Products	47	45
Food and Kindred Products	36	79
Mining	73	47
Construction	31	58
Textiles and Apparel	59	66
Misc. Primary Forest Products & Fisheries	78	31
Logging Camps & Contractors	100	53
Sawmills and Planing Mills	59	50
Millwork and Plywood	58	53
Wood Containers	34	52
Wood Buildings and Mobile Homes	19	71
Misc. Wood Products	21	61
Wood Furniture	37	58
Pulp, Paper and Board Mills	36	60
Paperboard Containers & Boxes	92	65
Printing and Publishing	59	47
Other Manufacturing	78	46
Transportation	71	39
Communications & Utilities	67	46
Wholesale & Retail Trade	36	16
Finance, Insurance, Real Estate	26	33
Services	37	11
State and Local Government	6	38

THE FUTURE OF MISSISSIPPI FORESTRY

An assessment of the Nation's renewable resources completed by

the U.S. Forest Service in June 1977 (U.S. Forest Service, 1977)

indicates that the U.S. demand for all forest resources has been and

⁸Based on the input-output model presented in Appendix B.

⁹Estimate based on the average of Type I and Type II output multipliers. See Appendix B, Table 2.

¹⁰Estimate based on the average of Type I and Type II employment multipliers. See Appendix B, Table 3.

¹¹Estimate based on the average of Type I and Type II income multipliers. See Appendix B, Table 4.

Table 44. Economic Impact of a \$100,000 Output Increase, by Economic Sector, Mississippi, 1974.

Sector	Output Increases in that Sector	Statewide Response		
		In Output	In Employment	In Household Income
Livestock & Agricultural Products	\$100,000	\$385,000	16	\$122,000
Food & Kindred Products	100,000	447,000	14	112,000
Mining	100,000	378,000	9	115,000
Construction	100,000	402,000	12	112,000
Textiles & Apparel	100,000	453,000	19	120,000
Misc. Primary Forest Products & Fisheries	100,000	363,000	10	125,000
Logging Camps & Logging Contractors	100,000	332,000	18	83,000
Sawmills & Planing Mills	100,000	326,000	11	80,000
Millwork & Plywood	100,000	334,000	11	83,000
Wood Containers	100,000	369,000	13	106,000
Wood Buildings & Mobile Homes	100,000	408,000	12	101,000
Misc. Wood Products	100,000	376,000	13	97,000
Wood Furniture	100,000	364,000	15	93,000
Pulp, Pap. & Bd. Mills: Misc. Pap. Prod.	100,000	365,000	11	90,000
Paperboard Containers & Boxes	100,000	375,000	11	91,000
TOTAL FOREST INDUSTRY	100,000	356,000	12	90,000
Printing & Publishing	100,000	375,000	14	112,000
Chem. & Allied; Petroleum & Other Mfg.	100,000	412,000	11	105,000
Transportation	100,000	347,000	12	107,000
Communications & Utilities	100,000	356,000	13	107,000
Wholesale & Retail Trade	100,000	328,000	13	124,000
Finance, Ins., & Real Estate	100,000	353,000	11	120,000
Services	100,000	376,000	15	147,000
State & Local Government	100,000	355,000	18	110,000

still is increasing as a result of population increases, rising family incomes and more leisure time (Table 45). Appreciable increases in demand for forest resources also are projected in other reports (U.S. Forest Service, 1973 and Bureau of Outdoor Recreation, 1973).

The Nation's energy needs may increase the demand for timber well beyond these projected levels, because the projected increases do not account for the possible effect of the changing energy situation

on the demand for forest resources. Wood can be burned, converted to charcoal and combustible gasses, used as the basis for manufacturing plastics and other petroleum-based products, and used in other ways to reduce dependency upon oil imports. Production of energy by plantations of fast-growing tree species to provide fuel for electricity generation has been shown to be promising (Howlett and Gamache, 1977).

Opportunities for increasing Mississippi's share in supplying the projected increases in demand for forest resources appear excellent. Upward population trends in Mississippi and the Southeast and stable or declining populations in the Northeast and Midwest mean that a larger percentage of the U.S. population will be in a position to use the recreational resources of Mississippi forests more readily. These population changes also place Mississippi

closer to expanding markets for wood products.

United States trade in wood products (exports and imports) was 36% of domestic production in 1976, and international trade of wood

products is projected to increase (Stone and Dickerhoof, 1977). World demand for paper and paper products (products for which Mississippi has a comparative advantage) is predicted to rise steeply

(Stone and Saeman, 1977). Mississippi's ports provide an opportunity for gaining an increasing share of the growing world market for wood and wood products.

However, the U.S. Forest Service assessment of renewable resources also indicates that projected levels of demand are above those that can be supplied with present management of the Nation's forests. Mississippi has the forest lands and adequate labor resources in the occupational groups most needed for expanding production but timber production is far below potential. Methods of increasing the productivity of forests are known but largely unused at present. Therefore, application of more intensive forestry management practices would ensure Mississippi's ability to respond to the growing market opportunities.

Table 45. Projected Increases in Demand for Forest Products, United States.

Product	Base Year	Percentage increase (base year equals 100)		
		1980	2000	2020
Remote camping	1975	106	133	180
Birdwatching	1975	107	138	168
Small game hunting	1975	106	121	136
Freshwater fishing	1975	111	156	205
Forest-range grazing	1970	135	150	164
Timber	1970	131	173	219
Water (consumptive use)	1975	103	123	139

Source: U. S. Forest Service, 1977

Effect of alternative forest management strategies

Ratios of timber growth to timber harvest with current levels of management of Mississippi's forest lands (Case A) provide an opportunity for increasing timber harvest without decreasing the State's total timber inventory. The additional raw materials would result in a greater gross state product, higher household incomes and increased employment of the labor force. However, total timber harvest and the subsequent impact on the State's economy would be much greater with more intensive management of forest industry lands (Case B) and private nonindustrial forests (Case C).

