Economic Impact and Associated Values of the Wild Turkey in Mississippi

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Abstract: The wild turkey (*Meleagris gallopavo*) has ecological, aesthetic, recreational, and economic values. Gross expenditures of hunters have been used to estimate economic value of game species. We examined the economic impact and associated values of the wild turkey in Mississippi. Expenditures of wild turkey hunters were obtained from a mail survey (N = 2,143, 69.6% response to economic section) and were used in an input-output model to determine economic impacts for the state. There were 39,775 hunters engaged in 334,856 activity-days in 1993. Wild turkey hunters spent an estimated $14.8 million or $44.27 per hunter day in 1993. Total sale impacts were $16.7 million. The value-added component of the economic impact totaled $10.4 million and supported 385 jobs. We also examined the structure of the economy in relation to the wild turkey. Expenditures and revenue in the state that related to the wild turkey were derived from industries, institutions, organizations, agencies, and associations. Revenues and income of these groups totaled $11.4 million in 1996. The wild turkey is a valuable resource in Mississippi, but the state's economy can further benefit by increasing the turkey population and expanding industries that manufacture equipment or materials associated with turkey hunting.

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Wildlife has many benefits and values, such as ecological, aesthetic, recreational, and economic. However, industries (e.g., forest) often make management decisions and policies based primarily on economic (monetary) values (Giles 1978). Wildlife managers can help decision makers by providing realistic economic values.

The wild turkey provides many benefits or values to the citizens of Mississippi, but the economic value has not been established. One method of estimating economic benefits of the wild turkey is through analysis of wild turkey hunting expenditures

(Giles 1978). This method is used increasingly and requires the summation of participants' total expenditures on travel, fees, food, clothing, equipment, and other items associated with the activity (Davis and Johnson 1987). These expenditures are classified as occurring within the recreation area, enroute to the site, or at home. Many expenditure items merit special attention. One illustration is equipment (e.g., a 4-wheel-drive vehicle) purchased with the intention of using it for a specific recreation activity (e.g., hunting). Such items last several years and can be used for both recreation and other purposes. These expenditures must be depreciated over several years and jointly apportioned to business, household, and recreation activity use.

The expenditure method provides information for evaluating the local or regional economic impact of recreation and tourism activity. However, this method of tallying expenditures results in a measure of value to a local or regional economy and not to the recreation participant. It does not relate to the on-site value of the activity.

There have been several studies describing expenditures related to hunting, including hunting of wild turkey (Baumann et al. 1990). A national study, including Mississippi, found hunters spent $50/activity-day (1991 dollars; U.S. Dep. Int. and U.S. Dep. Comm. 1993). Further studies explored the economic impact of hunting expenditures on a state or regional economy (Southwick 1995). An analysis of these economic impacts can secure political and public support, aid in the development of conservation and wildlife management plans, aid in understanding hunter management issues, promote habitat conservation, and serve as a guide for the restitution of illegally taken wildlife (Southwick 1995).

Economic impacts are founded upon the fundamentals of input-output analysis, which is the assessment of change in overall economic activity as the result of some corresponding change in 1 or several activities (Alward et al. 1993). Environmental economics can be analyzed using an input-output model (Rose and Miernyk 1989, U.S. Dept. Int. 1992). Input-output models are especially useful in describing the current and potential economic role of travel and tourism activities, including hunting, in an overall economy (U.S. Dep. Int. 1992, Johnson and Moore 1993, Strauss et al. 1995).

