

Preliminary Study on the Effects of Transportation on Forest Management and Production Forestry in Mississippi¹

D. Paul Gilliland², Donald L. Grebner, William Stuart, and Laura Grace

Abstract: The transportation system and overall infrastructure of a state is an important element in sustaining economic activity. In Mississippi, the forest products industry accounts for a significant portion of the economy. In 1997, more than \$1.3 billion dollars worth of timber was harvested in Mississippi (Daniels, 2000). Without an efficient transportation network, the cost to procure raw material to these mills would be extremely high and the margin of profit low. There are many factors that control a logger's transportation costs, which account for about 40% of total operating costs (Shaffer and Stuart, 1987). The purpose of this study is to examine the transportation of roundwood in three counties of Mississippi (Alcorn, Oktibbeha, and Wayne) and determine whether different regulations and roads affect wood hauling costs, therefore reducing the quantity of utilized wood by diminishing forest management opportunities. Comparisons with adjacent states will be conducted. This study utilizes a residual value approach for assessing policy impacts on hauling costs. Preliminary results are presented.

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² Authors are respectively, graduate research assistant, associate professor, associate professor, and professor, Mississippi State University, Department of Forestry, PO Box 9681, Mississippi State, MS 39762 USA 662-325-0928, dgrebner@cfr.msstate.edu.

INTRODUCTION

The forest products industry is an important sector of the economy in the southern United States. Private non-industrial landowners own the majority of the forestland in the region, and depend on a viable market for products to support their investment. Timber is the second most valuable agricultural crop in Mississippi. Timber was the number one agricultural crop in 49 of Mississippi's 82 counties in 1997, and the number two crop in 17 counties (Daniels, 2000). According to Daniels (2000), it had a delivered value in excess of \$1.3 billion. Timber values in the counties where it was the number one crop ranged from \$5 million to \$39.2 million dollars. The total value Mississippi landowners received for their timber in 1997 was \$1.02 billion (Daniels, 2000). When looking at the value of timber in Mississippi, however, it is important to look at the total economic picture.

The transportation system is an important component in a state or region's economy. In the forest sector, logs are transported to a mill or wood-yard by trucks on roads of all standards, from simple woods roads to interstate highways. Without an efficient transportation network, the cost to acquire raw materials would be high, reducing the competitiveness of Mississippi's timber in what is now a global market. There are many factors that affect a logger's transportation costs, which account for about 40% (Shaffer and Stuart, 1987) of total harvest and delivery costs. Factors such as road quality, road and bridge weight limits, taxes, insurance, etc., affect the cost of transporting wood. These costs are passed along to the landowner, resulting in lower prices for their timber. These increased costs are also taking their toll on logging contractors. Texas reported a loss of 40 – 45% of their logging contractors due to increasing expenses such as insurance, fuel, workers compensation, etc. (Anon, 2001). Mississippi's losses are similar to these.

The objectives of this study are to: 1) develop a cost profile for hauling logs, 2) evaluate potential road weight limit proposals for three counties in Mississippi. Alcorn, Oktibbeha, and Wayne counties were chosen for this study because of their location and local proposals to lower road weight limits on county roads. Alcorn County borders Tennessee and proposed a 40,000-pound road weight limit. Okitibbeha county is only one county west of Alabama; supervisors proposed a 57,650-pound road weight limit. Wayne County borders Alabama and proposed a 57,650-pound road weight limit. This study utilizes a residual value approach for assessing policy impacts on hauling costs.

Development of Transportation Systems

The value of good roads has been recognized since Roman times. The Romans had three classes of roads: public, military, and private. Public roads were the most important. These were used by merchants and farmers to transport goods to the market place. Land travel in those times was much safer than traveling over water because of pirates and storms. Military roads were second in importance. These were primarily used by the military in times of war to transport troops, equipment, and supplies in a quick and efficient manner. When the military was not using these roads, they were opened to public use. Lastly, there were the private roads. These roads were constructed and maintained by private individuals who charged a fee or "toll" for travelers to use. The Romans understood that an efficient road system was essential in maintaining economic activity and in the defense of the country. Our interstate system, built with national defense in mind, is essentially a military road with public use permitted. The

federal and state road system evolved to serve inter-urban commerce and the county or “farm to market” roads were constructed to transport supplies to market towns and for personal uses.