Case A (status quo management)--Annual timber growth in Mississippi exceeds timber harvest by 33 million cu ft (23.2 million cu ft of softwood and 9.8 million cu ft of hardwood); therefore, annual harvest could be increased 33 million cu ft without reducing the State's timber inventory.

Using the forest industry mix depicted in the input-output analysis, this much additional raw material would result in an increased output of \$65.3 million for the forest industry (at 1974 prices) and would add more than 2,000 jobs in forestry employment. Increasing timber harvest to just balance annual growth with no increase in forest management intensity would increase Mississippi's total economic output by \$232.4 million, would create 9,400 new jobs (including the 2,000 in the forestry industry), and would lead to more than a \$61.1 million increase in household incomes of Mississippians.¹²

The \$65.3 million increase for the forest industry represents only a 5% increase over current output. The statewide output, employment and household income effects represent increases of only 0.8, 1.2 and 0.7%, respectively (Figure 4).

Case B (more intensive manage-

ment of forestry industry lands)--Average production of forest industry lands in Mississippi is only 60% of the potential of fully-stocked natural stands. An additional 83 million cu ft of timber (largely softwood) would be available for harvest if all forest industry acres were producing at natural stand potential.

Harvesting and processing this much additional raw material would result in an increased output of \$164 million for the forest industry and would add as many as 5,060 jobs in forestry employment. Intensified management of forest industry lands and subsequent expansion of forestry output could increase Mississippi's total economic output by \$584 million and could mean as many as 23,630 new jobs (including the 5,060 in the forest industry) and as much as \$152.2 in additional household income.

The \$164 million increase in

¹²Estimates based on the average of Type I and Type II multipliers for the forest industry mix.

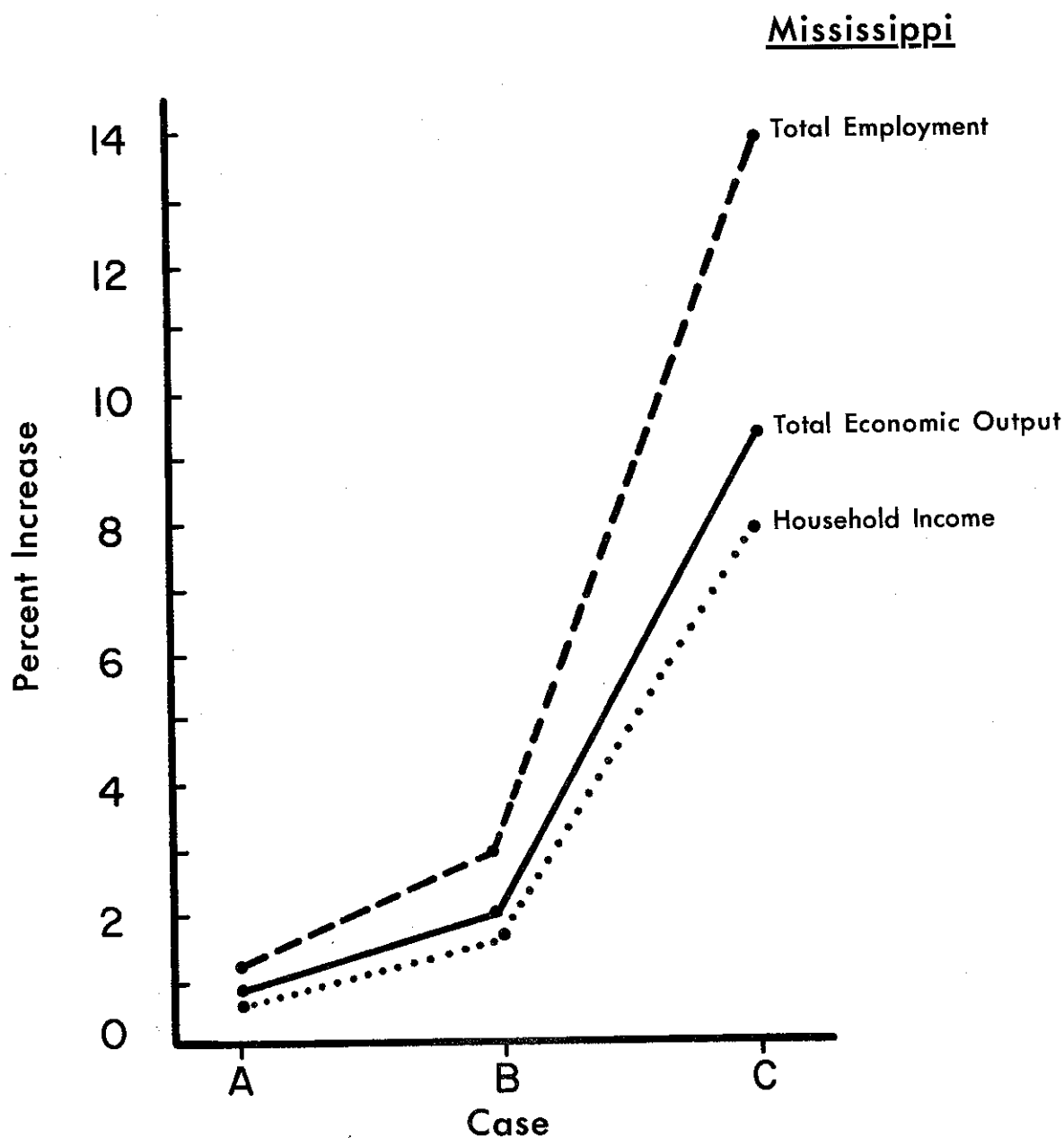


Figure 4. Impact of Expansion of the Mississippi Forest Products Industry

forestry output and the 5,060 new jobs in forestry each represent an increase of 12% over current levels. The statewide output, employment and household income effects represent increases of about 2.0, 3.0, and 1.7%, respectively (Figure 4).

Case C (more intensive manage-

ment of private, nonindustrial forest lands)---The largest opportunity for expanding forestry production lies in intensifying forest management of the private nonindustrial holdings that account for 75% of Mississippi's total forest acreage. Average production

of forest lands in this ownership category is 49 cu ft of wood per acre per year, only 56% of average growth potential. Bringing productivity of the 12.5 million acres of land in this ownership category to the potential of fully-stocked natural stands would result in an

additional 388.3 million cu ft of timber available for harvest.