The economic impacts of wild turkey hunting activities taking place in Mississippi were modeled using the Impact Analysis for Planning (IMPLAN) System (Alward et al. 1985). This computer program was originally developed by the U.S. Forest Service to estimate the regional economic impacts of management plans for National Forests (Alward et al. 1985). The IMPLAN model of Mississippi was used to identify direct and secondary impacts resulting from turkey-hunting expenditures. Direct impacts represent those expenditures retained by an economic entity in the operation of their business. For example, the direct sales impact from retail goods purchased by wild turkey hunters would be less than the actual expenditures made in the region because the model treats retail sales outlets as margined sectors. In this situation, only the value-added earned by the retail outlet is included, with the actual cost of the commodity directed back to the producing industry. The portion of the commodity purchase that actually comes from state industries is identified in the model by the Regional Purchase Coefficient (RPC). Thus, for a commodity such as

gasoline, which may originate almost entirely from refineries outside of the state, only a portion of the retail purchase would be credited to the in-state wholesaler, with most of the remaining retail purchase directed to out-of-state producers.

Secondary impacts are the indirect effects of inter-industry trade within the region and the induced effects of household consumption originating from employment tied to the direct and indirect activities. In sum, economic impact is measured in terms of value of shipments, value-added to the total economy, and the employment attributed to direct and secondary activities. Value-added is the portion of total sales directed to employee compensation, proprietary income, property income, and indirect business taxes.

Additionally, economic multipliers were created from this analysis. They were used to evaluate the short-term incremental contribution to the regional economy from per unit changes in final demand. Our goal was to estimate the economic impact and associated values of wild turkey in Mississippi. The first objective of the study was to measure the economic impact of turkey hunter expenditures in Mississippi in total sales, value-added, and total employment. Additionally, economic multipliers were used to evaluate the short-term incremental contribution to the state economy from per unit changes in final demand for wild turkey-hunting-related services. The second objective was to measure total expenditures and revenues in the state related to wild turkey. These included institutions, agencies, associations, industry, and other groups or individuals involved in wild-turkey-related transactions in Mississippi.

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Methods

We surveyed wild turkey hunters to determine economic expenditures. Results of the hunter survey were used to model the overall economic impacts of wild turkey hunting in the state. We also surveyed industries serving hunters and hunter associations to determine economic expenditures and other values associated with wild turkey hunting. Supporting industry surveys were used to better understand relationships in the economy and served as supporting evidence for the economic impact results. Surveys with hunter associations were used to describe additional economic activity related to the wild turkey but not incorporated into the economic impacts.

Hunter Surveys

A mail survey of 2,143 wild turkey hunters who hunted in 1993 in Mississippi was undertaken (Godwin et al. 1997). This sample was approximately 5.4% of the turkey hunter population. Survey participants were randomly selected from 2 sources: respondents to the 1992 Mississippi Mail Survey of Game Harvest and Hunter Effort

and hunters using a state Wildlife Management Area (WMA). No participants were double-sampled. The initial mailing consisted of a cover letter, survey booklet, and a postage-paid return envelope. There were no follow-up mailings for non-respondents. The economic section asked for estimated costs associated with wild turkey hunting. Key expenditure categories were travel costs (e.g., lodging, food, gas), guns, ammunition, hunter accessories (e.g., calls, decoys, camouflage, and clothing), hunting fees (i.e., lease fees), and miscellaneous expenses (e.g., equipment, taxidermy, and vehicles). Data also were secured on the number of wild turkey hunters in the state and the number of hunting activity-days (Shropshire 1994). These data were used to assess economic impacts.

To use the survey data in the IMPLAN model, several adjustments were made. First, the lease fees were examined and it was estimated that 25% of the total hunting fees reported were dedicated to wild turkey (Godwin et al. 1997). Second, hunter expenditure profiles for hunting wild turkey were used to refine our broad expenditure categories (Baumann et al. 1990). These data refinements created input variables better suited to the IMPLAN model since they now reflected purchases made to specific industrial sectors. The expenditure for each industrial sector category was defined as an average expenditure/hunter/activity-day times the total number of hunter activity days.

Economic Impact

The IMPLAN model relies on 2 sets of data. The first of these is a 528 sector, input-output transactions table based upon the Bureau of Economic Analysis' National I-O table (U.S. Dep. Comm. 1984), which describes the intermediate utilization and production of commodities by manufacturers in the United States. A state-level data set describing total output, employment, and the components of final demand and value-added for each sector is used to regionalize the input-output structure. Hunter expenditures made in Mississippi were organized into final demands on state industrial sectors and entered into the model as such. Total economic impacts reflect the total number of hunter activity-days.