Although good roads were desired in the earliest settlement days of the U.S., demand increased even more when rural free delivery was introduced in the late 1800s. Good roads were needed so that postal workers could get deliveries to rural households. Farmers required better roads for transporting crops to market. In addition, one of the greatest impacts on the development of United States roads was the introduction of Henry Ford’s Model T in 1908. This automobile was affordable by many households. In the early 1900s, the number of automobile owners grew rapidly and so did the demand for better roads. In 1910, there were 458,000 registered automobile owners in the United States. By 1915, there were 2.3 million automobiles and 8.1 million just five years later (Kuennen, 2002). President Wilson signed the Federal Aid Road Act in 1916. This legislation allocated funds to state highway agencies for highway construction and improvements.

The Natchez Trace is one of the most famous roads in Mississippi, serving foot travelers and post riders. It ran from Nashville, Tennessee to Natchez, Mississippi. The Robinson Road was constructed in 1821 to transport cotton and other goods. It connected Columbus, Mississippi (located in the heart of the black prairie cotton region) with Jackson, Mississippi, two of the largest cities in Mississippi at that time. The Jackson Military Road was built in the 1820s to link Nashville, Tennessee to New Orleans. This road’s purpose was to allow defense of New Orleans in case of an attack from the Gulf of Mexico. The first concrete road in the South was constructed in Lee County in 1915. During the mid – 1800s railroad companies began to move into Mississippi in order to service the lumber industry and soon became the major source of transporting goods. Prior to the railroad, water transportation was the only means of shipping large quantities of goods in Mississippi. In 1987, the Mississippi legislature passed the Four Lane Program. This program added 1,077 miles of four lane highways to the existing highway system. Over \$5 billion will be spent over three phases to complete the project, which is currently about one-third complete (www.peer.state.ms.us, 2003).

Mississippi is different from many other states in the fact that it has a three-tiered road system with federally funded roads, state funded roads, and county funded roads. County funded roads account for about 85% of the total road mileage; the other 15% are state and federally funded. According to Mississippi state code, §65-9-1, the board of supervisors has full jurisdiction over all roads, ferries, and bridges in their respective county not maintained as state highways. These roads are designated as “feeder”, “local farm roads”, or “state aid roads”.

County Profiles

Alcorn County is located in northeast Mississippi and borders Tennessee, a state with a maximum gross vehicle weight of 88,000 pounds. The Alcorn county board of supervisors proposed a 40,000-pound road weight limit to help reduce maintenance costs on county roads. Fifty-four percent of land in the county is forested. The major forest type is oak-hickory followed by planted pine. All of the land in Alcorn County is privately owned. Forestry is the number one agricultural product followed by cattle and corn (Traugott, 2001).

Oktibbeha County is located in east central Mississippi and is one county west of Alabama. The Oktibbeha county board of supervisors proposed a 57,650-pound road weight limit. Sixty-four percent of the total acreage is forested. Of that 64% forested land, the major forest type is oak-hickory followed by native pine. Approximately 79% of the land in Oktibbeha

County is privately owned. Forestry is the number one agricultural product followed by milk and cattle (Traugott, 2001).

Wayne County is located in southeast Mississippi and borders Alabama, a state with a maximum gross vehicle weight of 88,000 pounds. The Wayne county board of supervisors proposed a 57,650-pound road weight limit. Eighty-six percent of the total acreage is forested. The major forest type is native pine followed by oak-pine. Less than half of the land in Wayne County is privately owned. Forestry is the number two agricultural product with poultry being number one (Traugott, 1999).

Data was collected from the Office of State Aid Road Construction on bridge conditions in each of the three study counties. According to Table 1, Oktibbeha had the best bridges. Only 8% of 160 bridges were damaged (unable to carry the weight of an 84,000 pound truck). Out of 157 bridges in Alcorn county, 28% were damaged and in Wayne county, 15% of 159 bridges were damaged. Supervisors may, in effect, set two different weight limits for a stretch of road, one to protect the road itself and another because of

Table 1. Condition of Bridges in the Three Study Counties.