Harvesting and processing this much additional raw material would result in an increased output of \$767.8 million for the forest industry and would add as many as 23,686 jobs in forestry employment. Intensified management of the 12.5

million acres in the hands of private nonindustrial owners could increase Mississippi's total economic output by \$2733.3 million and could mean as many as 110,600 new jobs (including the 23,686 in the forest industry) and as much as \$717.2 million in additional household income.

The \$767.8 million increase in forestry output and the 23,686 new jobs in forestry each represent an increase of about 60% over current levels. The statewide output, employment and household income effects represent increases of 9, 14 and 8%, respectively (Figure 4).

Caution in interpreting the impact of more intensive management of forest lands

The estimates of the impact of more intensive forest management (Cases B and C) are simple first approximations because input-output analysis or no other technique can estimate the impact of expansion of any large sector of an economy (especially a change of the magnitude of Case C) with complete accuracy. Also, the economic benefits attributable to more intensive management of the State's forest resources cannot be expected in the short run, because

the forest industry and industries linked to it can bring about change of this magnitude only in the long run. Furthermore, a major limitation to bringing forest land productivity to the potential of fully-stocked natural stands is that many landowners will not be interested in intensifying management of their forest lands and some private nonindustrial ownerships are too small to permit profitable management and harvest.

Our estimates do indicate,

however, the general magnitude of the benefits to be expected from more intensive management of Mississippi's forest resources. However, action programs to overcome three related impediments---low productivity, low profitability and low levels of owner's interest in forest resource management---will be required to realize the forest industry's potential contribution to the State's economy.

Action program elements

Intensifying forest management practices, particularly on the smaller private nonindustrial ownerships, is a complex matter. Any action program designed to promote more intensive management of such ownerships must fully recognize landowner's goals. Single-product management plans will be desired by some owners, but indications are that the majority will want multiple-product management plans. Tradeoffs between resources will have to be recognized for these multiple-product forest management plans and more research is needed in this area.

Action programs also must fully recognize the economics of timber production, which is a long-term activity with substantial risks. Production of timber with existing stand conditions is not profitable for many landowners and depleted

stands may not contain an adequate number of acceptable growing stock trees to be managed for timber production even in conjunction with other forest resources. Most owners of small tracts do not have the financial resources for preparing land for planting; therefore, there is genuine danger that depleted stands will remain unproductive. Federal and state incentive programs, as well as industrial landowner assistance programs, offer very important aid in these cases.

Low profitability also means that landowners likely will favor natural stand management to minimize costs even where stocking is adequate. It also means that output of nontimber resources can be quite important in determining the level of forest management selected, because increasing output of a highly-valued alternative may

cost so little in terms of timber revenue foregone. The advice of a professional forester is quite important under prevailing conditions of low profitability.

A massive communications effort is needed to acquaint owners of forest lands with their alternatives. Most landowners do not realize the multiple-use potential of forest land and do not have the knowledge of forest management practices necessary for increasing the cash flow from their property. Landowners need to be made aware of such items as stumpage price trends, growth response to forest management practices, other factors that increase productivity and profitability, and sources of assistance in improving management of their forest lands. The most useful approach is communication on a one-to-one basis in

order to assess goals of individual landowners.

The benefits from increasing the productivity of Mississippi's forest lands are obvious from this study. However, the future supply of the

array of forest resource products available in Mississippi depends upon how well we meet the challenges facing Mississippi forestry today. The issues of low productivity, low profitability and

low levels of interest in forest resource management all are related. Action programs must be implemented soon to assure a bright future for Mississippi forestry.

Appendix A

Composition of Input-Output Model Sectors

Sector	Components
1. Livestock and Agricultural Products	<ul style="list-style-type: none"> a. Crops b. Livestock c. Dairy Products d. Poultry and Eggs
2. Food and Kindred Products (Processing)	<ul style="list-style-type: none"> a. Meat Products b. Dairy Products c. Grain d. Vegetables e. Beverages f. Bakery Products
3. Mining	<ul style="list-style-type: none"> a. Iron Ore b. Minerals c. Crude Petroleum d. Gas e. Stone and Clay
4. Construction	<ul style="list-style-type: none"> a. New Construction b. Maintenance and Repair Construction
5. Textiles and Apparel	<ul style="list-style-type: none"> a. Yarn and Thread Mills b. Fabric Mills c. Apparel d. Miscellaneous Textiles
6. Miscellaneous Primary Forest Products and Fisheries	<ul style="list-style-type: none"> a. Timber Tracts b. Forest Nurseries c. Tree Seed Gathering d. Pine Gum Extraction e. Forest Products Gathering f. Commercial Fishing g. Hunting and Trapping
7. Logging Camps and Logging Contractors	<ul style="list-style-type: none"> a. Wood Raw Materials Harvesting
8. Sawmills and Planing Mills	<ul style="list-style-type: none"> a. Rough Timber Sawing