In this analysis, both resident and non-resident expenditures were used to assess economic impacts resulting from wild turkey hunting. For non-residents, the dollars spent in the state economy are equivalent to the export of a good from Mississippi's industrial and commercial base. For resident dollars to be considered economic impact it was assumed that, if these dollars were not spent turkey hunting in the state, they would be spent outside the state. In other words, they would not be spent on some other item in the state's economy. At the least, they show the support given the economy from these purchases.

Supporting Industry Surveys

Many hunter purchases were absorbed by businesses in the state. Surveys were sent to various commercial enterprises and businesses that directly rely on the wild turkey. Surveys were completed by taxidermists (Mississippi State Taxidermist Association) ($N = 35$), wild turkey mounting material manufacturers ($N = 2$), hunting equipment and clothing manufacturers ($N = 2$), and hunting outfitters ($N = 9$). Only

major producers of equipment and clothing were surveyed. Activities taking place in those industries that benefit from wild turkey hunters' expenditures were further described. For example, taxidermists can be found throughout the state; jobs are supported by those manufacturing materials used by taxidermists. Additionally, turkey hunting materials (e.g., calls, camouflage, clothing, blinds) are produced in Mississippi. Raw materials (e.g., wood, cotton) come from forests and fields in the state to supply these industries. Commercial hunting businesses and guided hunts, partially or solely devoted to wild turkey, are present in the state.

Additional Economic Activity Related to the Wild Turkey

An investigation also was undertaken to determine additional sources of economic activity and associated values that relate to wild turkey by collecting financial data from state industries, institutions, organizations, agencies, and associations (e.g., Miss. Chap. Natl. Wild Turkey Fed.). These expenditures and revenues were used to determine total valuation of the wild turkey in terms of dollars spent to maintain, support, and enjoy the wild turkey resource.

Results

There were 39,775 (SE = 1,220) wild turkey hunters in Mississippi during spring 1993 and they spent 334,856 (SE = 14,695) hunter activity-days in pursuit of the wild turkey (Shropshire 1994). The survey of wild turkey hunters who hunted in 1993 in Mississippi resulted in 1,524 returns for a response rate of 71% (Godwin et al. 1997). Approximately 55% of the surveys were sent to hunters whose addresses were acquired from WMA activity. However, there was no significant difference among WMA contacts and non-WMA contacts in the amount of time spent on public and private lands hunting turkey (Godwin et al. 1997). Therefore, it was felt that the sample was representative of state hunters. The response rate to the economic section of the survey was 69.6%. Average expenditures by wild turkey hunters surveyed (N = 1491) in Mississippi in 1993 were estimated (Table 1). Wild turkey

Table 1. Average expenditures by wild turkey hunters surveyed (N = 1,491) in Mississippi, 1993 (zero values were included in the averages).

Expenditure type	Expenditure $\bar{x}$	Expenditure SE	Total dollars
Ammunition	16.57	2.75	24,704
Guns	70.24	4.22	104,724
Hunter accessories, clothing	67.85	4.53	101,164
Hunting fees[a]	148.50	9.71	221,418
Lodging, gasoline, food	143.46	5.84	213,900
Miscellaneous	22.91	2.87	34,165
Total			700,075

a. includes land lease costs and payments to outfitters.

Table 2. Estimated wild turkey hunter expenditures by type and distribution in Mississippi, 1993, based on surveyed wild turkey hunters ($N = 1,491$).