County	Deficient	Critical	Closed	Total w/damage	Total Bridges	Percent Damaged
Alcorn	43	2	3	44	157	28%
Oktibbeha	13	12	0	13	160	8%
Wayne	12	21	2	24	159	15%

the condition of bridges along that road. Mississippi has had a major initiative to replace lower-weight wooden and metal bridges with concrete, box culvert bridges of higher standards in recent years, but replacement has not been completed. A bridge with “deficient” structural components is one with rotten or cracked piles, spalled concrete, severely rusted members, joint misalignment, broken welds, etc. If a bridge is rated “closed”, then the structure is unable to carry at least 6,000 pounds. “Critical” maintenance means that the structure is in need of immediate attention in order to remain in service. Lack of attention could lead to a reduction in safe load capacity below 6,000 pounds.

Transportation Costs

There are three main areas that affect transportation costs: infrastructure, policy, and equipment. Road and bridge standards are very important for efficient transportation, as is road width, alignment, and pavement. It is also important to look at conditions of the roads and bridges in the area. What is the shortest route to the main highway with bridges that will support a heavy load? A second issue is the number of other uses along a route. The number of other users (i.e. farm trucks, gravel trucks, oil trucks) increases the possibility of complaints about dust, noise, danger, etc. Policy also affects transportation efficiency. Policy such as weight limits set by state and local governments on roads and bridges limit the normal operating practices of logging contractors, increasing their costs. Labor costs are probably the most important expenditure of a logging contractor. There are, however, other components such as equipment, insurance, fuel, and maintenance that are directly linked to equipment costs. According to this study, it costs a logger 12¢ per mile to haul one ton of roundwood. This estimate does not include an ad valorem tax of about \$4,000/year on the log truck.

METHODS

This paper focuses on how lower road weight limits can affect the price a landowner receives for his standing timber. The first objective will be achieved by profiling the cost expenditures associated with hauling wood and deriving cost per mile assuming a 25-ton load with speed of about 50 miles per hour. This is the “unregulated” situation and will serve as a control condition. The same will be done assuming a 13.5-ton load and a 5-ton load to reflect changes in the road weight limit policies. A truck can carry 13.5 tons with a 57,650-pound road weight limit and 5 tons with a 40,000-pound road weight limit.

The second objective is to utilize a conceptual residual value model that reflects changes in transportation policies that directly impact wood hauling costs. The model will be adjusted for each county by using regional average cost values. Stumpage price data collected from Timber Mart South, Inc. will be used to evaluate relative changes in costs and their effect on stumpage prices. Changes in stumpage value due to changes in hauling costs can be an effective tool in evaluating potential impacts on forest management activities. This study applies methods consistent to Grace’s (1997) work in which she demonstrated the effects on Alcorn County revenues as a result of lower road weight limits.

The residual value is one method of pricing standing timber. The residual, or stumpage price, is what’s left over after manufacturing costs, harvesting costs, and profit are subtracted from the finished product price (Hotvedt and Straka, 1987). The following is an example of the residual value model used for this study:

$$RV = P - MC - HC - \text{profit}$$

- RV = residual value
- P = finished product price
- MC = manufacturing costs
- HC = harvesting costs + transportation costs

This study takes the transportation portion of the harvesting cost variable and determines the effects on stumpage price if transportation costs are increased, assuming the other variables remain constant.

Preliminary Results

As shown in Tables 2, 3, and 4, there would be a significant reduction in the value of timber if the counties had mandated a lower road weight restriction. Alcorn county landowners would see a decrease of \$96.75 per ton for their timber. Oktibbeha and Wayne county landowners would lose \$19.63 per ton.

Table 2. Impacts of 40,000 Pound Road Weight Restriction in Alcorn County, MS.

Product	Stumpage Prices per ton - 2002	Value per ton w/restriction
Pine sawtimber	\$43.78	-\$52.97
Oak sawtimber	\$33.53	-\$63.22
Mix hdwd sawtimber	\$19.56	-\$77.19

Pine chip-n-saw	\$27.81	-\$68.94
Pine pulpwood	\$5.79	-\$90.96
Hardwood pulpwood	\$4.97	-\$91.78

Table 3. Impacts of 57,650 Pound Road Weight Restriction in Oktibbeha County, MS.

Product	Stumpage Prices per ton - 2002	Value per ton w/restriction
Pine sawtimber	\$43.78	\$24.15
Oak sawtimber	\$33.53	\$13.90
Mix hdwd sawtimber	\$19.56	-\$0.07
Pine chip-n-saw	\$27.81	\$8.18
Pine pulpwood	\$5.79	-\$13.84
Hardwood pulpwood	\$4.97	-\$14.66

Table 4. Impacts of 57,650 Pound Road Weight Restriction in Wayne County, MS.