- 9. Millwork and Plywood
 - b. Hardwood Dimension and Flooring Mills
 - c. Special Product Mills
 - a. Millwork
 - b. Wood Kitchen Cabinets
 - c. Hardwood Veneer and Plywood
 - d. Softwood Veneer and Plywood
 - e. Laminated Structural Members
- 10. Wood Containers
 - a. Nailed and Lock Corner Wood Boxes and Shook
 - b. Wood Pallets and Skids
 - c. Cooperage, Wood Boxes, and Crates
- 11. Wood Buildings and Mobile Homes
 - a. Prefabricated Wood Buildings and Components
 - b. Mobile Homes: Recreational and Dwelling
- 12. Miscellaneous Wood Products
 - a. Poles, Posts, and Piling
 - b. Particleboard
- 13. Wood Furniture
 - a. Wood Household Furniture, except Upholstered
 - b. Wood Office Furniture
 - c. Wood Television, Radio, Phonograph, and Sewing Machine Cabinets
 - d. Wood Partitions, Shelving, and Fixtures
- 14. Pulp, Paper, and Boardmills; Miscellaneous Paper Products
 - a. Pulp Mills
 - b. Paper Mills
 - c. Paperboard Mills
 - d. Converted Paper and Paperboard Products
- 15. Paperboard Containers and Boxes
 - a. Folding Paperboard Boxes
 - b. Set-up Paperboard Boxes
 - c. Corrugated and Solid Fiber Boxes
 - d. Sanitary Food Containers
 - e. Fiber Cans, Tubes, and Drums
- 16. Printing and Publishing
 - a. Newspapers and Periodicals
 - b. Books
 - c. Miscellaneous Publishing
 - d. Commercial Printing
 - e. Printing Service Industries
- 17. Chemical and Allied; Other Manufacturing
 - a. Industrial Chemicals
 - b. Petroleum Refining

- c. Miscellaneous Furniture
 - d. Rubber and Miscellaneous Plastic Products
 - e. Leather and Leather Products
 - f. Primary Metal Industries
 - g. Stone, Clay, Glass, and Concrete Products
 - h. Fabricated Metal Products
 - i. Machinery
 - j. Transportation Equipment
 - k. Precision Instruments and Clocks
 - l. Miscellaneous Manufacturing
18. Transportation
- a. Railroads
 - b. Motor Freight Transportation
 - c. Water Transportation
 - d. Air Transportation
 - e. Pipeline Transportation
19. Communications and Utilities
- a. Telephone and Telegraph Communication
 - b. Radio and Television Broadcasting
 - c. Electric, Gas, Water, and Sanitary Services
20. Wholesale and Retail Trade
- a. Wholesale Trade
 - b. Retail Trade
21. Finance, Insurance, and Real Estate
- a. Banking and Other Credit Agencies
 - b. Security and Commodity Brokers
 - c. Insurance
 - d. Real Estate
22. Services
- a. Hotels, Motels, and Other Lodging
 - b. Personal Services
 - c. Business Services
 - d. Automotive and Miscellaneous Repair Services
 - e. Motion Pictures and Amusements
 - f. Health Services
 - g. Legal Services
 - h. Educational Services
 - i. Social Services
 - j. Agricultural Services
 - k. Forestry Services
 - l. Miscellaneous Services
23. State and Local Government
- a. State Governments
 - b. County Governments
 - c. Municipal Governments
 - d. School Districts

Appendix B

The Input-Output Model

A 1974 input-output model emphasizing the forest products industry was developed for Mississippi with the assistance of the Mississippi Research and Development Center. Published output data and 1967 national coefficients were used in construction of the model and the model was adjusted to Mississippi conditions by use of questionnaire response data received from members of the Mississippi Forestry Association. Twenty three producing (endogenous) sectors and three nonproducing (exogenous) final demand sectors were included in the model (Table 1 of this Appendix).

Table 1. 1974 Mississippi Interindustry Transaction or Flow Matrix.¹

Sector Code	Producing Sector	Purchasing Sector Code*							
		1	2	3	4	5	6	7	8
1.	Livestock and Agricultural Products	179.3	399.6	--	.9	27.1	2.4	1.8	16.9
2.	Food and Kindred Products	124.8	250.0	--	--	.8	.3	.2	--
3.	Mining	3.0	.9	48.5	5.4	.4	--	--	--
4.	Construction	16.6	4.6	21.5	.6	1.8	--	.3	7.9
5.	Textiles and Apparel	.6	2.6	1.4	5.8	393.5	.9	.1	1.5
6.	Misc. Primary Forest Products and Fisheries	--	7.8	--	--	3.2	.2	6.2	--
7.	Logging Camps and Logging Contractors	--	--	.5	--	--	--	6.7	25.7
8.	Sawmills and Planing Mills	--	.2	.5	35.8	--	--	2.2	13.4
9.	Millwork and Plywood	--	--	--	45.2	--	--	.3	1.1
10.	Wood Containers	.6	1.8	--	--	--	--	--	.9
11.	Wood Buildings and Mobile Homes	--	--	--	9.0	--	--	--	--
12.	Miscellaneous Wood products	--	.1	--	12.3	.2	--	--	2.2
13.	Wood Furniture	--	--	--	3.6	--	--	--	--
14.	Pulp, Pap, & Bd. Mills; Misc. Pap. Prod.	.7	14.5	--	6.1	.6	--	.1	1.9
15.	Paperboard Containers and Boxes	.1	15.4	.5	--	3.3	--	--	.1
16.	Printing and Publishing	.3	5.6	--	--	.3	--	--	--
17.	Chem. & Allied: Petroleum & Other Mfg.	137.7	89.0	77.6	608.6	80.7	1.7	9.2	23.7
18.	Transportation	13.3	20.2	8.4	25.6	5.1	.4	8.3	14.0
19.	Communications and Utilities	5.7	6.6	7.1	3.4	3.7	--	.8	11.1
20.	Wholesale and Retail Trade	86.4	59.1	13.4	170.3	27.9	.7	3.7	9.6
21.	Finance, Ins., & Real Estate	26.6	4.3	26.0	6.3	3.1	.1	2.9	1.2
22.	Services	62.9	22.2	7.6	39.8	5.2	.3	.8	7.4
23.	State and Local Government	--	.3	--	.7	.1	--	.2	.6
	Total Endogenous	658.6	904.8	213.0	979.4	557.0	7.0	43.8	139.2
24.	Federal Government	.2	1.1	.5	.7	.2	.6	.6	2.3
25.	Households	751.8	171.1	212.9	611.8	263.3	14.4	16.3	58.7
26.	Imports	50.1	69.9	30.5	89.0	21.3	.5	22.3	79.2
	Total Gross Input	1460.7	1146.9	456.9	1680.9	841.8	22.5	83.0	279.4

¹In millions of dollars, producers prices.

*A dash (---) in a cell indicates a value less than \$.5 million.