Expenditure type	Total dollars	Distribution (%)
Ammunition	659,022	4.45
Clothing	984,670	6.64
Equipment	638,629	4.31
Gasoline	744,123	5.02
Guns	2,793,694	18.85
Hunter accessories	1,714,055	11.56
Hunting fees[a]	1,476,677	9.96
Licenses	576,976	3.89
Lodging	3,448,374	23.26
Restaurants, groceries	1,513,655	10.22
Taxidermy	2,72,781	1.84
Total	14,822,656	100.00

a. Includes land lease costs and payments to outfitters.

hunters spent $14.8 million in Mississippi during 1993 (Table 2). These hunters spent an average of $44.27/activity-day (1993 dollars). The largest expense category was lodging (23.3%). The next 2 largest categories were for guns and hunter accessories at 18.9% and 11.6%, respectively.

As a result of the $14.8 million in expenditures from wild turkey hunting in Mississippi, $7.4 million was retained as a direct sales impact (Table 3). In turn, the direct sales generated $9.3 million in secondary impacts for a total sales impact of $16.7 million. These impacts represented $10.4 million of value-added to the state economy of which $5.5 million was directed to wages and salaries in support of 385 full- and part-time jobs. Key beneficiaries of wild turkey hunting were the wholesale and retail trade, services, and manufacturing and the finance, insurance, and real estate sector groups.

Table 3. Total state economic impacts (dollars) of wild turkey hunting by industrial groups in Mississippi, 1993, estimated by IMPLAN model.

Industry	Direct sales	Secondary sales	Total sales	Value-added	Employee income	Jobs (*N*)
Agriculture, forestry, fisheries	5,600	154,100	159,700	69,500	20,200	4.83
Mining	20,400	255,500	275,900	139,600	21,100	0.84
Construction	0	634,000	634,000	239,100	132,000	7.15
Manufacturing	1,136,400	1,431,600	2,568,000	687,200	371,900	15.82
Transportation, commun., utilities	92,800	835,100	927,900	517,600	229,700	7.06
Wholesale, retail trade	3,023,700	1,819,800	4,843,500	3,575,900	1,861,900	175.79
Finance, insurance, real estate	268,000	1,696,000	1,964,000	1,189,000	233,500	11.92
Services	2,198,200	2,132,600	4,510,800	3,216,500	1,994,400	129.35
Government enterprises	603,100	158,600	761,700	711,200	671,200	32.46
Totals	7,348,200	9,297,300	16,645,500	10,345,600	5,535,800	385.22

Wholesale and retail trade sectors had the highest sales impact ($4.8 million) and included businesses selling clothing, footwear, turkey calls, food, accessories, and other miscellaneous retail. These items are in demand during most hunting trips. The wholesale and retail trade group delivered the largest portion of the value-added ($3.6 million) to the state. This reflects on the state's ability to supply, among other items, agricultural and forestry products to these businesses (e.g., food, cotton, wood products).

The services group had the second largest total sales impact in the state, estimated as $4.5 million. This group, which includes the hotel and lodging-places sector, also delivered a major portion of the value-added ($3.2 million). Taxidermists and hunting outfitters were included in the services industrial group. The Mississippi State Taxidermist Association includes about 35 businesses that employ approximately 50 people. There are up to 75 other taxidermists in the state whose businesses involve wild turkey (B. Beebe, Miss. State Taxidermist Assoc., pers. commun., July 1996). The annual number of turkeys mounted by association taxidermists in the state (5-year average) was 538. Turkey hunters utilizing taxidermy services spent $333 and $285 per bird, respectively, to have gobblers and hens mounted. Taxidermists utilize a variety of basic materials to mount wild turkeys. These inputs include steel rods, bodies, wire, heads, and glass eyes. Taxidermists surveyed spent over $23,000 for inputs related to wild turkey, of which approximately 61% was purchased from manufacturers in the state (Table 4).