Product	Stumpage Prices per ton - 2002	Value per ton w/restriction
Pine sawtimber	\$45.47	\$25.84
Oak sawtimber	\$35.51	\$15.88
Mix hdwd sawtimber	\$23.02	\$3.39
Pine chip-n-saw	\$28.85	\$9.22
Pine pulpwood	\$7.16	-\$12.47
Hardwood pulpwood	\$4.51	-\$15.12

As shown in Table 2, the value of timber is negative for all product classes in Alcorn County if a 40,000-pound road weight limit is imposed. With these prices it would be infeasible for landowners to harvest timber because they would have to pay the logger to cover current harvest costs. In Oktibbeha County, pine and hardwood pulpwood along with mixed hardwood sawtimber would have a negative value if the 57,650-pound road weight limit were imposed. Pine sawtimber, oak sawtimber, and pine chip-n-saw maintain positive values, however, landowners would still receive a lower price for their timber. Wayne County, whose stumpage prices were slightly higher than the other counties, showed only negative prices on pulpwood. The other product classes still earned a positive return, although they were significantly lower with the proposed weight restrictions.

Weight limits and transportation costs have an effect on stumpage prices. Greater weight restrictions affect forest management activity by increasing costs for producers to haul wood, lowering prices for landowners, and creates fewer silvicultural options. With pulpwood prices receiving negative values, landowners would have to pay to have it cut. This could result in unhealthy stands and could also present a fire hazard for the entire county area. Lower stumpage prices would result in lower returns for landowners, thus making timberland a less attractive investment.

CONCLUDING REMARKS

Transportation plays a vital role in forest management and production forestry. Without an efficient transportation network, the cost to procure raw material for mills would be higher and the margin of profit lower. Also, if no mills are located in a close proximity, then transportation costs are increased. If the proposed weight limits had been enforced, landowners would receive less money for their timber and in some cases they would have to pay to have it cut.

Future work in this area could be evaluating lighter hauling vehicles, to allow more wood to be hauled without exceeding the weight limit. It would be beneficial to examine how funds are allocated to county governments for road construction and maintenance. Determining the mileage statistics for county roads is also a topic for further investigation.

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LITERATURE CITED

- Anon. 2001. "Some Mills now Hurting for Wood". Southern Loggin' Times. 30(10):50.
- Daniels, B. 2000. "The Importance of Forest Management and Timber Harvests In Local Economies: A Mississippi Example". Mississippi State University Extension Service, Mississippi State, MS. Pamphlet. Publication No. MTN16C.
- Grace, L.A. 1997. "The Effect of Changed Road Weight Limits on Alcorn Timber Values". Mississippi State University Extension Service, Mississippi State, MS. Pamphlet. Publication No. MTN3D.
- Hotvedt, J.E and T.J. Straka. 1987. "Using Residual Values to Analyze the Economics of Southern Pine Thinning." Southern Journal of Applied Forestry. 11(2):99 – 106 .
- Kuennan, T. "ARTBA Helps Achieve First Federal Investment in Roads". <http://www.artba.org>. Accessed 7/02.
- Office of State Aid Road Construction – Bridge Data. <http://www.osarc.state.ms.us>. Accessed 3/3/03.
- Shaffer, R.M. and W.B. Stuart. 1987. "A Checklist for Efficient Log Trucking". Publication 420-094. Virginia Cooperative Extension Service, Blacksburg, VA. 7 p.
- The Mississippi Legislature: The Joint Committee on Performance Evaluation and Expenditure Review, Report #414. <http://www.peer.state.ms.us/414.html>. Accessed 1/13/03.
- Traugott, T. 2001. "Timber – Alcorn County's Number One Crop". Mississippi State University Extension Service, Mississippi State, MS. Pamphlet. Publication No. 2042.
- Traugott, T. 2001. "Timber – Oktibbeha County's Number One Crop". Mississippi State University Extension Service, Mississippi State, MS. Pamphlet. Publication No. 2113.

Traugott, T. 1999. "Timber – An Important Crop in Wayne County". Mississippi State University Extension Service, Mississippi State, MS. Pamphlet. Publication No. 2151.