(continued)

Table 1. Continued

Sector		Purchasing Sector Code*							
		9	10	11	12	13	14	15	16
Code	Producing Sector								
1.	Livestock and Agricultural Products	12.3	--	--	--	.4	18.7	2.7	--
2.	Food and Kindred Products	--	--	--	--	--	3.8	--	--
3.	Mining	--	--	--	.4	--	4.6	--	--
4.	Construction	1.1	.2	.3	1.0	--	3.6	.1	.5
5.	Textiles and Apparel	.2	.1	1.3	1.1	.3	7.0	.1	.6
6.	Misc. Primary Forest Products and Fisheries	--	--	--	--	--	--	--	--
7.	Logging Camps and Logging Contractors	13.6	1.4	--	9.3	--	21.8	3.7	--
8.	Sawmills and Planing Mills	2.2	3.6	16.2	46.8	9.3	8.4	.1	--
9.	Millwork and Plywood	7.9	3.0	4.7	3.0	7.6	--	--	--
10.	Wood Containers	.1	2.3	.2	2.2	.1	--	--	--
11.	Wood Buildings and Mobile Homes	.3	--	2.1	--	.1	--	--	--
12.	Miscellaneous Wood products	.7	2.2	.3	4.9	1.1	1.3	--	--
13.	Wood Furniture	--	--	.1	--	.1	--	--	--
14.	Pulp, Pap, & Bd. Mills; Misc. Pap. Prod.	.5	.2	.3	4.6	--	39.8	9.0	13.2
15.	Paperboard Containers and Boxes	.2	.2	.1	.8	.1	4.2	.3	1.7
16.	Printing and Publishing	--	--	--	.1	--	2.6	.1	1.5
17.	Chem. & Allied: Petroleum & Other Mfg.	12.5	3.4	13.7	26.9	.4	45.0	10.4	6.5
18.	Transportation	7.4	1.7	1.8	11.4	.1	35.1	6.4	.9
19.	Communications and Utilities	5.9	.4	.3	1.9	--	4.7	.2	.9
20.	Wholesale and Retail Trade	7.9	3.5	5.0	11.7	.2	16.1	5.3	3.2
21.	Finance, Ins., & Real Estate	.7	.3	.4	.7	--	2.0	.4	1.5
22.	Services	3.5	.7	.7	2.6	.1	8.1	1.5	2.4
23.	State and Local Government	.4	--	--	--	--	.8	.2	--
Total Endogenous		77.4	23.2	47.5	129.4	19.9	227.6	40.5	32.9
24.	Federal Government	1.2	.1	.1	.2	.3	3.4	.6	1.6
25.	Households	31.0	18.1	16.1	61.2	11.4	78.2	10.6	32.1
26.	Imports	37.8	3.5	3.1	22.3	3.0	71.9	10.6	2.7
Total Gross Input		147.4	44.9	66.8	213.1	34.6	381.1	62.3	69.3

¹In millions of dollars, producers prices.

*A dash (---) in a cell indicates a value less than \$.5 million.

(continued)

Table 1. Continued

Sector		Purchasing Sector Code*						
		17	18	19	20	21	22	23
Code	Producing Sector							
1.	Livestock and Agricultural Products	11.9	.1	--	--	17.8	1.7	.1
2.	Food and Kindred Products	14.0	1.6	--	12.7	1.4	1.7	--
3.	Mining	220.6	.4	34.8	.1	2.8	.1	13.6
4.	Construction	27.6	13.7	17.4	8.0	80.8	4.5	315.1
5.	Textiles and Apparel	69.5	1.5	.2	4.4	1.1	1.3	1.5
6.	Misc. Primary Forest Products and Fisheries	.1	--	--	--	--	--	--
7.	Logging Camps and Logging Contractors	--	.1	--	--	--	--	--
8.	Sawmills and Planing Mills	24.3	--	--	.4	.1	--	--
9.	Millwork and Plywood	12.2	--	--	.4	.1	--	--
10.	Wood Containers	5.3	--	--	1.6	--	--	--
11.	Wood Buildings and Mobile Homes	1.2	--	--	.1	--	--	--
12.	Miscellaneous Wood products	18.3	--	--	.4	--	--	--
13.	Wood Furniture	8.6	--	--	.2	.1	--	--
14.	Pulp, Pap, & Bd. Mills; Misc. Pap. Prod.	23.8	.6	.6	15.2	3.2	1.1	1.7
15.	Paperboard Containers and Boxes	25.4	.2	--	4.2	--	.3	.1
16.	Printing and Publishing	.5	.3	.3	3.6	3.8	21.1	1.1
17.	Chem. & Allied: Petroleum & Other Mfg.	2012.5	40.8	9.0	78.9	28.5	38.5	63.9
18.	Transportation	23.5	22.0	3.6	10.9	7.8	1.8	8.4
19.	Communications and Utilities	31.0	3.5	30.2	25.0	8.9	9.9	68.2
20.	Wholesale and Retail Trade	170.7	17.1	4.1	51.2	24.5	14.8	20.3
21.	Finance, Ins., & Real Estate	25.8	5.0	2.3	37.5	44.3	6.7	13.7
22.	Services	68.1	6.6	8.3	60.1	34.9	12.4	25.7
23.	State and Local Government	.7	15.2	45.7	8.9	11.6	.8	1.1
	Total Endogenous	2795.6	128.7	156.5	323.8	271.7	116.7	534.5
24.	Federal Government	6.2	1.1	7.4	27.1	14.0	7.2	2.4
25.	Households	1193.7	160.1	140.9	1570.2	506.2	874.7	718.6
26.	Imports	401.4	43.4	37.2	71.2	36.3	34.6	159.0
	Total Gross Input	4396.9	333.3	342.0	1992.3	828.2	1033.2	1414.5

¹In million of dollars, producers prices.

*A dash (---) in a cell indicates a value less than \$.5 million.