The manufacturing group had the third largest total sales impact in the state, at $2.6 million, with a value-added of $0.69 million. The group included manufacturers of mounting materials used by taxidermists or sold by wholesale companies. Mounting material manufacturers employ about 10 people in Mississippi. The estimated gross salaries dedicated to manufacturing wild turkey mounting materials by companies in the state is over $35,000. Gross sales to companies and taxidermists selling turkey mounting materials are over $100,000; however, most of these businesses reside outside the state. Almost $22,000 worth of basic material inputs are used to manufacture turkey mounting materials; again, most of these inputs are purchased outside of Mississippi. Since many of the inputs to this industry are produced outside the state, the economic impact on the state is reduced from hunter purchases. The taxidermy business illustrates why there is a relatively low value-added for the manufacturing group when compared to the other sector groupings. Other supporting industries of wild turkey hunting in the state were the manufacturers of hunting equipment and clothing.

Major expenditures and revenues associated with industries, institutions, organizations, agencies, associations, (e.g., Haas Outdoors, Primos Hunting Calls, Miss. Chap. Natl. Turkey Fed., Miss. State Taxidermist Assoc.) and other groups or individuals made on behalf of the wild turkey totaled $11.4 million (Table 4). These revenues included some items purchased by hunters but not included in the 1993 hunter survey. A prime example was the money spent on establishing food plots. The estimate for food plot expenditures was based on costs for establishing the field plots and the amount of land dedicated to this endeavor. Establishment costs for ryegrass, clover,

Table 4. Monetary (dollars) exchanges made on behalf of the wild turkey in Mississippi, 1996.

Category	Costs and expenditures	Revenues and incomes	Category descriptions
Accessories, camouflage, and videos		9,593,950	sold in the state by state producers
Miss. Coop. Wild Turkey Res. Proj.		344,964	salaries, appropriations, etc.
Food plots	1,490,065		establishment costs
Hunter expenditures (1993 dollars)	14,822,656		includes some hunter accessories, etc.
Hunting outfitters		657,788	for Miss., included in hunter expenditures
Mounting material, target manufacturers	21,285		basic material inputs only
Mounting material, target manufacturers		107,000	U.S. revenues
National Wild Turkey Fed. (NWTF)		125,444	returned to the chapter
NWTF	55,000	115,000	Miss. director, budget; chapter dues
NWTF Miss. Chap.	70,000		turkey projects
NWTF Miss. Chap. banquets		269,086	net revenue
Miss. State Taxidermist Assoc.	23,692		basic material inputs only
Miss. State Taxidermist Assoc.		175,980	gross revenues for wild turkey in Miss.
Turkey and turkey hunting magazines	8,042		state resident subscriptions
Totals	16,490,740	11,389,213	

and wheat averaged $378/ha (1989 dollars) while chufa was $558/ha (1996 dollars) (Vanderhoof and Jacobson 1989). We estimated that 30% of the forest land (7.53 million ha) in Mississippi is managed for wildlife (2.27 million ha). Of this, about 1% is planted in food plots (22,576 ha). The Mississippi State Department of Wildlife, Fisheries and Parks plants about 1,000 ha/year on public lands. Approximately 445 ha are planted in chufa on private lands in Mississippi exclusively for turkey, with the remainder dedicated to both white-tailed deer (*Odocoileus virginianus*) and wild turkey. It was assumed that 15% of this remaining land base was directed toward wild turkey.

Discussion

Total expenditures in Mississippi by wild turkey hunters compared favorably with studies in other states (Baumann et al. 1990). Likewise, the cost per activity-day was similar, after adjusting for inflation, to a similar study of big game hunters in Mississippi (U.S. Dep. Int. and U.S. Dep. Comm. 1993). Big game hunting in the southern United States, in large measure, comprises the pursuit of white-tailed deer, wild turkey, and black bear.

In most instances, indirect sale impacts were greater than direct sale impacts for a particular sector group such as services. Direct sales in this sector require utilization of inputs from other sectors in their production systems. Inputs produced statewide generate additional indirect economic impacts. Local businesses use items consumed as a result of turkey hunting activity that need to be reproduced and resupplied (e.g., paper products).

In the case of manufacturing, where many inputs are produced outside the state, the secondary sales and value-added were relatively low. Wages generated by producing the inputs needed by state industries are lost. For example, the steel rods and wire used to mount wild turkeys are purchased mainly from outside the state. Shot guns and shells are almost exclusively produced in other states.

Our analysis also indicated that other industries in the state's economy, not usually associated with hunting, benefit from the resource. For example, Mississippi's finance, insurance, and real estate businesses receive $2.0 million in total sales impact from wild turkey hunting. Indirectly, other businesses, such as those included in the construction group (634,000), also benefit.

The output multiplier was 2.27 for wild turkey hunting in Mississippi (total sales impact/direct sales impact). In other words, for every dollar absorbed by industries in the state from hunter purchases, there is an additional $1.27 in economic impact. Multipliers provide a useful picture of the degree of internal linkage between various sectors of the economy and the relationship of these sectors to consumer spending (Archer 1982). Therefore, this value represents the ability of a state economy to recirculate economic impact by providing goods and services internally. It also reflects the ability of the economy to meet the purchasing demands of those employed by either the direct or indirect business sectors. The inability on the part of the state economy to capture these activities is directly related to its size and complexity.

Each dollar of expenditures in the state for wild turkey hunting generated $0.50

in direct impact (expenditures/direct sales). A larger value would reflect a smaller proportion of imports by state businesses on goods and services produced outside the state economy. In terms of business to business trade (indirect impacts), there was minimal opportunity to purchase inputs within the state for many supporting industries (e.g., chufa, turkey eyes). This same effect also occurred in the household expenditure of wages and salaries earned from turkey-hunting related employment (induced impact). If more products (e.g., shot guns, shells) were manufactured in the state, wages and salaries would increase.

The wild turkey has sizable economic and associated values for Mississippi. However, there are a number of ways in which the state and its economy can further benefit from this resource, although state and federal agencies, private landowners, forest industry, turkey hunters, and the public will have to work cooperatively to improve habitat availability and management. Further economic benefits would occur if there were more hunters, higher expenditures, and a different structure of state industries.

To increase economic and non-economic values and benefits to the state of Mississippi, forest and wildlife managers could work toward increasing the turkey population. Several factors, such as habitat modifications (e.g., large-scale harvest of mature forests, lack of prescribed burning), predation, diseases, and flooding have resulted in a major decline in the turkey population in Mississippi (Hurst 1997). Harvests of wild turkeys have declined from 59,241 in 1987 to 28,406 birds in 1996. The number of wild turkey hunters has fallen from 65,516 in 1987 to just under an average of 40,000 (1988–1996), a decline of 39%. Based on current activity-day and expenditure patterns, this decline represents a potential loss of over $5.8 million in revenue for the state economy in 1996. If a larger population of birds is maintained in the state, there are ample numbers of hunters available who will spend time and money to hunt the wild turkey.

The existence of a healthy environment for species such as wild turkey and the corresponding hunting activity offer economic opportunities for private landowners in the state. An important hunter expenditure category was access fees to landowners. Since 1980, in the southern United States, hunting has become an important income source for private landowners, paying for property taxes and some management expenses (Thomas 1996). The establishment and management of hunting areas can lead to further income for Mississippi's private forest landowners.

The third area concerns the establishment of basic industries in the state that can produce raw materials used to produce turkey-related items. In some cases, this is being done with the forest resource (e.g., wood, paper, cardboard). However, other items can add to the economic benefit accruing from wild turkey if they are produced in the state, such as the production of chufa for food plots or oil-based products used in the game mounting process.

Another concern is the loss or paucity of manufacturing companies producing retail items (e.g., game calls) that directly relate to the hunting activity in Mississippi. In the last few years, 3 Mississippi companies that produced hunter accessories such as calls, seats, masks, or gloves have left the state or are no longer in operation.

Currently, there are no major gun manufacturers in the state. We recommend a refined survey to update the wild turkey hunter data base to secure current information on expenditures related to hunting trips.

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