(continued)

Table 1. Continued

Sector Code	Producing Sector	Total Endogenous Sales	Final Demand			Total Gross Output
			24	25	Exports	
1.	Livestock and Agricultural Products	693.7	2.9	22.2	741.0	1460.7
2.	Food and Kindred Products	411.3	10.9	724.7	--	1146.9
3.	Mining	335.6	1.7	1.6	118.0	456.9
4.	Construction	527.2	84.0	562.6	507.1	1680.9
5.	Textiles and Apparel	496.6	9.5	244.7	91.0	841.8
6.	Misc. Primary Forest Products and Fisheries	17.5	--	5.0	--	22.5
7.	Logging Camps and Logging Contractors	82.8	--	.2	--	83.0
8.	Sawmills and Planing Mills	163.5	--	--	115.9	279.4
9.	Millwork and Plywood	85.5	--	--	61.9	147.4
10.	Wood Containers	15.1	.4	--	29.4	44.9
11.	Wood Buildings and Mobile Homes	12.8	.1	--	53.9	66.8
12.	Miscellaneous Wood products	44.0	.4	2.9	165.8	213.1
13.	Wood Furniture	12.7	--	20.8	1.1	34.6
14.	Pulp, Pap, & Bd. Mills; Misc. Pap. Prod.	137.7	2.0	18.3	223.1	381.1
15.	Paperboard Containers and Boxes	57.2	.3	.4	4.4	62.3
16.	Printing and Publishing	41.2	19.0	9.1	--	69.3
17.	Chem. & Allied: Petroleum & Other Mfg.	3419.1	192.0	785.8	--	4396.9
18.	Transportation	238.1	22.1	73.1	--	333.3
19.	Communications and Utilities	229.4	6.3	106.3	--	342.0
20.	Wholesale and Retail Trade	726.7	23.8	1019.2	222.6	1992.3
21.	Finance, Ins., & Real Estate	211.8	4.7	611.7	--	828.2
22.	Services	381.9	79.0	572.3	--	1033.2
23.	State and Local Government	87.3	5.7	584.0	737.5	1414.5
	Total Endogenous	8428.7				
24.	Federal Government		4.8	856.6	661.6	1601.5
25.	Households		986.5	--	330.0	8840.5
26.	Imports		83.5	515.1	--	1899.4
	Total Gross Input		1539.6	6736.6	4065.2	29,673.4

The basis of any input-output analysis is a "transaction" or "flow" table that shows the distribution of total dollar output to each producing industry in the economy and to the nonproducing final demand sectors. The model completed as part of this study has 26 rows and 26 columns (one row for each producing sector plus one row for each nonproducing final demand sector and a corresponding column for each row).

Two other key components of

input-output analysis---the technical coefficients matrix and the interdependence coefficients matrix---are derived from the flow table. Input-output multipliers are derived from the technical coefficients and the interdependence coefficients matrices.

The contribution of any producing sector to the total output of the Mississippi economy can be determined by referring to Table 1 of this Appendix. For example, the pulp, paper and board industry (sector

code 14) sold \$6.1 million to the construction sector (purchasing sector code 4); \$300 thousand to wood buildings and mobile homes (purchasing sector code 11) and had a total gross output of \$381.1 million in 1974. Detailed information on purchases by each economic sector also can be determined by reading down the columns of the flow table. For example, sawmills paid \$25.7 million to loggers for harvesting timber in 1974.

Multipliers

An input-output model is a valuable aid in showing economic structural interdependence but also is useful in further economic analysis. Any change in output in a particular producing sector will be magnified to some extent because of economic sectoral linkages. The magnification is a function of the degree of structural interrelationship and measures of the overall economic effect of output changes are known as sector multipliers.

Multipliers are categorized as Type I or Type II. Type I multipliers reflect only direct and indirect effects of a change in economic activity (interindustry effects only). Type II multipliers account for induced household effects as well. Type II multipliers always will be larger than Type I multipliers because business-induced household spending is included.

Output Multipliers (Table 2 of this Appendix) estimate the change in industrial production precipitated by a change in final demand. Type I multipliers are derived by summing the entries in each column of the interdependence coefficients matrix with households as an exogenous sector.¹

Income multipliers estimate the statewide change in household income resulting from a \$1 change in payments to the households in a given economic sector. Type I multipliers estimate the direct and indirect changes in household income for each \$1 change in direct income payments to households. Type II multipliers include the effect of changes in household spending in response to changes in household income.

Employment multipliers estimate the statewide change in

employment resulting from a change in employment in a given producing sector. Type I multipliers estimate the direct and indirect change in employment associated with a unit change in employment in a sector. Type II multipliers include the employment effect of the change in household spending resulting from a change in employment.

Type I multipliers generally underestimate and Type II multipliers generally overestimate the impact of sectoral economic activity on the total output, income and employment of an economy.² Consequently, averages of the Type I and Type II multipliers (Tables 2, 3 and 4 of this Appendix) were used to project the total output, income and employment resulting from changes in productivity of the Mississippi forest industry.

¹The interdependence coefficients matrices and the technical coefficients matrices used to derive all multipliers reported in Tables 2, 3 and 4 of this Appendix are omitted to conserve space. Readers interested in examining them may see Terfehr, Thomas Raymond, **The Economic Contribution of Forestry to Mississippi: An Application of Input-Output Analysis**, unpublished Master's Thesis, Mississippi State University, May 1976.

²A fuller explanation of the input-output model and the multiplier effects is available from the senior author, Department of Forestry, Mississippi State University.

Table 2. 1974 Mississippi output multipliers, by Sector.¹

Sector	Type I	Type II	Average of Type I and Type II
1. Livestock and Agricultural Products	1.91	5.80	3.86
2. Food and Kindred Products	2.68	6.26	4.47
3. Mining	1.96	5.61	3.78
4. Construction	2.24	5.80	4.02
5. Textiles and Apparel	2.63	6.43	4.53
6. Miscellaneous Primary Forest Products and Fisheries	1.64	5.62	3.63
7. Logging Camps and Logging Contractors	2.00	4.65	3.32
8. Sawmills and Planing Mills	1.98	4.54	3.26
9. Millwork and Plywood	2.01	4.67	3.34
10. Wood Containers	2.00	5.38	3.69
11. Wood Buildings and Mobile Homes	2.47	5.70	4.08
12. Miscellaneous Wood Products	2.22	5.30	3.76
13. Wood Furniture	2.16	5.13	3.64
14. Pulp, Paper and Board Mills; Miscellaneous Paper Products	2.22	5.09	3.66
15. Paperboard Containers and Boxes	2.30	5.21	3.76
TOTAL FOREST INDUSTRY	2.13	4.99	3.56
16. Printing and Publishing	1.97	5.54	3.76
17. Chemical and Allied; Petroleum; Other Manufacturing	2.45	5.79	4.12
18. Transportation	1.76	5.18	3.47
19. Communications and Utilities	1.86	5.26	3.56
20. Wholesale and Retail Trade	1.30	5.27	3.28
21. Finance, Insurance, and Real Estate	1.61	5.45	3.53
22. Services	1.22	6.30	3.76
23. State and Local Government	1.79	5.31	3.55
Mississippi economy (average) multiplier	2.02	5.45	3.74

¹See Footnote 1 of this Appendix.

Table 3. 1974 Mississippi Income Multipliers, by Sector.¹

Sector	Type I	Type II	Average of Type I and Type II
1. Livestock and Agricultural Products	1.76	2.99	2.38
2. Food and Kindred Products	5.56	9.48	7.52
3. Mining	1.83	3.09	2.46
4. Construction	2.28	3.86	3.07
5. Textiles and Apparel	2.85	4.80	3.82
6. Miscellaneous Primary Forest Products and Fisheries	1.40	2.36	1.88
7. Logging Camps and Logging Contractors	3.15	5.32	4.24
8. Sawmills and Planing Mills	2.83	4.82	3.82
9. Millwork and Plywood	2.01	4.67	3.34
10. Wood Containers	1.95	3.31	2.63
11. Wood Buildings and Mobile Homes	3.13	5.30	4.22
12. Miscellaneous Wood Products	2.50	4.24	3.37
13. Wood Furniture	2.10	3.56	2.83
14. Pulp, Paper and Board Mills; Miscellaneous Paper Products	3.25	5.53	4.39
15. Paperboard Containers and Boxes	3.97	6.77	5.37
TOTAL FOREST INDUSTRY	2.92	4.97	3.94
16. Printing and Publishing	1.78	3.04	2.41
17. Chemical and Allied; Petroleum; Other Manufacturing	2.87	4.86	3.86
18. Transportation	1.66	2.81	2.24
19. Communications and Utilities	1.92	3.26	2.59
20. Wholesale and Retail Trade	1.17	1.98	1.58
21. Finance, Insurance, and Real Estate	1.46	2.48	1.97
22. Services	1.11	2.37	1.74
23. State and Local Government	1.62	2.73	2.18
Mississippi economy (average) multiplier	2.39	4.09	3.24

¹See Footnote 1 of this Appendix.

Table 4. 1974 Mississippi Employment Multipliers, by Sector.¹

Sector	Type I	Type II	Average of Type I and Type II
1. Livestock and Agricultural Products	1.55	3.01	2.28
2. Food and Kindred Products	5.30	10.71	8.00
3. Mining	3.14	9.94	6.54
4. Construction	2.63	6.20	4.42
5. Textiles and Apparel	2.38	4.12	3.25
6. Miscellaneous Primary Forest Products and Fisheries	2.64	8.55	5.60
7. Logging Camps and Logging Contractors	1.42	2.10	1.76
8. Sawmills and Planing Mills	2.50	4.65	3.58
9. Millwork and Plywood	3.24	6.43	4.84
10. Wood Containers	1.97	4.04	3.00
11. Wood Buildings and Mobile Homes	3.53	7.49	5.51
12. Miscellaneous Wood Products	2.48	4.92	3.70
13. Wood Furniture	1.71	2.95	2.33
14. Pulp, Paper and Board Mills; Miscellaneous Paper Products	4.23	9.06	6.64
15. Paperboard Containers and Boxes	3.65	7.48	5.56
TOTAL FOREST INDUSTRY	3.07	6.27	4.67
16. Printing and Publishing	1.64	3.40	2.52
17. Chemical and Allied; Petroleum; Other Manufacturing	2.80	6.27	4.54
18. Transportation	1.71	3.78	2.74
19. Communications and Utilities	1.77	3.55	2.66
20. Wholesale and Retail Trade	1.19	2.78	1.98
21. Finance, Insurance, and Real Estate	1.80	5.07	3.44
22. Services	1.13	3.04	2.08
23. State and Local Government	1.28	2.22	1.75
Economy (average) multiplier	2.42	5.29	3.86

¹See Footnote 1 of this Appendix.

GLOSSARY OF TERMS¹

Annual Growth--Annual increase in timber volume in the absence of cutting and mortality.

Board Foot--A piece of lumber measuring one foot square and one inch thick. MBF is one thousand board feet.

Commercial Forest Land--Forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization. Virtually all of Mississippi's forest land is classified as commercial forest land.

Cord--A stack of wood (wood, bark and air) measuring 4 feet by 4 feet by 8 feet long; 128 cubic feet.

Employment Multipliers--These multipliers show the total change in statewide employment resulting from the addition of one employee in a particular industry. Type I employment multipliers estimate the effect due to industry changes within the economy. Type II employment multipliers include the type I effect plus that due to induced household spending.

Endogenous Sectors--Industries within Mississippi that produce goods and services for sale to other industries or for final consumption (exogenous sectors).

Exogenous Sectors--Nonproducing sectors that purchase goods and services from endogenous industries. Once products enter exogenous sectors, they are "used" by these final demand sectors.

Fully Stocked Natural Stand--Stocking is a measure of the extent to which the growth potential of the site is utilized by trees or preempted by other vegetative cover. Full stocking assumes the entire tree growing potential of the site is captured by the existing stand of trees.

Growing Stock Trees--Sawtimber trees, pole timber trees, and saplings (down to a 1.0 inch diameter at 4.5 feet from the ground); that is, in essence, all live trees except rough and rotten trees.

Growth-Harvest Ratio--Annual growth of timber volume divided by annual volume harvested. Ratios greater than 1.0, equal to 1.0 and less than 1.0 indicate growth in excess of harvest, growth equals harvest and growth less than harvest, respectively.

Hardwoods--Usually broadleaf trees that lose their leaves in the fall.

Induced Effect--The impact of changes brought about by household spending. Increased household income will result in increased industrial output as households spend the income.

Income Multipliers--These multipliers indicate the statewide effect on total household income of a one dollar increase in payments to households by a particular industry. Type I income multipliers measure the change due to interactions among industries in the State.

Type II income multipliers include the changes due to industry interactions and the *induced* effect due to household spending.

Input-Output Analysis--A systematic method of analyzing the interrelationships between an industry's output of goods and services and the volume of goods and services needed to achieve a given level of production (Curtis, 1972).

Inter-Industry--Transactions between industrial sectors.

Interdependence Coefficient Matrix--A table showing the total output (both *direct* and *indirect*) required from each industrial sector when a particular industry expands output by one dollar. For a given industry to produce and sell output it must purchase materials from other industries. These purchases are termed *direct* effects. All industries, in turn, purchase goods and services from various sectors of the economy to carry on their production. These are *indirect* effects.

Interindustry Transaction Matrix--A table showing the distribution of sales (output) by each industrial sector to all other industries and to final consumers (final demand). This table also shows the distribution of total purchases by each industry. The table is a listing of the flow of dollars within the economy.

Intra-Industry--Transactions among firms within one industrial

¹Glossary based in part on definitions of terms found in Van Sickle and Van Hooser, 1969.

sector.

Output Multipliers---These multipliers indicate the effect on the total Mississippi economy of a one dollar increase in output from a particular industry. Type I output multipliers measure the effect due to industry changes within the economy. Type II multipliers measure the impact of industry changes plus the *induced* effect due to household spending.

Primary Industries---Basic industries in which an area specializes---industries that generally produce more than that

area needs; i.e., exports its product. Examples are agriculture, mining, manufacturing and railroads.

Roundwood---Logs, bolts or other round sections cut from trees for industrial or consumer uses. Wood is unprocessed in this form.

Sawtimber trees---Live trees of commercial species---softwoods 9.0 inches and larger in diameter 4.5 feet from the ground, hardwoods 11.0 inches and larger and containing at least one 12-foot sawlog.

Secondary Industries---Industries providing goods and services for

the primary industries. Examples are transportation, trade, services and local government.

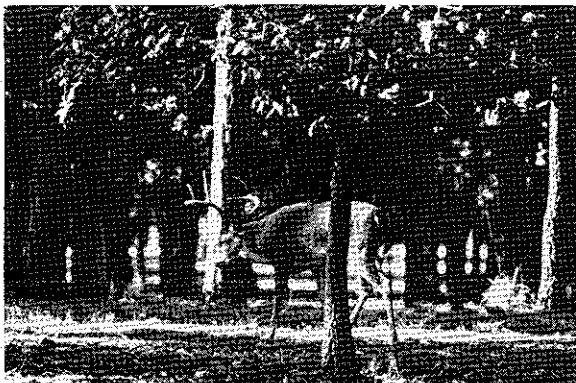
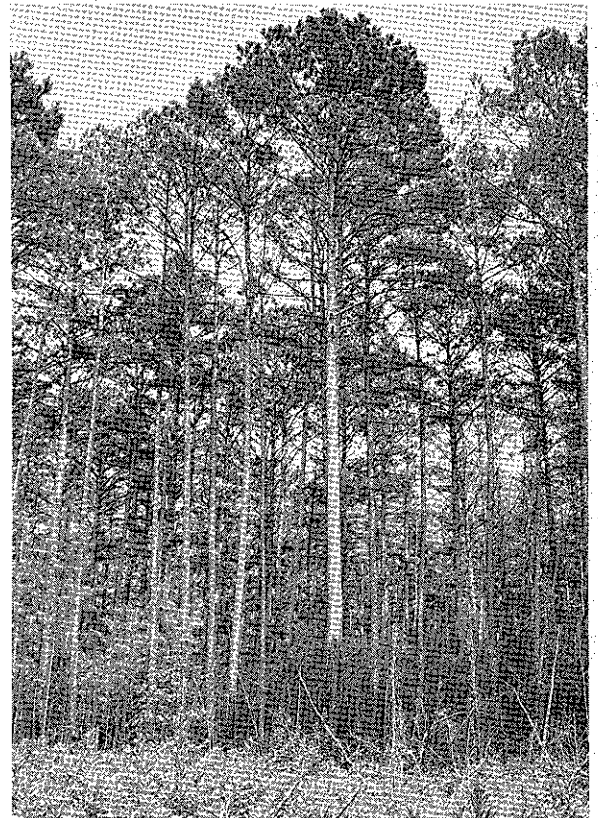
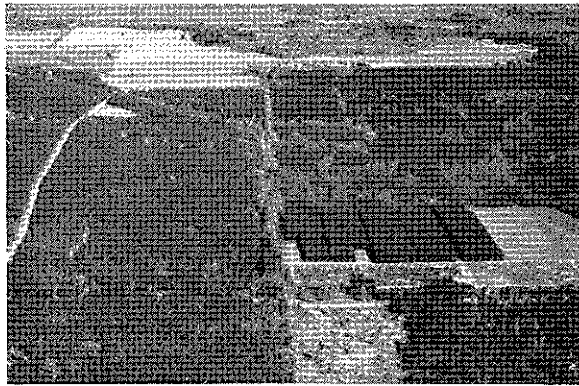
Small, Nonindustrial, Private Forest Ownership---Non-corporate, non-public forest ownerships of less than 500 acres.

Softwoods---Coniferous trees, usually evergreen, with needle or scale like leaves.

Visitor Day---A visit that is equivalent to a twelve-hour stay. Two people staying six hours would equal one visitor day.

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